JAW

Merton Vision

BREEAM 2018 Pre-Assessment Report

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Client:	
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BREEAM

JAWSustainability

Contents

1. Introduction

This pre-assessment has been prepared for the redevelopment of Merton Vision. The site currently accommodates several buildings which provide facilities to Merton Vision. The current proposal is to demolish these building and redevelop the site to provide a two-storey development, which would host improved facilities for Merton Vision across the ground floor, with a GP practice across part of the ground floor and the first floor.

This report assessed the potential of the new building part of the development to achieve a BREEAM rating. There is a requirement for new build developments to achieve a BREEAM Excellent rating.

This Pre Assessment Report demonstrates that the development has the potential to achieve an Excellent rating with a target score of 71.55%. The credit strategy has been agreed with the design team following a BREEAM workshop with the BREEAM Assessor and represents the most appropriate way of meeting the requirements.

The results presented are indicative only of the potential performance achievable for the assessed building at this stage.

2. Policy

London Borough of Merton Core Strategy
Policy CS 15: Climate Change

All minor and major development, including major refurbishment, will be required to demonstrate the following unless developers can robustly justify why full compliance with the policy requirements is not viable:

All non-domestic development over 500m2which does not qualify for assessment under Code for Sustainable Homes will be expected to be built to a minimum of BREEAM (Building Research Establishment Assessment Method) Very Good standard, and meet CO2 reduction targets in line with the requirements of the London Plan or national policy, whichever is the greater.

3. BREEAM 2018 New Construction

BREEAM 2018 is an environmental assessment method used to evaluate new build non-domestic buildings.

The performance of the building is assessed using a framework of environmental benchmarks. The standards against which the building is evaluated encapsulate the following categories:

- Management
- Health and Wellbeing
- Energy
- Transport
- Water
- Materials
- Waste
- Land Use & Ecology
- Pollution
- Innovation

4. BREEAM Scoring

There are a wide range of credits to be achieved within the categories listed above. There are a number of minimum mandatory standards that must be met and tradable credits that can be achieved in order to meet the target score.

Once an appropriate credit strategy has been targets, environmental weightings are applied, that vary between each category to demonstrate their environmental impact.

The current rating benchmarks for the BREEAM 2018 scheme are detailed in the table below:

BREEAM Rating	% Score
Outstanding	≥ 85
Excellent	≥ 70
Very Good	≥ 55
Good	≥ 45
Pass	≥ 30
Unclassified	< 30

Table 2.1 - BREEAM 2018 rating benchmarks

5. Score Summary

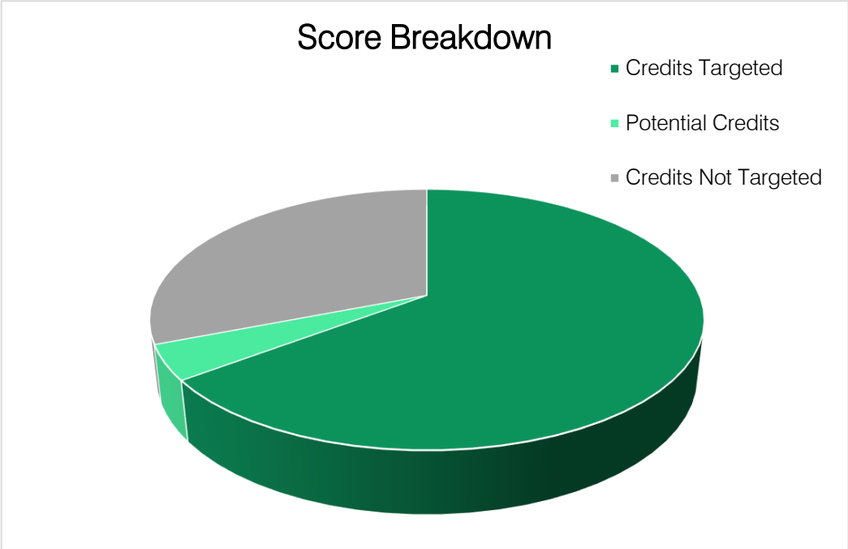
Building Type	Office
Project Type	Fully Fitted

Target BREEAM Score	71.55
Target BREEAM Rating	Very Good

Miniumum Standards for target rating met?	YES

Potential BREEAM Score	74.27
Potential BREEAM Rating	Very Good

BREEAM Category	Credits Available	Targeted Credits	Potential Credits	% of Credits Achieved	Environmental Weighting	Section Score
Management	21	16	2	76.2%	11.0%	8.38
Health & Wellbeing	18	5	0	27.8%	14.0%	3.89
Energy	21	19	0	90.5%	16.0%	14.48
Transport	12	2	0	16.7%	10.0%	1.67
Water	8	10	0	125.0%	7.0%	8.75
Materials	14	12	1	85.7%	15.0%	12.86
Waste	10	7	1	70.0%	6.0%	4.20
Land Use & Ecology	13	11	0	84.6%	13.0%	11.00
Pollution	12	8	0	66.7%	8.0%	5.33
Innovation	10	1	0	10.0%	10.0%	1.00



This report demonstrates that the development has met all of the minimum standards and can achieve a Very Good rating on the BREEAM 2018 scheme.

6. Pre-Assessment Credit Strategy Summary Report

The following table details the BREEAM credit strategy targeted for the development. Comments are provided against each credit to demonstrate why they have been deemed feasible or unfeasible.

Management							
Credit Summary	BREEAM Assessor Comments	Action at RIBA Stage	DT Responsibility	Minimum Standard for Rating	Points Available	Status	Points Targeted
Man 01 Project Brief and Design							
Project delivery stakeholders meet to set out compliant roles and responsibilities established in accordance with details in Appendix A1	The design team have met from Stage 2 to identify and define their roles, responsibilities and contributions for each of the key phases of project delivery.	2	Architect / Client	-	0.52	Targeted	0.52
Third party consultation activities undertaken in line with requirements in Appendix A1	Comprehensive consultation has been undertaken.	2	Architect / Client	-	0.52	Targeted	0.52
The project team, including the client, formally agree strategic performance targets	The project team have formally agreed to achieve the target BREEAM rating.				Prerequisite	Targeted	Prerequisite
BREEAM AP appointed and a target rating contractually agreed. To achieve the credit at the Design Stage Assessment the agreed performance targets must be demonstrably achieved by the project design and demonstrated via the BREEAM Assessor's Design Stage report	A BREEAM AP has been involved with the project.	2	JAW	-	0.52	Targeted	0.52
BREEAM AP involved and reports on progress. The BREEAM AP will monitor against agreed targets throughout the design process and formally report the progress. The previous credit must be achieved to receive this credit.	Th BREEAM AP should continue their involvement throughout the next stages	2-4	JAW	-	0.52	Targeted	0.52
Man 02 Life Cycle Cost and Service Life Planning							
An elemental LCC analysis is commissioned in line with requirements in Appendix A2	Compliant LCC is a significant piece of work that is not being undertaken for this small project.	2	Client / QS	-	1.05	Not Targeted	0.00
A component level LCC plan has been developed in line with requirements in Appendix A2		4	Client / QS	-	0.52	Not Targeted	0.00
The capital cost of the building will be reported in £k/m^2 via the BREEAM Assessment Scoring and Reporting tool	The capital cost will be confirmed in the BREEAM tool.	-	Contractor	-	0.52	Targeted	0.52
Man 03 Responsible Construction Practices							
All timber and timber-based products used during the construction process of the project are legally harvested and traded timber (FSC compliant or equivalent)	All site timber (including formwork, hoarding, shuttering etc.) will be from FSC sources, with CoC	-	Contractor	-	Prerequisite	Targeted	Prerequisite
All parties who at any stage manage the construction site (e.g. the principal contractor, the demolition contractor) must operate an environmental management system (EMS) covering their main operations and implement best practice pollution prevention policies (air & water pollution).	The main contractor is expected to operate an EMS (ISO 14001 or equivalent) and implement best practice pollution prevention policies and procedures on-site in accordance with Pollution Prevention Guidelines, Working at construction and demolition-sites: PPG6 If the demolition contractors can also comply, the credit will be achievable. This might not be feasible for this small site.	-	Contractor	-	0.52	Potential	0.00
The client and the contractor formally agree BREEAM performance targets	This will be undertaken.				Prerequisite	Targeted	Prerequisite
BREEAM AP monitors and reports progress through construction.	A sustainability champion should be appointed by the contractor.	5-6	Contractor	-	0.52	Targeted	0.52
Responsible construction management checklist followed, with all minimum requirements met and 6 additional items	The Responsible construction management checklist will be followed on site to achieve 2 credits.	-	Contractor	Very Good	0.52	Targeted	0.52
		-		Excellent	0.52	Targeted	0.52
Site energy and water consumption recorded / monitored. See Appendix A3 for details of the requirements.	All site energy, water and transport of materials and waste will be monitored during the construction process and reported monthly.	-	Contractor	-	0.52	Targeted	0.52
Transport of construction materials and waste metered / monitored. See Appendix A3 for details of the requirements.					0.52	Targeted	0.52

Man 04 Commissioning and Handover							
A schedule of commissioning and testing is required. Commissioning and testing of building services to CIBSE, BSRIA regs, monitored on behalf of the client by an appropriate person. Refer to Appendix A4 for detailed requirements	A schedule of commissioning and testing will be prepared. An appropriate project team member will be appointed to monitor and programme pre-commissioning, commissioning and, where necessary, re-commissioning. All commissioning will be carried out in accordance with the relevant guidelines.	-	M&E / Contractor	Very Good	0.52	Targeted	0.52
During the design stage, an appropriate project team member is appointed, provided they are not involved in the general installation works for the building services systems, with responsibility for: a. Undertaking design reviews and giving advice on suitability for ease of commissioning. b. Providing commissioning management input to construction programming and during installation stages. c. Management of commissioning, performance testing and handover or post-handover stages. For complex systems, a specialist commissioning agent must be appointed during the design stage. Refer to Appendix A4 for detailed requirements	An appropriate project team member will be appointed to carry out the commissioning requirements. A specialist commissioning manager will be appointed during the design stage to provide design advice regarding commissioning of complex systems.	-	Contractor	-	0.52	Targeted	0.52
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). defects must be rectified. See Appendix A4 for details	Thermographic surveys are considered prohibitively expensive for a project of this scale.	-	Client / Contractor to appoint specialist	-	0.52	Potential	0.00
Two Building User Guides (BUGs) and training schedules are developed to provide: - Non-technical guidance for distribution to the building occupiers. - Technical guidance for premises facilities managers. Refer to Appendix A4 for detailed contents requirements	The contractor will produce compliant BUGs & training schedules.	-	Contractor	Very Good	0.52	Targeted	0.52
Man 05 Aftercare							
Commitment to provide aftercare support to building occupants for at least the first 12 months from occupation, in accordance with requirements in Appendix A5	There will be a mechanism to collect the energy and water consumption data for at least 12 months after occupation, compare this with expectations and analyse any differences. There will also be a contract or commitment to provide aftercare support to all the building occupiers. See Appendix A5 for details.	-	Contractor / Client	-	0.52	Targeted	0.52
Seasonal commissioning of building services over a minimum 12-month period, once the building becomes substantially occupied. See Appendix A5	The contractor will be required to undertake seasonal commissioning responsibilities will be completed over a minimum 12 month period.	-	M&E / Contractor	Very Good	0.52	Targeted	0.52
Post occupancy evaluation (POE) is undertaken by a third party. The client or building occupier commits funds to pay for the POE in advance. Refer to Appendix A5 for detailed requirements	Post Occupancy Evaluation will be undertaken.	-	Client	-	0.52	Targeted	0.52

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Health & Wellbeing							
Credit Summary	BREEAM Assessor Comments	Action at RIBA Stage	DT Responsibility	Minimum Standard for Rating	Points Available	Status	Points Targeted
Hea 01 Visual Comfort							
Daylighting Should be met following either option A. or B. A. 2% daylight factor AND either (a) OR {(b) and (c)} (a) Uniformity ratio of 0.3 or point daylight factor of 0.3 times the relevant average daylight factor Uniformity ratio of 0.7 or point daylight factor of 0.7 times the relevant average daylight factor where the spaces with glazed roofs, atria (b) At least 80% of the room has a view of sky from desk or table top height (0.85m in multi-residential buildings, 0.7m in other buildings). (c) The room depth criterion d/w + d/HW < 2/(1-RB) is satisfied B. Minimum 80% of the relevant building areas meet 300 lux Average daylight illuminance and 90 lux Minimum daylight illuminance for 2000 hours per year or more	It is expected that at least one credit will be achievable.	-	Client appointed specialist.	-	0.78	Targeted	0.78
					0.78	Not Targeted	0.00
View Out 95% of the floor area in 95% of spaces for each relevant building area is within 8 m of an external wall. The external wall has a window or permanent opening that provides an adequate view out.. The window or opening must be ≥ 20% of the surrounding wall area See Appendix B1.	This criteria will be achieved.	-	Architect	-	0.78	Targeted	0.78
External lighting specified to SLL and CIBSE standards and adequately zoned and controlled. Refer to Appendix B1 for detailed requirements	All lighting will be designed to meet the required standards.	-	M&E	-	0.78	Targeted	0.78

Hea 05 Acoustic Performance							
Achieve indoor ambient noise levels that comply with the design ranges given in Section 7 of BS 8233:2014 A programme of acoustic measurements is carried out by a compliant test body.	The acoustic criteria will be targeted and testing carried out.	-	Acoustician	-	0.78	Targeted	0.78
Hea 06 Security							
A Suitably Qualified Security Specialist (SQSS) conducts an evidence-based Security Needs Assessment (SNA). They produce a set of recommendations and solutions to ensure the design of the development is planned, designed and specified to address the issues identified in the preceding SNA.	A SQSS will not be appointed.	2	Client appointed specialist & Architect	-	0.78	Not Targeted	0.00
Hea 07 Safe and Healthy Surroundings							
Dedicated and safe cycle paths are provided from the site entrance to any cycle storage, and connect to offsite cycle paths where applicable. Dedicated and safe footpaths are provided on and around the site providing suitable links between site areas (e.g. car park to building entrance) Pedestrian drop-off areas provide direct access to footpaths Delivery areas are not accessed through general parking areas and there are dedicated parking/waiting/turning areas for delivery vehicles	There will be shared access for cars and cyclists so this is not achievable.	-	Architect	-	0.78	Not Targeted	0.00
There is an outside space providing building users with an external amenity area.	Outside space is provided.	-	Architect	-	0.78	Targeted	0.78

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Energy							
Credit Summary	BREEAM Assessor Comments	Action at RIBA Stage	DT Responsibility	Minimum Standard for Rating	Points Available	Status	Points Targeted
Ene 01 Reduction of Energy Use and Carbon Emissions							
Energy Performance Ratio for New Constructions (EPRNC) (Based the EPRNC achieved): 0.100	It is anticipated that 3 credits will be achieved due to energy reduction measures.	-	M&E		0.76	Targeted	0.76
0.200					0.76	Targeted	0.76
0.300					0.76	Targeted	0.76
0.400				Excellent	0.76	Targeted	0.76
0.500					0.76	Targeted	0.76
0.600				Outstanding	0.76	Not Targeted	0.00
0.700					0.76	Not Targeted	0.00
0.800					0.76	Not Targeted	0.00
0.900 AND zero net regulated CO_2 emissions					0.76	Not Targeted	0.00
Prior to completion of the Concept Design, a preliminary design workshop focusing on operational energy performance is held by relevant members of the design team.	A preliminary design workshop will be held focusing on operational energy performance.	2	M&E	-	Prerequisite	Targeted	Prerequisite
Additional energy modelling is undertaken during the design and post-construction stage to generate predicted operational energy consumption figures Predicted energy consumption targets by end use, design assumptions and input data are reported A risk assessment will be carried out to highlight any significant design, technical, and process risks that should be monitored and managed throughout the construction and commissioning process.	The required modelling will be undertaken at the correct time.	-	M&E	-	3.05	Targeted	3.05
Ene 02 Energy Monitoring							
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 Meter the energy consumption in buildings according to the total useful floor area Through labelling or data outputs, building users can identify energy consuming end uses See Appendix C1 for further details	All major energy consuming items will be metered (with a pulsed output and/or connected to a BMS): - Space Heating - Domestic Hot Water Heating - Humidification - Cooling - Ventilation i.e. fans (major) - Pumps - Lighting - Small Power (lighting and small power can be on the same sub-meter where supplies taken at each floor/department) - Renewable or Low Carbon Systems (separately) - Controls - Other major energy-consuming items where appropriate	-	M&E	Very Good	0.76	Targeted	0.76
Monitor a significant majority of the energy supply Sub-meter per floor plate in large single occupancy or single-tenancy buildings with one homogeneous function	The metering strategy will be designed to meet this criteria.		M&E	-	0.76	Targeted	0.76
Ene 03 External Lighting							
Specification of energy-efficient light fittings for external areas (in line with Appendix C2), controlled through a time switch, or daylight sensor, to prevent operation during daylight hours, with average initial luminous efficacy of not less than 70 l/W, and with presence detection in areas of intermittent pedestrian traffic	The luminous efficacy of the external light fittings will be greater than 70 lumens per circuit Watt. All lighting will be on daylight & presence detection.	-	M&E	-	0.76	Targeted	0.76

Ene 04 Low Carbon Design							
Analysis of the proposed building design/development before **RIBA Stage 2** was undertaken and identified opportunities for passive design solutions have been implemented and reduced total energy demand has been quantified. BREEAM issue Hea 04 Thermal Comfort has to have been achieved. See Appendix C3.	Thermal modelling will be undertaken, passive design features incorporated and the reduction in total energy demand and carbon dioxide emissions quantified.	2	M&E	-	0.76	Targeted	0.76
The building utilises a free cooling strategy and the first credit within the BREEAM issue 'Ene 04 Low Carbon Design' (passive design analysis) has been achieved	This will not be achievable.	-	M&E	-	0.76	Not Targeted	0.00
Feasibility study is carried out and implemented, covering points listed in Appendix C3. The reduction in reduced regulated CO_2 shown by the feasibility study is quantified and the requirements of Appendix C3 can be achieved.	Thermal modelling will be undertaken and will include LZC technologies.	2	M&E	-	0.76	Targeted	0.76
Ene 06 Energy Efficient Transportation Systems							
Where lifts are being installed; an analysis of the transportation demand and usage patterns for the building has been carried out and energy consumption calculated in accordance with BS EN ISO 25745 Part 2	An analysis of the transportation demand and usage patterns for the building will be carried out in order to appropriately specify lifts. The lift manufacturer will be asked to undertake energy calculations and specify the features that make the most savings	-	M&E / Lift Specialist	-	0.76	Targeted	0.76
Specify energy efficient features (specified in Appendix C4) for each lift and specify regenerative drives where their use is demonstrated to save energy (one credit) AND specify some method of motor synchronisation to passenger variables for escalators/moving walkways (second credit)	The lift and/or escalators specified must meet the required energy efficiency features		M&E / Lift Specialist		0.76	Targeted	0.76
					0.76	Targeted	0.76
Ene 08 Energy Efficient Equipment							
Unregulated energy consumption is monitored and a meaningful reduction is made in the building. See Appendix C6 for requirements.	The client will ensure that all equipment meets the requirements.	-	Client / Contractor	-	1.52	Targeted	1.52
Transport							
Credit Summary	BREEAM Assessor Comments	Action at RIBA Stage	DT Responsibility	Minimum Standard for Rating	Points Available	Status	Points Targeted
Tra 01 Transport Assessment and Travel Plan							
During the feasibility and design stages, a travel plan is developed based on a site-specific travel assessment or statement. See Appendix D1 for full requirements.	A compliant travel plan will be produced.	1 and 2	Transport Consultant	-	0.83	Targeted	0.83
					0.83	Targeted	0.83

Tra 02 Sustainable Transport Measures							
Achieve the Tra 01 Transport assessment and travel plan credits	Tra 01 will have been achieved	-		-	Prerequisite	Targeted	Prerequisite
Credits are awarded for Tra 02 according to the existing Accessible Index (AI) of the project, and the total number of points achieved for the options implemented, based on the table in Appendix D2. Please select in the next cell whether the existing building has < 25 points (Option A), ≥ 25 & < 40 (urban centre) points (Option B), or ≥ 40 points (Option C)	The development has an AI of 14.87				8.33	Targeted	5.83
The existing AI calculated in Tra 01 achieves the following: ≥ 4 for prison or MOD sites, rural location sensitive buildings, and other building group 3 ≥ 8 for all other building types	The existing AI will meet the required score					Targeted	
Demonstrate an increase over the existing Accessibility Index through negotiation with local bus, train or tram companies to increase the frequency of the local service provision for the development;	No change will be made to influence the AI.					Not Targeted	
OR Demonstrate an increase over the existing Accessibility Index. This could be through provision of a diverted bus route, a new or enhanced bus stop, or other similar solutions						Not Targeted	
OR Provide a dedicated service, such as a bus route or service.						Not Targeted	
Provide a public transport information system in a publicly accessible area, to allow building users access to up-to-date information on the available public transport and transport infrastructure. This may include signposting to public transport, cycling, walking infrastructure or local amenities	A public transport information system will be provided in a publicly accessible area					Targeted	
Provide electric recharging stations of a minimum of 3kW for at least 10% of the total car parking capacity for the development.	Recharging stations will be incorporated.					Targeted	
Set up a car sharing group or facility to facilitate and encourage building users to car share. AND Raise awareness of the sharing scheme with marketing and communication materials. AND Provide priority spaces for car sharers for at least 5% of the total car parking capacity for the development. AND Locate priority parking spaces nearest the development entrance used by the sharing scheme participants.	A scheme will be set up.					Targeted	
During preparation of the brief, the design team consults with the local authority (LA) on the state of the local cycling network and public accessible pedestrian routes, to focus on whichever the LA deems most relevant to the project, and how to improve it. AND Agree and implement one proposition chosen with the local authority. The proposition supported by the development is additional to existing local plans and has a significant impact on the local cycling network or on	This is not appropriate for this scale of building.					Not Targeted	
Install compliant cycle storage spaces to meet the minimum levels set out in Appendix D2a.	Compliant cycle storage spaces will be installed					Targeted	
Provide at least two compliant cyclists' facilities for the building users, (including pupils where appropriate to the building type). See Appendix D2a for further information on compliance for the following: – Showers – Changing facilities – Lockers – Drying spaces.	At least two compliant cyclists' facilities will be provided for the building users					Targeted	
Existing amenities: At least three existing accessible amenities are present, see Appendix D2b, where relevant for a Building Group.	There are sufficient local amenities in the areas.					Targeted	
Enhanced amenities: Ensure a minimum of one new accessible amenity, in accordance with Appendix D2b, for the relevant Building Group, is provided.	No new amenities will be provided.					Not Targeted	
OR Ensure more than one new accessible amenity, in accordance with Appendix D2b for the relevant Building Group, is provided.						Not Targeted	
Implement one site-specific improvement measure, not covered by the options already listed in this issue, in line with the recommendations of the travel plan. Submit this for review by BRE.	This is not achievable for this scale of project.					Not Targeted	
						Not Targeted	
						Not Targeted	

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Water							
Credit Summary	BREEAM Assessor Comments	Action at RIBA Stage	DT Responsibility	Minimum Standard for Rating	Points Available	Status	Points Targeted
Wat 01 Water Consumption							
Improvement over notional baseline of 12.5% (based on BREEAM calculation taking into account flow rates/consumption of sanitary ware & appliances)	The following flow rates will be used as guidance to achieve more than a 40% improvement: WC - 3.75 litre effective flush volume Urinal - 1.5 litre/bowl/hour WHB taps - 5 l/min Showers - 6 l/min Baths - 140 litres to overflow Kitchen taps - 7.3 l/min Kitchenette taps - 6 l/min Domestic sized dishwashers - 12 l/cycle	-	Architect / Contractor	Good	0.88	Targeted	0.88
Improvement over notional baseline of 25%				Outstanding	0.88	Targeted	0.88
Improvement over notional baseline of 40%					0.88	Targeted	0.88
Improvement over notional baseline of 50%					0.88	Not Targeted	0.00
Improvement over notional baseline of 55%					0.88	Not Targeted	0.00
Wat 02 Water Monitoring							
The specification of a water meter on the mains water supply to each building. AND Water-consuming plant or building areas, consuming 10% or more of the building's total water demand, are either fitted with sub meters or have water monitoring equipment integral to the plant or area AND Each meter (main and sub) has a pulsed output to enable connection to a Building Management System (BMS) and if there is an existing BMS any new build must be connected to the existing BMS	Sub-meters will be specified for the building and plant or area that consumes more than 10% of the building's water demand.	-	M&E	-	0.88	Targeted	0.88
Wat 03 Water Leak Detection							
A leak detection system capable of detecting major leaks on the water supply has been installed. The system must cover all mains water supply between and within the building and the site boundary. See Appendix E1 for details of requirements	Leak detection will be specified.	-	M&E	-	0.88	Targeted	0.88
Flow control devices are fitted in WC areas or sanitary facilities to ensure water is supplied only when needed (and therefore prevent minor water leaks). See Appendix E1 for details of compliant systems	Flow control devices (e.g. linked to a PIR) will be provided in the WC areas of the new building.	-	M&E	-	0.88	Targeted	0.88
Wat 04 Water Efficient Equipment							
All unregulated water demands have been identified and can be realistically reduced or mitigated through systems or processes in line with requirements in Appendix E2	No irrigation systems will be installed. External taps to be provided for manual watering.	-	Client / Contractor / Landscape Architect	-	0.88	Targeted	0.88

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Materials							
Credit Summary	BREEAM Assessor Comments	Action at RIBA Stage	DT Responsibility	Minimum Standard for Rating	Points Available	Status	Points Targeted
Mat 01 Environmental Impacts from Construction Products - Building Life Cycle Assessment (LCA)							
Offices, Industrial and Retail buildings must complete a comparison with BREEAM benchmark during Concept Design and Technical Design (**RIBA Stage 2 and 4**). Refer to Appendix F1. During concept design (**RIBA Stage 2**) identify opportunities for reducing environmental impacts by carrying out a LCA options appraisal of 2 to 4 significantly different substructure design options using an appropriate LCA Tool in line with requirements in Appendix F1. During the Technical Design stage (**RIBA Stage 4**) carry out a LCA options appraisal of 2 to 3 significantly different superstructure design options using an appropriate LCA Tool in line with requirements in Appendix F1.	Options for the superstructure will be appraised at all stages of the design to identify opportunities for reducing environmental impacts. It is expected that 6 credits will be achievable.	2 and 4	Architect / Contractor	-	1.07	Targeted	1.07
					1.07	Targeted	1.07
					1.07	Targeted	1.07
					1.07	Targeted	1.07
					1.07	Targeted	1.07
					1.07	Potential	0.00
During Concept Design (**RIBA Stage 2**) carry out a LCA options appraisal of a combined total of at least six significantly different substructure or hard landscaping design options.					1.07	Targeted	1.07
Mat 02 Mat 02 Environmental Impacts from Construction Products – Environmental Product Declaration (EPD)							
Construction products chosen with an EPD which will achieve a total EPD points score of at least 20 in compliance with requirements in Appendix F2. Enter the details of each EPD into the Mat 01/02 Results Submission Tool.	Products will be specified with EPDs in order to achieve the credit requirements	-	Architect / Contractor	-	1.07	Targeted	1.07
Mat 03 Responsible Sourcing of Materials							
All timber and timber based products used are 'legally harvested and traded'	The design team will develop a sustainable procurement plan. The contractor will be required to ensure that materials for major building elements are responsibly sourced to achieve at least 2 credits. All timber used on site will be legally sourced.	-	Contractor	Pass	Prerequisite	Targeted	Prerequisite
All materials for the project are sourced in accordance with a documented sustainable procurement plan				-	1.07	Targeted	1.07
Construction materials are responsibly sourced in line with requirements in Appendix F3. Points calculated using Mat 03 Tool: % of available points achieved - Superstructure - 10%					1.07	Targeted	1.07
% of available points achieved - as above and internal finishes, substructure and hard landscaping - 20%					1.07	Targeted	1.07
% of available points achieved - as above and internal finishes, substructure and hard landscaping - 30%					1.07	Not Targeted	0.00
Mat 05 Designing for Durability and Resilience							
The design incorporates suitable durability and protection measures into building design and construction to prevent damage to the building fabric or materials in case of accidental or malicious damage to provide protection against criteria detailed in Appendix F4. AND The relevant building elements incorporate design and specification measures to limit material degradation due to environmental factors. See Appendix F4 for methodology of assessment.	The building will incorporate suitable durability and robustness features.	-	Architect / Contractor	-	1.07	Targeted	1.07
Mat 06 Material Efficiency							
During **RIBA Stages 1 and 2** targets have been set and opportunities and methods have been reported which optimise the use of materials for **RIBA Stages 1-5.** AND The development of the implementation of material efficiency has been recorded for **RIBA Stages 3-5.** Refer to Appendix F5 for methodology.	Opportunities to optimise the use of materials in building design, procurement, construction, maintenance and the end of life in order to maximise the material efficiency of the project, will be investigated and implemented at every stage.	1-5	Architect / Contractor	-	1.07	Targeted	1.07

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Waste							
Credit Summary	BREEAM Assessor Comments	Action at RIBA Stage	DT Responsibility	Minimum Standard for Rating	Points Available	Status	Points Targeted
Wst 01 Construction Waste Management							
A pre-demolition audit (during **RIBA Stage 2**) has been completed for existing buildings/structures being considered for demolition to determine if refurbishment/reuse is feasible and to maximise material recovery in line with Appendix G1.	A pre-demolition audit will be carried out by the Demolition Contractor to maximise the recovery of material from the demolition.	2	Contractor	**Outstanding**	0.60	Targeted	0.60
A Resource Management Plan (RMP) is developed including accurate data records on waste arising and waste management routes. Amount of waste generated per 100m^2 = 13.3m^3 / 11.1 tonnes	A compliant RMP will be developed and the main contractor will be expected to ensure construction waste does not exceed 13.3m^3 / 11.1 tonnes per 100m^2 floor space. At least 80% of non-demolition waste and 90% of demolition by weight will be diverted from landfill following the waste hierarchy.	-			0.60	Targeted	0.60
Amount of waste generated per 100m^2 = 7.5 m^3 / 6.5 tonnes					0.60	Potential	0.00
Amount of waste generated per 100m^2 = 3.4m^3 / 3.2 tonnes					0.60	Not Targeted	0.00
Waste diverted from landfill: Volume (%) / Tonnage (%): Non-demolition 70% / 80% or Demolition 80% / 90%					0.60	Targeted	0.60
Wst 02 Use of Recycled and Sustainably Sourced Aggregates							
If demolition occurs onsite, a pre-demolition audit is completed of any existing buildings, structures or hard surfaces.					Prerequisite	Targeted	Prerequisite
3.5 - 6 Sustainable Aggregate Points achieved using the BREEAM Wst 02 calculator. See Appendix G2 for full details.	Recycled aggregates are not specified.	-	Contractor / Structural Engineer	-	0.60	Not Targeted	0.00
Wst 03 Operational Waste							
Provision of labelled, dedicated storage facilities for a building's operational recyclable waste of capacity appropriate to the building type, size and number of units (if relevant) and predicted volumes of waste. Sized either to meet known waste or 2m^2 (4m^2 if catering provided) for every 1000m^2 of floor area Where significant food waste is produced or in multi-residential buildings, composting facilities are provided and where significant packaging waste, a compactor/baler is provided	At least an 2m^2 space will be provided for the storage of recyclable waste.	-	Architect / Contractor	**Excellent**	0.60	Targeted	0.60
Wst 05 Adaptation to Climate Change							
A Climate Change Adaptation Strategy Appraisal (structural and fabric resilience specific) has been conducted using a systematic risk assessment evaluating the impact on the building over its projected life cycle from expected extreme weather due to climate change and, where feasible, mitigating against these impacts. Review mitigation methods during **RIBA Stage 4**. Develop recommendations or solutions based on Climate Change Adaptation Strategy Appraisal, and provide updates during Technical Design demonstrating how recommendations made at Concept Design have been implemented. See Appendix G3 for details	An assessment will be carried out to assess and mitigate the effects of climate change on the building.	2 & 4	Architect	-	0.60	Targeted	0.60
Wst 06 Design for Disassembly and Adaptability							
A study has been undertaken, and recommendations developed during the concept design, to explore ease of disassembly and the functional adaption potential of different design scenarios.	A functional adaptation strategy will be developed. This will include recommendations for measures to be incorporated to facilitate future adaptation.	2	Architect	-	0.60	Targeted	0.60
Updates have been provided during the Technical Design covering: - How recommendations (made during **RIBA stage 2**) have been implemented. - Changes to recommendations and solutions during the development of **RIBA Stage 4**. A building adaptability and disassembly guide has been developed to communicate the characteristics allowing functional adaptability and disassembly to prospective tenants.	The strategy will be updated for implementation at Stage 4.	3 & 4		-	0.60	Targeted	0.60

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Land Use & Ecology							
Credit Summary	BREEAM Assessor Comments	Action at RIBA Stage	DT Responsibility	Minimum Standard for Rating	Points Available	Status	Points Targeted
LE 01 Site Selection							
At least 75% of the proposed development's footprint is on an area of land which has previously been occupied	At least 75% of the proposed development's footprint is on land with was previously developed.	-	Architect	-	1.00	Targeted	1.00
The site is deemed to be significantly contaminated and will be remediated	The site is not contaminated therefore this credit is unavailable.	-	Architect / Client	-	1.00	Not Targeted	0.00
LE 02 Identifying and Understanding the Risks and Opportunities for the Project							
An assessment route has been determined and the client or contractor has confirmed it is compliant with all relevant UK and EU international legislation relating to the ecology of the site.		-		-	Prerequisite	Targeted	Prerequisite
Route 2 has been adopted (Refer to Appendix H1 for details)	An ecologist will be appointed to report on risks & opportunities for the project.	-	Ecologist	-	1.00	Targeted	1.00
					1.00	Targeted	1.00
LE 03 Managing Negative Impacts on Ecology							
LE 02 has been achieved. The client or contractor has confirmed that compliance is monitored against all relevant UK and EU or international legislation relating to the ecology of the site.	The ecologist will be asked to provide recommendations to achieve a neutral or positive increase in the ecological value of the site.			-	Prerequisite	Targeted	Prerequisite
Planning, liaison, implementation and data: - Roles and responsibilities have been defined - Impact of site preparation and construction works on ecology are identified to optimise benefits and outputs - Project team collaborate with representative stakeholders to select measures to be implemented during site preparation and construction works	Workshops and design team meetings will address the requirements.	1			1.00	Targeted	1.00
Route 2: Negative impacts from site preparation and construction works have been managed according to the hierarchy and EITHER: a. The loss of ecological value has been minimised (one credit) OR b. No overall loss of ecological value has occurred (two credits) (Refer to Appendix H2 for full details)	An ecologist will be appointed to provide recommendations for achieving this.		Ecologist		1.00	Targeted	1.00
					1.00	Targeted	1.00
LE 04 Change and Enhancement of Ecological Value							
LE 03 has been achieved. The client or contractor has confirmed that compliance is monitored against all relevant UK and EU or international legislation relating to the ecology of the site		-		-	Prerequisite	Targeted	Prerequisite
OR Route 2: The project team, collaborating with representative stakeholders, have implemented solutions and measures to enhance ecological value in the following order: - on site, and where this is not feasible, - off site within the zone of influence.	An ecologist will be appointed to provide recommendations for achieving this.	-	Ecologist		1.00	Targeted	1.00
AND Route 2: Credits are awarded on a scale of 1 to 3, based on the calculation of the change in ecological value occurring as a result of the project. This must be calculated in accordance with the process set out in GN 36 - BREEAM, CEEQUAL, HQM Ecology Calculation Methodology – Route 2. Credits are awarded as follows: 1. Minimising loss of ecological value (one credit - percentage score of 75-94)		-			1.00	Targeted	1.00
2. No net loss of ecological value (two credits - percentage score of 95-104)		-			1.00	Targeted	1.00
3. Net gain of ecological value (three credits - percentage score of 105-109)		-			1.00	Not Targeted	0.00
LE 05 Long Term Ecology Management and Maintenance							

The client or contractor has confirmed that compliance is monitored against all relevant UK and EU or international legislation relating to the ecology of the site. 'LE 03 - Planning, liaison, implementation and data' credit has been achieved. (At least one credit has been awarded under LE 04 for Route 2).		-		-	Prerequisite	Targeted	Prerequisite
Route 1 and 2: The project team have collaborated with stakeholders on solutions and measures implemented to monitor, review and develop management solutions. Monitor and report on ecological outcomes from the design and construction stages and overall project, and maintain ecological value of the site in line with its zone of influence and any sustainability linked activities. Include a section about Ecology and Biodiversity as part of the tenant or building owner information. (Refer to Appendix H4 for methodology)	The ecologist will advise on how to meet all mandatory ecological requirements and on suitable additional criteria for the design team to implement. The design team will then aim to follow 4 of the additional criteria.	-	Ecologist / Contractor	-	1.00	Targeted	1.00
Route 2: Landscape and ecology management plan, or similar, is developed in accordance with BS 42020:2013(206) covering as a minimum the first five years after project completion (See Appendix H4 for management plan requirements).	At present this is not going to be developed.	-	Ecologist / Contractor	-	1.00	Targeted	1.00
Pollution							
Credit Summary	**BREEAM Assessor Comments**	**Action at RIBA Stage**	**DT Responsibility**	**Minimum Standard for Rating**	**Points Available**	**Status**	**Points Targeted**
Pol 01 Impact of Refrigerants							
All systems (with electric compressors) must comply with the requirements set out in BS EN 378:2016 (Parts 2 and 3)	The system will be specified so that the refrigernats have a DELC CO_2e of less than 1000 $kgCO_2e/kW$. A leak detection system for the refrigerants will not be provided.	-	M&E	-	Prerequisite	Targeted	Prerequisite
Systems using refrigerants have Direct Effect Life Cycle CO_2 equivalent emissions (DELC CO_2e) of ≤100 $kgCO_2e/kW$ cooling and heating capacity OR Refrigerants used have a Global Warming Potential (GWP) ≤10					1.33	Not Targeted	0.00
Systems using refrigerants have DELC CO_2e of ≤1000 $kgCO_2e/kW$ cooling and heating capacity					0.67	Targeted	0.67
All systems are hermetically sealed or only use environmentally benign refrigerants. Refer to Appendix J1 for full details					0.67	Not Targeted	0.00

Pol 02 Local Air Quality							
All heating and hot water is supplied by non-combustion systems. OR Emissions from all installed combustion plant that provide space heating and domestic hot water do not exceed the levels set in Appendix J2.	Space and hot water heating is via electrical systems				0.67	Targeted	0.67
					0.67	Targeted	0.67
Pol 03 Flood and Surface Water Management							
An appropriate SuDS consultant is appointed	A consultant will be appointed to advise on SUDs.	-	Infrastructure	-	Prerequisite	Targeted	Prerequisite
A site specific Flood Risk Assessment (FRA) confirms there is a LOW annual probability of flooding	At present there is not an FRA.	-	Infrastructure	-	1.33	Targeted	1.33
Surface water run-off design solutions must be bespoke, i.e. they take account of the specific site requirements and natural or man-made environment of and surrounding the site.	Site specific solutions will be developed as the design progresses.	-	Infrastructure	-	Prerequisite	Targeted	Prerequisite
Drainage measures are specified to ensure peak run-off rates from the site show a 30% improvement over the pre-developed site (brownfield sites) or no increase in run-off rates over the pre-developed site (greenfield sites). This should comply at the 1 year and 100 year return period events. Calculations should include an allowance for climate change. See Appendix J3 for full details.	It is expected that the peak run-off rate for the site can be maintained to be less than for the pre-developed site. There is no change in impermeable area.	-	Infrastructure	-	0.67	Not Targeted	0.00
Flooding of property will not occur in the event of local drainage system failure AND For the 100 year 6 hour event, the post development run-off volume, over the development lifetime, is no greater than it would have been prior to the assessed site's development. Any additional predicted volume of run-off for this event must be prevented from leaving the site by using infiltration or other SuDS techniques. See Appendix J3 for full details.	It is expected that the peak run-off rate for the site can be maintained to be less than for the pre-developed site. There is no change in impermeable area.	-	Infrastructure	-	0.67	Targeted	0.67
Measures are implemented to minimise water course pollution in line with requirements in Appendix J3	This is not achievable on this site.	-	Infrastructure	-	0.67	Not Targeted	0.00
Pol 04 Reduction of Night Time Light Pollution							
External lighting pollution has been eliminated through effective design removing the need for external lighting OR It is designed in accordance with ILP Guidance and provided with a time switch to allow lighting to be switched off between 23:00 and 07:00	All external lighting will be designed in compliance with ILP guidance and can be automatically switched off between 23:00 hr and 07:00 hr. Safety and security lighting will be designed to meet the lower lighting levels.	-	M&E	-	0.67	Targeted	0.67
Pol 05 Reduction of Noise Pollution							
Where the development does have noise-sensitive areas or buildings within 800m, a noise impact assessment in compliance with BS 4142:2014 has been carried out by an acoustician, and the following noise levels measured/determined: - Existing background noise levels - Noise rating level from the assessed building The noise level from the proposed site/building must be at least 5dB lower than the background noise throughout the day and night. Attenuation must be used if required.	An acoustician will be appointed to ensure compliance with this criteria.	-	Acoustician	-	0.67	Targeted	0.67

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Innovation							
Credit Summary	BREEAM Assessor Comments	Action at RIBA Stage	DT Responsibility	Minimum Standard?	Points Available	Status	Points Targeted
Man 03 Responsible Construction Practices							
Achieve all responsible construction management checklist items detailed in Appendix A3.	This will be targeted by the contractor.	-		-	1.00	Targeted	1.00
Hea 01 Visual Comfort							
Daylighting criteria: Relevant building areas meet either; exemplary daylight factors, or, average and minimum point daylight illuminance criteria	This credit is not being targeted.	-		-	1.00	Not Targeted	0.00
Lighting levels and zoning: Lighting in each zone can be manually dimmed down to 20% of the maximum light output using dimmer switches	This credit is not being targeted.	-		-	1.00	Not Targeted	0.00
Hea 02 Indoor Air Quality							
Three out of the five product types meet exemplary emission limits, testing requirements and any additional requirements listed in Appendix B2	This credit is not being targeted.	-		-	1.00	Not Targeted	0.00
Hea 06 Security							
A compliant risk based security rating scheme has been used	Independent assessment and verification confirming performance against the scheme				1.00	Not Targeted	0.00
Ene 01 Reduction of Energy Use and Carbon Emissions							
The building achieves an EPR_{NC} ≥0.9 and zero net regulated CO_2-eq emissions (up to two credits)	This credit is not being targeted.	-		-	1.00	Not Targeted	0.00
					1.00	Not Targeted	0.00
The building is deemed carbon negative where >100% of carbon emissions from unregulated (and regulated) energy use are offset by energy generated from on-site and near-site LZC sources (up to three credits)	This credit is not being targeted.				1.00	Not Targeted	0.00
		-		-	1.00	Not Targeted	0.00
					1.00	Not Targeted	0.00
Achieve maximum available credits in Ene 02 Energy monitoring, some buildings must meet the requirements of the second credit for sub-metering of high energy load and tenancy areas. The client or building occupier must commit funds to pay for the post-occupancy stage. The energy model must be submitted to BRE and retained by the building owner	This credit is not being targeted.	-		-	1.00	Not Targeted	0.00
	This credit is not being targeted.				1.00	Not Targeted	0.00
Wat 01 Water Consumption							
65% improvement over notional baseline	This credit is not being targeted.	-		-	1.00	Not Targeted	0.00
Mat 01 Environmental impacts from Construction Products - Building Life Cycle Assessment (LCA)							
During Concept Design identify opportunities for reducing environmental impacts	This credit is not being targeted.	-		-	1.00	Not Targeted	0.00
Achieve Elemental LCC plan and Component Level LCC options appraisal credits (Man 02 Life cycle cost and service life planning) AND Include design options appraised during Concept Design (Man 02 Life cycle cost and service life planning) AND Include the design options appraised during Technical Design (Man 02 Life cycle cost and service life planning) AND Integrate the aligned LCA and LCC options appraisal activity within the wider design decision-making process					1.00	Not Targeted	0.00
A suitably qualified third party carries out the building LCA work, or produces a report verifying it, with each LCA option itemised in the report and details of the suitably qualified third party and a declaration of their independence					1.00	Not Targeted	0.00
Mat 03 Responsible Sourcing of Construction Products							
Achieved Mat 03 credits AND Responsible sourcing % of available points achieved >50%	This credit is not being targeted.	-		-	1.00	Not Targeted	0.00
Wst 01 Construction Waste Management							
Amount of waste generated per $100m^2$ - $1.6m^3$ / 1.9 tonnes AND Waste diverted from landfill: Volume (%) / Tonnage (%): Non-demolition 85% / 90% or Demolition 85% / 95% or Excavation 95% / 95%	This credit is not being targeted.	-		-	1.00	Not Targeted	0.00
Achieve the construction resource efficiency credits Allocate waste generated to specific projects Meet or better BREEAM exemplary level benchmark for diversion from landfill of non-hazardous construction and demolition waste	This credit is not being targeted.				1.00	Not Targeted	0.00

Wst 02 Use of Recycled and Sustainably Sourced Aggregates							
The Project Sustainable Aggregate Points score will be 6 or above	This credit is not being targeted.	-		-	1.00	Not Targeted	0.00
Wst 05 Adaptation to Climate Change							
Meet 'Wst 05 - Resilience of structure, fabric, building services and renewables installation' credit Meet criteria or achieve credits of issues detailed in Appendix G3	This credit is not being targeted.	-		-	1.00	Not Targeted	0.00
LE 02 Identifying and understanding the risks and opportunities for the project							
During Concept Design, wider site sustainability-related activities and the potential for ecosystem service related benefits are considered. Achieve the following credits: - Hea 07 Safe and healthy surroundings - Pol 03 Flood and surface water management: - 'Surface water run-off' credit - 'Minimising watercourse pollution' credit - Pol 05 Reduction of noise pollution	This credit is not being targeted.				1.00	Not Targeted	0.00
	This credit is not being targeted.						
	This credit is not being targeted.						
LE 04 Change and Enhancement of Ecological Value							
Achieve significant net gain of ecological value (≥110%), calculated in accordance with process set out in GN36 - BREEAM, CEEQUAL and HQM Ecology Calculation Methodology – Route 2.	This credit is not being targeted.				1.00	Not Targeted	0.00

7. Conclusion

This pre assessment report demonstrates that the development has the potential to achieve an Excellent rating with a target score of 71.55%, which as incorporates a buffer should credits be lost as the design progresses. The minimum mandatory standards can all be achieved.

Appendices

Appendix A - Management
- A1: Man 01 - Project Brief and Design
- A2: Man 02 - Life Cycle Cost and Service Life Planning
- A3: Man 03 - Responsible Construction Practices
- A4: Man 04 - Commissioning and Handover
- A5: Man 05 - Aftercare

Appendix B - Health & Wellbeing
- B1: Hea 01 - Visual Comfort
- B2: Hea 02 - Indoor Air Quality
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- B4: Hea 06 - Security
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Appendix C - Energy
- C1: Ene 02 - Energy Monitoring
- C2: Ene 03 - External Lighting
- C3: Ene 04 - Low Carbon Design
- C4: Ene 06 - Energy Efficient Transportation Systems
- C5: Ene 07 - Energy Efficient Laboratory Systems
- C6: Ene 08 - Energy Efficient Equipment

Appendix D - Transport
- D1: Tra 03 - Cyclist Facilities
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Appendix E - Water
- E1: Wat 03 - Water Leak Detection and Prevention
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Appendix F - Materials
- F1: Mat 03 - Responsible Sourcing of Materials
- F2: Mat 05 - Design for Durability and Resilience
- F3: Mat 06 – Material Efficiency

Appendix G - Waste
- G1: Wst 02 - Recycled Aggregates
- G2: Wst 05 - Adaptation to Climate Change
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Appendix H - Land Use & Ecology
- H1: LE05 - Long Term Impact on Biodiversity

Appendix J - Pollution
- J1: Pol 01 - Impact of Refrigerants
- J2: Pol 03 - Surface Water Runoff
- J3: Pol 05 - Reduction of Noise Pollution

Appendix A Management

A1: Man 01 Project Brief and Design

Project delivery planning

- Must be undertaken prior to the completion of Concept Stage (RIBA Stage 2 or equivalent)
- The following people must be involved:
  - Client
  - Building occupier
  - Design team
  - Contractor (does not need to be the contractor who is eventually appointed for the job but a contractor must be part of the process)
- As a minimum, the process must include a meeting to identify and define their roles, responsibilities and contributions during the following phases:
  - Initial Project Brief
  - Project Execution Plan
  - Communication Strategy
  - Concept Design.
- The roles, responsibilities and contributions outlined above include consideration of:
  - End user requirements
  - Aims of the design and design strategy
  - Particular installation and construction requirements or limitations
  - Occupiers budget and technical expertise in maintaining any proposed systems
  - Manageability and adaptability of any proposals
  - Operational energy
  - Requirements for the production of project and end user documentation
  - Requirements for commissioning, training and aftercare support

  Where the building occupants are unknown the above considerations still apply. In this case, the appropriate project delivery stakeholder considers each item based on likely scenarios of occupancy

Stakeholder Consultation (Interested parties)

- Must be undertaken prior to the completion of Concept Stage (RIBA Stage 2 or equivalent)
- All relevant stakeholders (interested parties) have consulted with the design team. As a minimum the consultation must include the following information:
  - Functionality, build quality and impact (including aesthetics)
  - Provision of appropriate internal and external facilities (for future building occupants and visitors/users)
  - Management and operational implications
  - Maintenance resources implications
  - Impacts on the local community (traffic/transport impact)
  - Opportunities for shared use of facilities and infrastructure with the community/appropriate stakeholders, if relevant/appropriate to building type
  - Compliance with statutory (national/local) consultation requirements
  - Energy use and sustainability measures
  - Inclusive and accessible design.

  In the case of educational building types, minimum content also includes:
  - How the building/grounds could best be designed to facilitate learning and provide a range of social spaces appropriate to the needs of pupils, students and other users of all abilities

  In the case of building types containing technical areas or functions, e.g. laboratories, workshops etc., minimum content also includes:
  - The end users' broad requirements for such facilities, including appropriate sizing, optimisation and integration of equipment and systems.

  In the case of transport Hubs, minimum content also includes: how to ensure a smooth safe and secure transition between different modes of transport (i.e. air. Rail, road, bike and pedestrian), recognising the needs and abilities of a diverse range of people.
- The project must demonstrate how the stakeholder contributions and outcomes of the consultation exercise have influenced or changed the Initial Project Brief and Concept Design.
- All consultation feedback has been given to, and received by, all relevant parties by the Technical Design Stage (RIBA Stage 4).

A2: Man 02 Life Cycle Cost and Service Life Planning

Elemental Life Cycle Cost (LCC)

- An entire asset LCC plan analysis has been carried out, at Concept Design (RIBA Stage 2 or equivalent) together with any design option appraisals in line with PD 156865:2008
- The LCC analysis should show:
  - An indication of future replacement costs over a period of analysis as required by the client 20, 30, 50, 60 years
  - Inclusion of service life, maintenance and operation cost estimates.
- The study period should ideally be agreed by the client, in line with the design life expectancy of the building. However, where the life expectancy of the building is not yet formally agreed (due to being at very early design stages), the default design life of 60 years should be used for modelling purposes (in line with the UK default).
- Demonstrate, using appropriate examples provided by the design team, how the elemental LCC plan has been used to influence building and systems design and specification to minimise life cycle costs and maximise critical value.

Component Level LCC Plan

- A component level LCC plan has been developed by the end of Technical Design (RIBA Stage 4 or equivalent) in line with PD 156865:2008 and includes the following component types (where present):
  - Envelope e.g. cladding/windows, and/or roofing
  - Services, e.g. heat source cooling source, and/or controls
  - Finishes, e.g. walls, floors and/or ceilings
  - External spaces, e.g. alternative hard landscaping, boundary protection

  The Component level LCC option appraisal should review all of the above component types (where present). However, you do not need to consider every single example cited under each component; only a selection of those most likely to draw valued comparisons. This is to ensure that a wide range of options are considered and help focus the analysis on components which would benefit the most from appraisal.
- Demonstrate how the component level LCC plan has been used to influence the building and systems design/specification to minimise life cycle costs and maximise critical value

Capital Cost Reporting

- Report the capital cost for the building in pounds per square metre (£k/ m^2), via the BREEAM Assessment Scoring and Reporting tool, Assessment Issue Scoring tab, Management section
- At design stage, if the final information is not available, award the credit if the client provides the predicted capital cost, including contingencies, and commits to providing this information for the final assessment stage. At the final stage, if the final capital cost is not

known, provide the client's or cost consultant's best estimate. This data will be anonymised and used to inform future BREEAM performance benchmarking.

A3: Man 03 Responsible Construction Practices

BREEAM AP (Site)

Involve a BREEAM AP in the project at an appropriate time and level to:

- Work with the project team, including the client, to consider the links between BREEAM issues and assist them in achieving and if possible going beyond the design intent, to maximise the project's performance against the agreed performance targets throughout the Construction, Handover and Close Out stages.
- Monitor construction progress against the performance targets agreed under criterion 5 above throughout all stages where decisions critically impact BREEAM performance.
- Proactively identify risks and opportunities related to the procurement and construction process and the achievement of the targets agreed under criterion 5 above.
- Provide feedback to the constructors and the project team as appropriate, to support them in taking corrective actions and achieving their agreed performance targets.
- Monitor and, where relevant, coordinate the generation of appropriate evidence by the project team and the provision to the assessor.

Responsible Construction Management Checklist

The Principle Contractor will evaluate the likely responsible construction management risks (on site and off site), plan and implement actions to minimise the identified risks.

The Principle Contractor will cover all of the following items when preparing the plan:

- Vehicle Movement
  - Managing the construction site entrance to minimise the impacts (e.g. safety, disruption) arising from vehicles approaching and leaving the development footprint.
  - Ensure the development footprint is accessible for delivery vehicles fitted with safety features (e.g. side under run protection) to remove or limit the need for on-street loading or unloading. Where on-street loading is unavoidable, this should be appropriately managed.
  - Identify access routes to the development footprint, including for heavy vehicles to minimise traffic disruption and safety risks to others.

- Pollution Management
  - Minimising the risks of air, land and water pollution.
  - Minimise the risks of nuisance from vibration, light and noise pollution.
- Tidiness
  - Implementing practices which ensure the development footprint is safe, clean and organised at all times. This includes, but is not limited to, facilities, materials and waste storage.
  - Ensuring there is clear and safe access in and around the buildings at the point of handover.
- Health and Wellbeing
  - Providing processes and equipment required to respond to medical emergencies.
  - The principal contractor identifies and implements initiatives to promote and maintain the health and wellbeing of all site operatives within the development footprint. This can be via site facilities, site management arrangements, staff policies etc.
  - Establishing management practices and facilities which encourage equality, fair treatment and respect of all site operatives
  - Provide secure, clean and organised facilities (e.g. changing and storage facilities) for site operatives within the development footprint.
- Security processes
  - Minimise risks of the site becoming a focus for antisocial behaviour in the local community (e.g. robust perimeter fencing, CCTV, avoid creating dark corners etc.).
- Training, awareness and feedback
  - Aspects of the construction process that might impact the community are communicated regularly, ensuring that nuisance and intrusion are minimised.
  - Ensuring that ongoing training is provided, and up to date, for personnel and visitors (covering items a to l, as appropriate.)
  - Ensuring that site operatives are trained for the tasks they are undertaking (including any site-specific considerations).
  - The fleet operators undertakes driver training and awareness to promote safety within the development footprint and off site.
- Monitoring and reporting
  - The fleet operators, captures and investigates any road accidents, incidents and near misses and reports them back to the principal contractor. The principal contractor analyses these items.
  - Ensuring that all visitor, workforce and community accidents, incidents and near misses are recorded and action is taken to reduce the likelihood of them reoccurring
  - Processes are in place to facilitate collecting and recording feedback from the community and to address any concerns related to the development footprint

Energy Consumption

Set targets for the site energy consumption in kWh (and where relevant, litres of fuel used) as a result of the use of construction plant, equipment (mobile and fixed) and site accommodation, resulting from all on-site construction processes and **dedicated** off site manufacturing

Monitor and record data pertaining to energy consumption as described above.

Using the collated data, the Contractor will report the energy consumption (total kWh/£100k of project value) and carbon dioxide emissions (total $kgCO_{2eq}$ and $kgCO_{2eq}$/£100k of project value) from the construction process.

Water Consumption

Set targets for the potable water consumption (m^3) arising from the use of construction plant, equipment (mobile and fixed) and site accommodation, resulting from all on site construction activity and **dedicated** off site manufacturing.

Monitoring and recording data on water consumption (m^3) as described above.

Using the collated data, the Contractor will report the total net water consumption (m^3), i.e. consumption minus any recycled water use, from the construction process via BREEAM Projects (for the purpose of future BREEAM benchmarking)

Monitoring of Transport of Construction Material and Waste

Set targets for transportation movements and impacts resulting from the delivery of the major construction materials to site and construction waste from site these should include the following as a minimum:

- Transport of materials from the point of supply to the building site, including any transport, intermediate storage and distribution; Scope of this monitoring must cover the following as a minimum:
    - Materials used in major building elements (i.e. those defined in BREEAM issue Mat 01), including insulation materials,
    - Ground works and landscaping materials
- Transport of construction waste from the construction gate to waste disposal processing/ recovery centre gate. Scope of this monitoring must cover the construction waste groups outlined in the project's site waste management plan (SWMP)

Monitor and record data pertaining to transport movements as described above.

Using the collected data, report separately for materials and waste the total transport related greenhouse gas emissions (kgCO_2-eq) and total distance travelled (km) via BREEAM projects.

Sustainability Champion

The Principle Contractor will be required to employ a Sustainability Champion to monitor the project to ensure ongoing compliance with the relevant sustainability performance/process criteria. To do this the Sustainability Champion will ideally be site based or will visit the site regularly to carry out spot checks, with the relevant authority to do so, and will require action to be taken to address shortcomings in compliance. The Sustainability Champion will monitor site activities with sufficient frequency to ensure that risks of non-compliance are minimised. They will report on progress at relevant project team meetings including identifying potential areas of non-compliance and any action needed to mitigate.

<u>Definition of 'Sustainability Champion'</u>

Members of formal schemes approved by BRE Global in connection with the provision of design advice. At present the following schemes are deemed to satisfy this requirement:

- BREEAM Accredited Professional (AP) Membership Scheme
- BRE Site Sustainability Manager Membership Scheme.

Timber Procurement

All site timber used on the project (that is timber used to facilitate the construction process, including but not limited to formwork, site hoardings and other temporary site timber) must be sourced in accordance with the UK Government's Timber Procurement Policy (from legal sources with relevant timber certification (FSC or PEFC).

Construction Site Management

The Principle Contractor must operate an Environmental Management System (EMS) covering their main operations. The EMS must be third party certified to ISO140001.

The Principle Contractor must commit to implementing best practice pollution prevention policies and procedures on site, in accordance with Pollution Prevention Guidelines, Working at construction and demolition-sites: PPG6. Appropriate supporting evidence may include but is not limited to the following:

- Posters displayed on site
- Tool box talks
- Site photos
- Confirmation that site induction covers these aspects

Refer to the checklists at the end of each section of PPG6 for an exhaustive list.

A4: Man 04 Commissioning and Handover

Commissioning and Testing Schedule Responsibilities

- A schedule of commissioning and testing is to be prepared that identifies and includes a suitable timescale for commissioning and re-commissioning of all complex and non-complex building services and control systems and testing and inspecting building fabric
- The schedule will identify appropriate standards that all commissioning activities will be conducted in accordance with:
    a. Current Building Regulations
    b. BSRIA guidelines
    c. CIBSE guidelines
    d. Other appropriate standards
- 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.
- Where a building management system (BMS) is specified:
    a. Carry out commissioning of air and water systems when all control devices are installed, wired and functional
    b. Include physical measurements of room temperatures, off-coil temperatures and other key
    c. parameters, as appropriate, in commissioning results
    d. The BMS or controls installation should be running in auto with satisfactory internal conditions prior to handover
    e. All BMS schematics and graphics (if BMS is present) are fully installed and functional to user interface prior to handover
    f. Fully train the occupier or facilities team in the operation of the system.
- An appropriate project team member(s) is appointed to monitor and programme pre-commissioning, commissioning, testing and, where necessary, re-commissioning activities on behalf of the client.
- Principal contractor accounts for the commissioning and testing programme, responsibilities and criteria within their budget and main programme works, allowing for the required time to complete all commissioning and testing activities prior to handover.

Commissioning Building Services

- The first Man 04 credit must be achieved
- During the design stage, the client or the principal contractor appoints an appropriate project team member, provided they are not involved in the general installation works for the building services systems, with responsibility for:
    a. Undertaking design reviews and giving advice on suitability for ease of commissioning.
    b. Providing commissioning management input to construction programming and during installation stages.
    c. Management of commissioning, performance testing and handover or post-handover stages.
- For complex building services and systems, a specialist commissioning agent appointed during the design stage to complete the above tasks.

<u>Complex systems</u>

These include, but are not limited to, air-conditioning, comfort cooling, mechanical ventilation, displacement ventilation, complex passive ventilation, building management systems (BMS), renewable

energy sources, microbiological safety cabinets and fume cupboards, cold storage enclosures and refrigeration plant.

Testing and Inspecting Building Fabric

- The first Man 04 credit must be achieved
- The integrity of the building fabric, including continuity of insulation, avoidance of excessive thermal bridging and air leakage paths is quality assured through completion of post construction testing and inspection (e.g. thermographic survey as well as an air tightness test and inspection).
- Any defects identified via the post construction inspections are rectified prior to building handover and close out. Any remedial work must meet the required performance characteristics for the building/element.

Thermographic Survey

- Scope
    - The thermographic survey must cover 100% of the treated spaces, unless it is a large complex building (see below). Ensure that all elements of the building fabric that enclose an internal heated or conditioned (treated) zone of the building are tested. This includes internal walls separating treated and untreated zones.
- Large complex buildings
    - In the case of large complex buildings, it may be impractical for the thermographic survey and airtightness testing to cover 100% of the building. Where a complete thermographic survey is deemed impractical by a Level 2 qualified thermographic surveyor, the guidance in airtightness standard TSL2 should be followed on the extent of the survey and testing. This could include airports, large hospitals and high-rise buildings.

Handover

- The (Building User Guide) BUG is developed prior to handover for building occupiers and premises managers
- The Building User Guide should be written in plain English and will provide easily accessible and understandable information relevant to the following stakeholders:
    - The building's staff (or where relevant residents)
    - The non-technical facilities management team/building manager
    - Other building users, e.g. visitors/community users.

The content of the guide will be specific to the building type and end users, but broadly should include information on the following:

- Overview of the building and its environmental strategy, e.g. energy/water/waste efficiency policy/strategy and how users should engage with/deliver the policy/strategy.
- Provision of, and access to, shared facilities
- Safety and emergency information/instructions
- Building related operational procedures specific to building type/operation, e.g. laboratories
- Building related incident reporting/feedback arrangements
- Provision of, and access to, transport facilities, e.g. public transport, cyclist facilities, pedestrian routes etc.
- Provision of, and access to, local amenities
- Links, references and relevant contact details

Additionally, for the building occupiers' guide:

- Building services overview and access to building occupant controls, e.g. where to find them, what they control, how to operate effectively and efficiently etc.
- Pre-arrival information for visitors, e.g. access and security procedures or provisions.

Additionally, for the facilities managers' guide:

- Building services overview and access to facilities management controls, e.g. where to find them, what they control, how to operate effectively and efficiently etc.
- Refit, refurbishment and maintenance arrangements or considerations
- Building related training information or links.

The training schedule is developed for building occupiers and premises managers contains the following as minimum content:

- The building's design intent
- The available aftercare provision and aftercare team main contact(s), including any scheduled seasonal commissioning and post occupancy evaluation
- Introduction and demonstration of, installed systems and key features (e.g. building management systems, controls and their interfaces)
- Introduction to the Building User Guide and other relevant building documentation, (e.g. design data, technical guides, maintenance strategy etc)
- Maintenance requirements, including any maintenance contracts and regimes in place.

A5: Man 05 Aftercare

Aftercare

The aftercare support to all building occupiers through having in place operational infrastructure and Resources in place should include the following as a minimum:

- A meeting programmed to occur between the aftercare team/individual and the building occupier management (prior to initial occupation, or as soon as possible thereafter) to:
    - Introduce the aftercare team or individual to the aftercare support team available, including Building User Guide (where existing) and training schedule content.
    - Present key information about the building the design intent and how to use the building to ensure it operates as efficiently and effectively as possible
- On-site facilities management training, to include a walkabout of the building and introduction and familiarization with the building systems, their controls and how to operate them in accordance with the design intent and operational demand.
- Initial aftercare provision for at least the first month of building occupation, e.g. on site attendance on a weekly basis to support building users and management (depending on the frequency of the building.
- Longer term after care e.g. a helpline, nominated individual or other appropriate system to support building users for at least the first 12 months of occupation

There must be operational infrastructure and resources in place to co-ordinate the collection and monitoring of energy and water consumption data for a minimum of 12 months, once the building is occupied. This is done to facilitate analysis of discrepancies between actual and predicted performance, with a view to adjusting systems and/or user behaviours accordingly.

Seasonal Commissioning

Commissioning responsibilities over a minimum 12-month period, once the building becomes occupied:

- Complex Systems – Specialist commissioning manager
    - Identify changes made by the owner or operator that might have caused impaired or improved performance
    - Testing of all building services under full load conditions, i.e. heating equipment in mid-winter, cooling/ventilation equipment in mid-summer, and under part load conditions (spring/ autumn);
    - Where applicable, testing should also be carried out during periods of extreme (high or low) occupancy.

    - Interviews with building occupants (where they are affected by the complex services) to identify problems or concerns regarding the effectiveness of the systems
    - Produce monthly reports comparing sub-metered energy performance to the predicted one
    - Identify inefficiencies and areas in need of improvement
    - Re-commissioning of systems (following any work needed to serve revised loads) and incorporating any revisions in operating procedures into the O&M manuals.
- Simple Systems (naturally ventilated) – External Consultant/Facilities Manager
    - Review thermal comfort, ventilation, and lighting, at three, six and nine month intervals after initial occupation, either by measurement or occupant feedback.
    - Identify deficiencies and areas in need of improvement.
    - Take all reasonable steps to re-commission systems following the review and incorporate any relevant revisions in operating procedures into the O&M manuals.

Post Occupancy Evaluation (POE)

The client or building occupier commits to carry out a POE exercise one year after the building is substantially occupied. This gains comprehensive in-use performance feedback 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.

The POE should be carried out by an independent third party and should cover:

- A review of the design and construction process (review of design, procurement, construction and handover processes) should include:
    - Internal environmental conditions (light, noise, temperature, air quality)
    - Control, operation and maintenance
    - Facilities and amenities
    - Access and layout
    - Other relevant issues including:
        - Sustainability performance (energy/water consumption, performance of any sustainable features or technologies e.g. materials, renewable energy, rainwater harvesting etc.)
        - Health, safety and wellbeing
        - Building user information including training for building users and operators
        - Value for money, achievement of business objectives
        - Sector–specific issues, such as impacts on absenteeism in offices, infection rates in healthcare facilities, pupil performance in schools etc.

The independent party provides a report with lessons learned to the client and building occupiers.

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. Evidence of the appointment of the independent party and schedule of responsibilities which fulfils the BREEAM criteria are acceptable to demonstrate compliance.

Relevant information for dissemination; the published case study about the building and its performance should cover:

- A basic description of the project and building
- BREEAM Rating and score
- The key innovative and low-impact design features of the building
- Project cost
- Project size: Floor area, site area
- Facilities to be used by community (where relevant)
- Any steps taken during the construction process to reduce environmental impacts, i.e. innovative construction management techniques
- Predicted and actual carbon dioxide emissions and/or EPC rating
- Outcomes of the Post Occupancy Evaluation study, to share the lessons learned from the project including
    - Occupant feedback
    - Energy and water consumption including renewable energy generation, level of rainwater/grey water provision

Appendix B Health & Wellbeing

B1: Hea 01 Visual Comfort

Glare Control Strategy

- 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.
- A glare control strategy designs out potential glare in all relevant building areas where risk has been identified. This should be achieved through building form and layout or building design measures.
- The glare control strategy does not increase energy consumption used for lighting. This is achieved by:
  - 3.a Maximising daylight levels in all weather, cloudy or sunny AND
  - 3.b Ensuring the use or location of shading does not conflict with the operation of lighting control systems.

Daylighting

Should comply with either option A or B as follows:

A:

2% average daylight factor

AND either (a) OR {(b) and (c)}

(a) Uniformity ratio of 0.3 or point daylight factor of 0.3 times the relevant average daylight factor Uniformity ratio of 0.7 or point daylight factor of 0.3 times the relevant average daylight factor where the spaces with glazed roofs, atria

(b) At least 80% of the room has a view of sky from desk or table top height (0.85m in multi-residential buildings, 0.7m in other buildings)

(c) The room depth criterion d/w + d/HW < 2/(1-RB) is satisfied

Where:

d = room depth,

w = room width,

HW = window head height from floor level,

RB = average reflectance of surfaces in the rear half of the room,

B:

Minimum 80% of the relevant building areas meet 300 lux of Average daylight illuminance and 90 lux of Minimum daylight illuminance for 2000 hours per year or more

View out

- 95% of the floor area in 95% of spaces for each relevant building area is within 8 m of an external wall. The external wall has a window or permanent opening that provides an adequate view out.
- The window or opening must be ≥ 20% of the surrounding wall area.
- Where the room depth is greater than 8 m, compliance is only possible where the percentage of window or opening is the same as, or greater than, the values in Table 1.0 of BS 8206: part 2

  Adequate view out: Where relevant building areas are within 8m of an external wall which has a window or permanent opening, and the window or opening is ≥ 20% of the surrounding wall area. Where the room depth is greater than 8m, the percentage of window or opening must instead be the same as, or greater than, the values in Table 1.0 BS8206: Part 2. The view out must be a view of a landscape or buildings (rather than just the sky) at seated eye level (1.2– 1.3m) within the relevant building areas and should ideally be through an external window. A view into an internal courtyard or atrium will comply provided the distance from the opening to the back wall of the courtyard or atrium is at least 10m (therefore allowing enough distance for the eyes to refocus). The view cannot be an internal view across the room, as this is likely to become obstructed by partitions, filing cabinets etc. In addition to this, an external view out can offer positive effects on health and wellbeing that cannot be offered by an internal view.

Internal & External Lighting

Internal lighting

- 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 and any other relevant industry standard. Internal lighting should be appropriate to the tasks undertaken, accounting for building user concentration and comfort levels.
- For areas where computer screens are regularly used, the lighting design complies with CIBSE Lighting Guide 7 (sections 3.3, 4.6, 4.7, 4.8 and 4.9). This gives recommendations highlighting:
  - Limits to the luminance of the luminaires, to avoid screen reflections. (Manufacturer' data for the luminaires should be sought to confirm this).
  - For up-lighting, the recommendations refer to the luminance of the lit ceiling rather than the luminaire; a design team calculation is usually required to demonstrate this.
  - Recommendations for direct lighting, ceiling illuminance, and average wall illuminance.

External lighting

- Illuminance levels for lighting in all external areas within the construction zone are specified in accordance with BS5489-1:2013 Lighting of roads and public amenity areas and BS EN 12464-2:2014 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.
- 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.

Zoning & Occupant Controls

The zoning of and occupant controls for internal lighting are in accordance with the criteria below for relevant areas present within the building.

- In office areas, zones of no more than four workplaces,
- Workstations adjacent to windows/atria and other building areas separately zoned and controlled,
- Seminar and lecture rooms: zoned for presentation and audience areas,
- Library spaces: separate zoning of stacks, reading and counter areas,
- Teaching space/demonstration area,
- Whiteboard/display screen
- Auditoria: zoning of seating areas, circulation space and lectern area,
- Dining, restaurant, café areas: separate zoning of servery and seating/dining areas,
- Bar areas: separate zoning of bar and seating areas,
- Wards or bedded areas: zoned for lighting control for individual bed spaces and control for staff over groups of bed spaces
- Treatment areas, dayrooms, waiting areas: zoning of seating and activity areas and circulation space with controls accessible to staff
- Areas used for teaching, seminar or lecture purposes have lighting controls provided in accordance with CIBSE Lighting Guide 5.

In addition the building type criteria in the table below where relevant

Building type	Internal and external lighting requirements
Educational buildings	Manual lighting controls are easily accessible for the teacher while teaching and on entering or leaving the teaching space. Manual lighting controls need only be provided for staff, not the children.
Prison buildings	Cells Lit to a maintained illuminance of 200 lux at table top level. In addition there must be the facility (using, for example, dimming, step switching or separate task and general lighting) for the occupant of the cell to select a lower level of general lighting if required. Exercise yards Lit to a maintained illuminance of at least 10 lux. However, if such spaces are, or will be, used as sports facilities they must be lit to a maintained illuminance of 100 lux.
Court buildings	Separate zoning is also provided for the following areas (as a minimum): 1.Judge's or magistrate's bench 2.Dock 3.Jury area 4.Public seating area. Lighting control of the zones in the above spaces, and the court as a whole, cater for the following settings: 1.Full lighting (to allow cleaning etc.) 2.Normal lighting (for court sessions) 3.Dimmed (for the purpose of showing audio-visual evidence, but allowing enough light for note taking).
Small spaces (Less than 40m^2)	Buildings consisting entirely of small rooms or spaces (less than 40m^2) which do not require any subdivision of lighting zones or control will meet the zoning criteria by default.
Lighting zoning and control for auditoria spaces	The controls specified will depend on the size and use of the space but a typical auditorium or lecture theatre with stepped seating and a formal lectern, demonstration or performance area would typically be expected to have lighting controls as follows: 1.Full normal lighting (to allow for entry, exit, cleaning etc.) 2.Demonstration area lighting off and audience area lighting reduced to a low level (for the purpose of line slide projection, but allowing enough light for the audience to take notes) 3.All lighting off (for the projection of tone slides, colour slides, and for the purposes of visual demonstrations or performances) 4.Separate localised lectern lighting.
Internal areas excluded from the lighting zone requirements	The following internal areas are excluded from the lighting zone requirements: 1.Media and arts production spaces 2.Sports facilities (exercise spaces only, including hydrotherapy and physiotherapy areas).

Table 1: internal and external building specific lighting and zone control requirements

B2: Hea 02 Indoor Air Quality

Indoor Air Quality Plan – Prerequisite

An indoor air quality plan has been produced, with the objective of facilitating a process that leads to design, specification and installation decisions and actions that minimise indoor air pollution during occupation of the building. The plan must be produced no later than the end of Concept Design. The indoor air quality plan must consider the following:

- Removal of contaminant sources
- Dilution and control of contaminant sources
- Procedures for pre-occupancy flush out
- 3rd party testing and analysis
- Maintaining indoor air quality in-use

Ventilation – Criteria

The building has been designed to minimise the indoor concentration and recirculation of pollutants in the building as follows:

- Provide fresh air into the building in accordance with the criteria of the relevant standard for ventilation
- Ventilation pathways are designed to minimise the ingress and build-up of air pollutants inside the building (see Methodology below)
- Where present, HVAC systems must incorporate suitable filtration to minimise external air pollution, as defined in BS EN 16798-3:2017. The specified filters should achieve supply air classification of at least SUP 2.
- Areas of the building subject to large and unpredictable or variable occupancy patterns have carbon dioxide (CO_2) or air quality sensors specified and:
    - In mechanically ventilated buildings or spaces: sensors are linked to the mechanical ventilation system and provide demand-controlled ventilation to the space
    - 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
- 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.

Ventilation – Methodology

The design of air-conditioned and mixed mode buildings should minimise the build-up of air pollutants. Locations of ventilation intakes and airflow pathways should be designed in accordance with any or a combination of the following methods:

- Locating the building's air intakes and exhausts, in relation to each other and sources of external pollution, in accordance with the following best practice as appropriate:
    - PD CEN/TR 16798-4:2017
    - BRE FB 30 Ventilation for healthy buildings: Reducing the impact of urban air pollution (2011)
    - BRE IP 9/14 Locating ventilation inlets to reduce ingress of external pollutants into buildings, as appropriate
    - CIBSE TM21.
- Pollutant dispersion modelling can be used to inform the location of the building's air intakes and exhausts in relation to each other and sources of external pollution. This can be achieved using either wind tunnel modelling or numerical modelling. Pollutant dispersion modelling in urban areas is complex, so it is important that the person carrying out the modelling is a competent individual.
- Positioning the building's air intakes and exhausts at least 10m of horizontal distance apart. Positioning intakes at least 10m horizontal distance from sources of external pollution (including the location of air exhausts from other buildings). The building's air intakes and exhausts should be located to reduce the risk of the intake air being contaminated by the exhausts. Exhausts or other pollutant sources should not be discharged into enclosed spaces, such as courtyards, in which intakes are also located.

Where significant levels of gaseous pollutants such as nitrogen dioxide are identified in the outdoor air, as in an Air Quality Management Area (AQMA), the use of appropriate gas phase filtration in the building ventilation system should be considered. Design teams must ensure that filter performance is appropriate for the pollutant conditions experienced at the site.

The design of naturally ventilated buildings should minimise the build-up of air pollutants. Ventilation intakes and airflow pathways should be designed using the following methods:

- Following guidance given in:
- BRE FB 30 Ventilation for healthy buildings: Reducing the impact of urban air pollution (2011),
- BRE IP 9/14 Locating ventilation inlets to reduce ingress of external pollutants into buildings (2014), and,
- CIBSE TM21 Minimising pollutants at air intakes (1999), as appropriate.

These give guidance on ventilation strategies, and the optimum location of ventilation inlets, openable windows, and trickle and background ventilators to reduce ingress of external pollutants into buildings.

- Positioning openable windows/ and background ventilators over at least 10m of horizontal distance from sources of external pollution (including the location of any building-related air exhausts).

VOC Emission requirements

The criteria to be met are as follows:

- All decorative paints and varnishes must meet the requirements listed in table 2
- At least five of the eight remaining product categories listed in the table below must meet the testing requirements and emission levels for Volatile Organic Compound (VOC) emissions against the relevant standards identified within this table. Where five or less products are specified within the building, all must meet the requirements to achieve these credits.

VOC and Formaldehyde testing requirements

- The formaldehyde concentration level is measured post construction (but pre-occupancy) and is found to be less than or equal to 100μg/averaged over 30 minutes (WHO guidelines for indoor air quality: Selected pollutants, 2010).
- The formaldehyde sampling and analysis is performed in accordance with ISO 16000-2 and ISO 16000-3
- The total volatile organic compound (TVOC) concentration level is measured post construction (but pre-occupancy) and found to be less than 500μg/over 8 hours, in line with the building regulation requirements.
- Where VOC and formaldehyde levels are found to exceed the limits defined in criteria 8 and 9, the project team confirms the measures that have, or will be taken, in accordance with the IAQ plan, to reduce the levels to within these limits.
- The testing and measurement of the above pollutants are in accordance with the following standards where relevant:
  - BS ISO 16000-4: 2011 Diffusive sampling of formaldehyde in air
  - BS ISO 16000-6: 2011 VOCs in air by active sampling
  - BS EN ISO 16017-2: 2003 VOCs - Indoor, ambient and workplace air by passive sampling
  - BS ISO 16000-3: 2011 formaldehyde and other carbonyls in air by pumped sampling.
- The measured concentration levels of formaldehyde (μg/m^3) and TVOC (μg/m^3) are reported, via the BREEAM Assessment Scoring and Reporting Tool.

Emission limit*			Testing requirement	Additional requirements
Formaldehyde	Total volatile organic compounds (TVOC)	Category 1A and 1B carcinogens		
Interior paints and coatings				
≤ 0.06 mg/m^3	≤ 1.0 mg/m^3	≤ 0.001 mg/m^3	EN 16402 or ISO 16000-9 or EN 16516 or CDPH Standard Method v1.1	Meet TVOC content limits. Paints used in wet areas (e.g. bathrooms, kitchens, utility rooms) should protect against mould growth
Wood-based products(including wood flooring)				
≤ 0.06 mg/m^3 m^3 (Non-MDF)≤ 0.08 mg/ m^3(MDF)	≤ 1.0 mg/m^3	≤ 0.001 mg/m^3	ISO 16000-9orEN 16516orCDPH Standard Method v1.1orEN 717-1 (formaldehyde emissions only)	N/A
Flooring materials (including floor levelling compounds and resin flooring)				
≤ 0.06 mg/m^3	≤ 1.0 mg/m^3	≤ 0.001 mg/m^3	ISO 10580 or ISO 16000-9 or EN 16516 or CDPH Standard Method v1.1	N/A
Ceiling, wall, and acoustic and thermal insulation materials				
≤ 0.06 mg/m^3	≤ 1.0 mg/m^3	≤ 0.001 mg/m^3	ISO 16000-9 or EN 16516 or CDPH Standard Method v1.1	N/A
Interior adhesives and sealants (including flooring adhesives)				
≤ 0.06 mg/m^3	≤ 1.0 mg/m^3	≤ 0.001 mg/m^3	EN 13999 (Parts 1-4) or ISO 16000-9 or EN 16516 or CDPH Standard Method v1.1	N/A
* Compliance with emission limits shall be demonstrated after 28 days in an emission test chamber or earlier as stipulated by the relevant testing requirements standard. The emission rate obtained from the chamber test method must be extrapolated to predict what the concentration would be in the air of the theoretical model or reference room (as detailed in the respective testing standard) and this extrapolated concentration compared with the emission limit in this table.				

Table 2: VOC criteria by product type

B3: Hea 04 Thermal Comfort

Thermal modelling

- Thermal modelling has been carried out using software in accordance with CIBSE AM11 Building Energy and Environmental Modelling.
- 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).
- 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, Table 1.5; or other appropriate industry standard (where this sets a higher or more appropriate requirement/level for the building type).
    - For naturally ventilated/free running 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/level for the building type).
        - The building is designed to limit the risk of overheating, in accordance with the adaptive comfort methodology outlined in CIBSE TM52: The limits of thermal comfort: avoiding overheating in European buildings.
- 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

- The thermal modelling demonstrates that the relevant requirements set out in criteria 3 are achieved for a projected climate change environment:
    - The following probabilistic DSY weather data files should be used to establish the projected climate change environment against which the design is evaluated:
    - Naturally ventilated buildings
      – Time period: 2050s
      – Emissions scenario: Medium (A1B)
      – 50th percentile DSY 2 and DSY 3
    - Mechanically ventilated or mixed mode buildings
      – Time period: 2020s
      – Emissions scenario: High (A1F1)
      – 50th percentile DSY 2 and DSY 3
- Where thermal comfort criteria are not met for the projected climate change environment, the project team demonstrates how the building has been adapted, or designed to be easily adapted in future using passive design solutions to subsequently meet the requirements above
- 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

- The thermal modelling analysis (undertaken for compliance with criteria above) has informed the temperature control strategy for the building and its users.
- The strategy for proposed heating/cooling system(s) demonstrates that it has addressed the following:
    - 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.
    - The degree of occupant control required for these zones, based on discussions with the end user (or alternatively building type or use specific design guidance, case studies, feedback) considers:
        - User knowledge of building services
        - Occupancy type, patterns and room functions (and therefore appropriate level of control required)
        - How the user is likely to operate or interact with the system(s), e.g. are they likely to open windows, access thermostatic radiator valves (TRV) on radiators, change air-conditioning settings etc.,
        - 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 drafts).
- 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.
- The need or otherwise for an accessible building user actuated manual override for any automatic systems.

B4: Hea 06 Security

- A Suitably Qualified Security Specialist (SQSS) conducts an evidence-based Security Needs Assessment (SNA) during or prior to Concept Design (RIBA Stage 2 or equivalent). The purpose of the SNA will be to identify attributes of the proposal, site and surroundings which may influence the approach to security for the development.
- The SQSS develops a set of security controls and recommendations for incorporation into the proposals. Those controls and recommendations shall directly relate to the threats and assets identified in the preceding SNA.
- The controls and recommendations shall be incorporated into proposals and implemented in the as-built
- development. Any deviation from those controls and recommendations shall be justified and agreed with the SQSS.

The following are, at present, deemed to meet this definition:

1. Crime Prevention Design Advisors (CPDA) or Architectural Liaison Officers (ALO), Counter Terrorism Security Advisor (CTSA); or
2. A specialist registered with a BREEAM-recognised third party accreditation scheme for security specialists.
3. A practising security consultant that meets the following requirements:
    a. Minimum of three years' relevant experience within the last five years. This experience must clearly demonstrate a practical understanding of factors affecting security in relation to construction and the built environment, relevant to the type and scale of the project being undertaken.
    b. Hold a suitable qualification relevant to security.
    c. Maintains (full) membership to a relevant professional body or accreditation scheme that meets the following:
        i. Has a professional code of conduct, to which members must adhere; and

ii. Ongoing membership is subject to peer review

When appointing the suitably qualified security specialist, consideration should be given to the appropriateness of the individual to carry out the security needs assessment, based on the size, scope and security needs of the development. Organisations, associations or scheme operators who wish to have their membership recognised as a 'third party accreditation scheme for security specialist', should review their current status (and therefore their members) against the requirements above and, where they feel they are compliant, contact BRE Global with the relevant information/evidence.

B5: Hea 07 Safe and Healthy Surroundings

Safe access

The requirements for access are as follows:

- Dedicated and safe cycle paths are provided from the site entrance to any cycle storage, and connect to offsite cycle paths where applicable.
- Dedicated and safe footpaths are provided on and around the site providing suitable links for the following:
    a. The site entrance to the building entrance,
    b. Car parks (where present) to the building entrance
    c. The building to outdoor space
    d. Connecting to off-site paths where applicable.
- Pedestrian drop-off areas are designed off, or adjoining to, the access road and should provide direct access to other footpaths.

Where vehicle delivery access and drop-off areas form part of the assessed development the following apply:

- Delivery areas are not directly accessed through general parking areas and do not cross or share pedestrian and cyclist routes and other outside amenity areas accessible to building users and general public.
- There is a separate parking/waiting area for goods vehicles away from / adjacent to the manoeuvring area and staff/visitor car parking.
- Parking and turning areas are designed for simple manoeuvring according to the type of delivery vehicle likely to access the site, thus avoiding the need for repeated shunting.
- There is a dedicated space for the storage of refuse skips and pallets away from the delivery vehicle manoeuvring area and staff/visitor car parking (if appropriate given the building type / function).

Appendix C Energy

C1: Ene 02 Energy Monitoring

- Energy metering systems are installed that enable **at least 90%** of the estimated annual energy consumption of each fuel to be assigned to the various end-use categories of energy consuming systems.
- Energy consuming systems in buildings with a total useful floor area greater than 1,000m^2 are metered using an appropriate energy monitoring and management system.
- If the area is less than 1,000m^2, use either:
  - An energy monitoring and management system **or;**
  - separate accessible energy sub-meters with pulsed or other open protocol communication outputs, for future connection to an energy monitoring and management system.
- Building users can identify the energy consuming end uses, for example through labelling or data outputs.
- The following **major energy consuming systems** (where present) are monitored using either a Building Energy Management System (BEMS) or separate accessible energy sub-meters with a pulsed or other open protocol communication outputs to enable future connection to a BEMS:
  - Space Heating
  - Domestic Hot Water Heating
  - Humidification
  - Cooling
  - Ventilation, i.e. Fans (major)
  - Pumps
  - Lighting
  - Small Power (lighting and small power can be on the same sub-meter where supplies are taken at each floor/department)
  - Renewable or Low Carbon Systems (separately)
  - Controls
  - Other major energy-consuming items where appropriate

- The following end-use categories may **be combined for metering purposes** if the appropriate criteria are met:
  - Lighting and small power – As long as sub-metering is provided for each floor plate
  - Space heating and hot water – Combined heat/gas meter per tenanted/functional area where multiple services are by common plant
  - Modular Boiler systems can be monitored as a whole
  - Small function areas – in a building consisting departments or functional areas less that 200m^2 sub metering heating, hot water and combined energy use is sufficient. Individual electricity use does **NOT** need to be sub-metered
  - In hotels – electric heating may be combined with lighting and small power as long as sub metering is provided at each floor, core or floor plate
- The following defines the relevant **function areas or departments** for BREEAM applicable building types:
  - Office
    - Office areas (metering by floor plate)
    - Catering
  - Retail
    - Sales area
    - Storage and warehouse
    - Cold storage
    - Offices
    - Catering
    - Tenant units
  - Industrial
    - Office areas
    - Operational area
    - Ancillary areas (e.g. canteens etc.)
  - Hotel
    - Office areas
    - Catering (e.g. kitchen, restaurant)
    - Conference suites
    - Swimming pool or leisure facilities
    - Hotel bedrooms metered per floor, core, floor plate in a strategy that would provide a benefit to the facilities management
  - Education
    - Kitchens (excluding small staff kitchens and food technology rooms)
    - Computer suites
    - Workshops
    - Lecture halls
    - Conference rooms
    - Drama studios
    - Swimming pools
    - Sports halls
    - Process areas
    - Laboratories
    - High containment suites within laboratories
    - Controlled environment chambers
    - Animal accommodation areas
    - Data centres
    - IT work and study rooms, including IT-equipped library space and any space with provision of more than one computer terminal per 5m^2
    - Individual classrooms are not considered departments and do not require sub metering
  - Hospital and healthcare
    - Operating departments
    - Imaging departments
    - Radiotherapy departments
    - Pathology departments
    - Dialysis departments
    - Medical physics facilities
    - Mortuary and post mortem departments
    - Rehabilitation when including hydrotherapy pools
    - Central sterile supplies departments (or equivalent)
    - Process areas (e.g. commercial-scale kitchens and laundries) IT rooms
    - Pharmacy departments

        - Laboratories
        - 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.
    - 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).
- In extensions of existing building the criteria only apply to the new extension

C2: Ene 03 External lighting

- External light fittings within the construction zone with:
    - Average initial luminous efficacy of not less than 70 luminaire lumens per circuit Watt
    - Automatic control to prevent operation during daylight hours
    - Presence detection in areas of intermittent pedestrian traffic.

C3: Ene 04 Low Carbon Design

Passive Design

- The passive design measures reduce the total heating, cooling, mechanical ventilation, lighting loads and energy consumptions in line with the passive design analysis. Reductions in total energy demand and/or carbon dioxide emissions, highlighted by the analysis, are quantified. The analysis should cover the following:
    - Site location
    - Site weather
    - Microclimate
    - Building layout
    - Building orientation
    - Building form
    - Building fabric
    - Thermal mass or other fabric thermal storage
    - Building occupancy type
    - Daylighting strategy
    - Ventilation strategy
    - Adaptation to climate change

Emission reduction quantification

Any savings resulting from the incorporation of passive design measures should be demonstrated by comparing the energy demand or CO_2-eq emissions for the building with and without the proposed passive design measures adopted. The baseline building should use the fabric performance of the local building regulations 'notional building' and should not feature any passive design elements (other than orientation which is for obvious reasons, fixed))

Free cooling

- The free cooling credit can be achieved if one of the following is used to meet the entire cooling requirement.
    - Night-time cooling (requires fabric to have a high thermal mass)
    - Ground coupled air cooling
    - Displacement ventilation
    - Groundwater cooling
    - Surface water cooling
    - Evaporative cooling, direct or indirect
    - Desiccant dehumidification and evaporative cooling, using waste heat
    - Absorption cooling, using waste heat.
    - The building does not require any form of cooling (i.e. naturally ventilated)

Feasibility Study

- The feasibility study has been carried out by the completion of the Concept Design Stage (RIBA Stage 2 or equivalent) and must cover the following as a minimum:
    - Energy generated from LZC energy source per year
    - Carbon dioxide savings from LZC energy source per year
    - Life cycle cost of the potential specification, accounting for payback
    - Local planning criteria, including land use and noise
    - Feasibility of exporting heat/electricity from the system
    - Any available grants
    - All technologies appropriate to the site and energy demand of the development.
    - Reasons for excluding other technologies.
    - Where appropriate to the building type,
        - connecting the proposed building to an existing local community CHP system or
        - source of waste heat or power
        - OR specifying a building/site CHP system or source of waste heat or power with the potential to export excess heat or power via a local community energy scheme.

- The reduction in regulated carbon dioxide emissions from the installation is quantified. This can be demonstrated by comparing regulated carbon dioxide (CO_2-eq) emissions with LZC technologies to the actual building-regulated emissions without LZCs.
- The comparison of potential LZC technologies may be handled outside of the BIM using manufactures data, hand calculations, spreadsheets etc.
- For specified technologies, savings are estimated using **dynamic systems modelling** base case energy supply uses mains gas (or oil when not applicable) and grid electricity. Base case energy demands are calculated as for the passive design analysis

C3: Ene 06 Energy Efficient Transportation Systems

Transport Demand

- Where new lifts, escalators and/or moving walks (transportation types) are specified:
- An analysis of the transportation demand and usage patterns for the building has been carried out to determine the optimum number and size of lifts, escalators and/or moving walks.
- The energy consumption has been estimated in accordance with BS EN ISO 25745 Energy performance of lifts, escalators and moving walks, Part 2: Energy calculation and classification for lifts (elevators) and/or Part 3 - Energy calculation and classification for escalators and moving walks, for one of the following:
    - At least two types of system (for each transportation type required); OR
    - An arrangement of systems (e.g. for lifts, hydraulic, traction, machine room-less lift (MRL)); OR
    - A system strategy which is 'fit for purpose', meaning
- The use of regenerative drives should be considered, subject to the requirements in CN6
- The transportation system with the lowest energy consumption is specified

Transport analysis

- The transport analysis (criterion 1.a on the previous page) can be in the form of a written statement justifying the lift selection for the following conditions:
    - where a single lift is provided in a low rise building for the purpose of providing disabled access only
    - or where a goods lift is selected based on the size of the goods it is intended to carry.

Energy Efficient Specification

- For lifts, the following three energy-efficient features are specified:
- The lifts operate in a stand-by condition during off-peak periods. For example, the power side of the lift controller and other operating equipment such as lift car lighting, user displays and ventilation fans switch off when the lift has been idle for a pre-scribed length of time.
- The lift car uses energy-efficient lighting and display lighting i.e. an average lamp efficacy, across all fittings in the car, of >70 lamp lumens/ circuit watt and lighting switches off after the lift has been idle for a prescribed length of time.
- The lift uses a drive controller capable of variable-speed, variable-voltage, variable-frequency (VVVF) control of the drive motor.
- Where the use of regenerative drives is demonstrated to save energy, they are specified

For escalators and/or moving walks, each escalator and/or moving walk complies with EITHER of the following:

- It is fitted with a load sensing device that synchronises motor output to passenger demand through a variable speed drive. OR
- It is fitted with a passenger sensing device for automated operation (auto walk), so the escalator operates in stand-by mode when there is no passenger demand.

NB: The criteria relating to lifts within this issue do not apply to lifting platforms, wheelchair stairlift/platforms or other similar facilities to aid persons with impaired mobility. However, any lift with a rated speed greater than 0.15m/s must be assessed inclusive of goods, vehicle and passenger lifts.

C4: Ene 07 Energy Efficient Laboratory Systems

Client engagement is sought through consultation during the preparation of the initial project brief (RIBA Stage 1 or equivalent) to determine occupant requirements and define laboratory performance criteria. Design Specification should include, but not be limited to the following aspects:

- Description of purpose
- Occupant/process activities
- Containment requirements and standards
- Interaction between systems
- Flexibility/adaptability of laboratory facilities
- Any other specific requirements (for example, requirements relevant to ventilation, heating or cooling)

The design team also demonstrates that the energy demand of the laboratory facilities has been minimized as a result of achieving the defined performance criteria.

Laboratory containment devices and containment areas:

Specification of fume cupboards and other containment devices has been carried out in compliance with criteria 2 and 3 of BREEAM Issue Hea 03 Safe containment in laboratories, as appropriate to the containment device specification

Where duct fume cupboards are specified:

- Average design air flow rate in the fume cupboards specified no greater than 0.16m^3/per linear metre (internal width) of fume cupboard workspace.
- Measurement of volume flow rate should be taken in the exhaust duct (at the boundary of the laboratory) to take account of reductions in (inward) volume flow rate from fume cupboard leakage
- A reduction in air flow does not compromise the defined performance criteria and therefore does not increase the health and safety risk to future building occupants.

Best practice energy efficient measures:

The following criteria are applicable where the laboratory area accounts for at least 10% of the total building floor area

- The first credit has been achieved
- Laboratory plant and systems are designed, specified and installed to promote energy efficiency demonstrated through compliance with B to L in the table below
    - Up to 2 credits where the laboratory areas accounts for at least 10% (but less than 25%) of the building floor area; OR
    - Up to 4 credits where the laboratory area accounts for 25% or more of the total building floor area
- To achieve credits for energy efficient measures, the chosen measure(s) must have a reasonably significant effect on the total energy consumption of the laboratory, i.e. 2% reduction or greater. This must be demonstrated by calculations or modelling.
- The energy efficient measures specified do not compromise the defined performance criteria, and therefore do not increase the health and safety risk to future building occupants.

Item	Category	Description
A	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
B	Grouping and/or isolation of high filtration/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.
C	Energy recovery - heat	Heat recovery from exhaust air (where there is no risk of cross-contamination) or via refrigerant or water cooling systems.
D	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.
E	Grouping of cooling loads	Grouping of cooling loads to enable supply efficiencies and thermal transfer.
F	Free cooling	Specification of free cooling coils in chillers or dry air coolers related to laboratory-specific activities.
G	Load responsiveness	Effective matching of supply with demand through modularity, variable speed drives and pumps, and other mechanisms.
H	Clean rooms	Specification of particle monitoring systems, linked to airflow controls.
I	Diversity	Achievement of high levels of diversity in central plant sizing and laboratory duct sizing, where compatible with safety.
J	Room air changes rates	Reducing air change rates by matching ventilation airflows to environmental needs and demands of containment devices.
K	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).

L	Best Practice SFP (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

C5: Ene 08 Energy Efficient Equipment

Identify from the list in the table below the functions/equipment that are or will be present within the assessed building. Of those functions identify which will be responsible for the significant majority of unregulated energy consumption in the building. Two credits are then awarded for compliance with the corresponding criteria demonstrating a meaningful reduction in the total annual unregulated energy consumption of the building.

Function/ equipment	Criteria
Small power, plug in equipment	The following equipment EITHER has been awarded an Energy Star rating OR has been procured in accordance with the Government Buying Standards: 1. Office equipment 2. Domestic scale white goods and other small powered equipment 3. Supplementary electric heating.
Swimming pool	1. Where automatic or semi-automatic pool covers or 'liquid' pool covers with an automatic dosing system is fitted to ALL pools, including spa pools and hot tubs (if relevant). 2. The covers envelop the entire pool surface when fully extended. 3. Where the air temperature in the pool hall can be controlled so that it is 1˚C above the water temperature.
Laundry facilities with commercial sized appliances	At least one of the following can be demonstrated for commercial sized appliances: 1. Specification of heat recovery from waste water 2. Use of greywater for part of the washing process i.e. either water from the final rinse used for the next pre-wash 3. The commercial or industrial sized machines are identified as eligible for the UK's Enhanced Capital Allowance Scheme for water
Data Centre	1. Design is in accordance with the 'Best practices for the EU Code of Conduct on Data Centres' principles with the data centre achieving at least the 'Expected minimum practice' level. 2. Temperature set points are not less than 24°C, as measured at the inlet of the equipment in the rack.
IT-intensive operating areas	1. Uses a natural ventilation and cooling strategy as standard, with forced ventilation only to be used when the internal temperature exceeds 20°C and active cooling only when the internal temperature exceeds 22°C. 2. There is a mechanism to achieve automatic power-down of equipment when not in use, including overnight.
Domestic-scale appliances	Any white goods, available to purchase from the developer, must achieve the following ratings (or better) under the EU Energy Efficiency Labelling Scheme: 1. Fridges, fridge freezers: A+ rating 2. Washing machines A++ rating 3. Dishwashers: A+ rating 4. Washer-dryers: A rating 5. Tumble dryers: a) A rating OR b) For multi-residential assessments only, provide an adequate internal or external space capable of holding drying lines as specified in Drying lines section. Note: 1. Any white goods available to purchase from the developer must be compliant with criteria F1 and F2 above. 2. If criteria F3 is chosen to demonstrate compliance, only one of the two available credits can be awarded.
Healthcare	1. Carry out a life cycle costing analysis for at least two options in accordance with HTM 07-02, Part B, Chapter 1. Inform and specify large-scale equipment and sets of electrical equipment (where numbering more than 50) based on the life cycle costing analysis.
Kitchen and catering facilities	Where the project team can demonstrate that the project has incorporated at least two third of energy efficiency measures outlined in each of the following sections of CIBSE Guide TM50: 1. Section 8 (Drainage and kitchen waste removal) 2. Section 9 (Energy controls - specifically controls relevant to equipment), 3. Section 11 (Appliance specification excluding fabrication specification or utensil specification), 4. Section 12 (Refrigeration), 5. Section 13 (Warewashing: dishwashers and glass washers), 6. Section 14 (Cooking appliance selection), 7. Section 15 (Water temperatures, taps, faucets and water saving controls) Refrigeration for kitchen and catering facilities should be assessed here, not in Ene 05 Energy efficient cold storage

Data centre

For the purpose of this BREEAM issue, the term 'data centres' includes all buildings, facilities and rooms which contain enterprise servers, server communication equipment, cooling equipment and power equipment, and may provide some form of data service (e.g. large scale mission critical facilities all the way down to small server rooms located in office buildings).

I.T-intensive areas

These include computer areas where more than 1 PC per 5 m^2 is provided, e.g. training suites, design studios, libraries' I.T areas and other areas with a high density of computing devices.

Estimating annual unregulated energy consumption

A method should be used that estimates actual energy use, based on expected equipment loads and hours of operation. The energy uses may be estimated by using simple hand calculations, or benchmark data, or by the methods described in CIBSE TM54: Evaluating operational energy performance of buildings at the design stage

Estimating a significant proportion of annual unregulated energy consumption

This methodology is used to estimate which energy uses make up a significant proportion of the unregulated energy uses which means that detailed calculations are not required. The approach should focus on identifying the larger energy uses that should be included and the small energy uses that can be excluded. As a guide, energy uses making up at least 90% of the estimated total annual energy consumption should typically be included

Appendix D Transport

D1: Tra 01 Transport Assessment and Travel Plan

The travel plan must cover all the criteria listed below:

- The travel plan is structured to meet the needs of the particular site and takes into consideration the findings of a site-specific transport survey and assessment that covers the following (as a minimum):
    - Where relevant, existing travel patterns and opinions of existing building or site users towards cycling and walking so that constraints and opportunities can be identified
    - Travel patterns and transport impact of future building users
    - Current local environment for walkers and cyclists (accounting for visitors who may be accompanied by young children)
    - Reporting of the number and type of existing accessible amenities within 500m of the site
    - Disabled access (accounting for varying levels of disability and visual impairment)
    - Calculation of the existing public transport Accessibility Index (AI)
    - Current facilities for cyclists
- The travel plan includes proposals to increase or improve sustainable modes of transport and movement of people and goods during the operations and user.
- If the occupier is known, they must be involved in the development of the travel plan and they must confirm that the travel plan will be implemented post construction and supported by the building management in operation.
- The following measures could be considered as part of the travel plan for the development:
    - Negotiation with local bus, train or tram companies an increase in the local service provision for the development
    - Provision of a public transport information system in a publicly accessible area
    - Provision of electric recharging stations
    - Provision of parking priority spaces for car sharers
    - Consultation with the local authority on the state of the local cycling network and on improvements
    - Provision of dedicated and convenient cycle storage
    - Provision of cyclists' facilities
    - Lighting, landscaping and shelter to create pleasant pedestrian and public transport waiting areas
    - Restrictions or charging for car parking
    - Pedestrian and cyclist friendly (for all types of user regardless of the level of mobility or visual impairment) with the provision of cycle lanes, safe crossing points, direct routes, appropriate tactile surfaces, good lighting and signposting to other amenities, public transport nodes and adjoining off-site pedestrian and cycle routes
    - Provision of suitable taxi drop-off or waiting areas
    - Ensuring that rural buildings are located with appropriate transport access to ensure that they adequately serve the local community (where procured to do so e.g. community centre).
- Amenities in proximity to the site:
    - Appropriate food outlet
    - Access to cash
    - Access to an outdoor open space (public or private, suitably sized and accessible to building users)
    - Access to a recreation or leisure facility for fitness or sports
    - Publicly available postal facility
    - Community facility
    - Over the counter services associated with a pharmacy
    - Public sector GP surgery or general medical centre
    - Childcare facility or school

D2: Tra 02 Sustainable Transport Measures

Credits available relating to the AI of the site and the number of points achieved

Points	Points	Points	Credits
AI < 25	25 ≤ AI < 40 (urban centres)	AI of ≥ 40 (metropolitan centre locations)	
1	1		1
2		1	2
3	2		3
4		2	4
5	3		5
6	4	3	6
7	5		7
8	6	4	8
9	7	5	9
10	8	6	10

Sustainable public private and active transport measures

Sustainable transport measures			
Assessment option	Public transport measures	Applicable building types	Points
1	1. The existing AI calculated in Tra 01 achieves the following: ≥ 4 for prison or MOD sites, rural location sensitive buildings, and other building group 3 ≥ 8 for all other building types	All	1
2	2. Demonstrate an increase over the existing Accessibility Index through negotiation with local bus, train or tram companies to increase the frequency of the local service provision for the development; OR	All	2
	3. Demonstrate an increase over the existing Accessibility Index. This could be through provision of a diverted bus route, a		3

	new or enhanced bus stop, or other similar solutions. OR		
	4. Provide a dedicated service, such as a bus route or service		3
3	5. Provide a public transport information system in a publicly accessible area, to allow building users access to up-to-date information on the available public transport and transport infrastructure. This may include signposting to public transport, cycling, walking infrastructure or local amenities.	All	1
Assessment option	Private transport measures	Applicable building types	Points
4	6. Provide electric recharging stations of a minimum of 3kw for at least 10% of the total car parking capacity for the development.	All	1
5	7. Set up a car sharing group or facility to facilitate and encourage building users to car share. 8. Raise awareness of the sharing scheme with marketing and communication materials. 9. Provide priority spaces for car sharers for at least 5% of the total car parking capacity for the development. 10. Locate priority parking spaces nearest the development entrance used by the sharing scheme participants.	All	1

Assessment option	Active travel measures	Applicable buildings types	Points
6	11. During preparation of the brief, the design team consults with the local authority (LA) on the state of the local cycling network and public accessible pedestrian routes, to focus on whichever the LA deems most relevant to the project, and how to improve it. 12. Agree and implement one proposition chosen with the local authority. The proposition supported by the development is additional to existing local plans and has a significant impact on the local cycling network or on pedestrian routes open to the public.	All	2
7	13. Install compliant cycle storage spaces to meet the minimum levels	All	1
8	14. Option 7 has been achieved. 15. Provide at least two compliant cyclists' facilities for the building users, (including pupils where appropriate to the building type) (See Appendix D3 for scope of each facility): – Showers – Changing facilities – Lockers – Drying spaces.	All	1
9	Existing amenities: 16. At least three existing accessible amenities are present where relevant for a Building Group		
10	Enhanced amenities:		2

	17. Ensure a minimum of one new accessible amenity for the relevant Building Group is provided. OR		
	18. Ensure more than one new accessible amenity for the relevant Building Group is provided.		3
Assessment	**Alternative transport measures**	**Applicable**	**Points**
11	19. Implement one site-specific improvement measure, not covered by the options already listed in this issue, in line with the recommendations of the travel plan. Submit these for review by BRE.	All	1-3

D2a: Tra 02 Sustainable Transport Measures - Cyclist Facilities

Compliant cycle storage space:

- The space is covered overhead and protected from the weather
- Cycles are secured within spaces in rack(s) and consists of fixings for 1 or more spaces.
- The covered area and the cycle racks are set in or fixed to a permanent structure (building or hardstanding). Alternatively the cycle storage may be located in a locked structure fixed to or part of a permanent structure with CCTV surveillance. For proprietary systems see also compliance note below.
- The distance between each cycle rack, and cycle racks and other obstructions e.g. a wall, allows for appropriate access to the cycle storage space, to enable bikes to be easily stored and accessed.
- The facilities are in a prominent site location that is viewable/overlooked from either an occupied building or a main access to a building.
- Lighting of the cycle storage facility must be compliant with the external (or internal where relevant) lighting criteria defined in BREEAM issue Hea 01. The lighting must be controlled to avoid 'out-of-hours' use and operation during daylight hours, where there is sufficient daylight in/around the facility.

Compliant showers:

- Provision of one shower for every 10 cycle storage spaces, subject to a minimum provision of one shower.
- Any building providing eight showers or more will comply regardless of the number of cycle storage spaces provided.
- Both male and female users must be catered for i.e. either separate showers within shared gender-specific facilities (required provision split 50-50) or single shower cubicles and changing space for mixed use.
- The showers do not need to be dedicated to cyclists and can be those shared with other users/uses.

Compliant changing facilities:

- Appropriately sized for the likely/required number of users. The assessor should use their judgement to determine whether the changing area is appropriately sized given the number of cycle storage spaces or showers provided.
- Changing areas must include adequate space and facilities to hang or store clothing and equipment while changing or showering, e.g. bench seat and/or hooks.
- Account for privacy to allow cyclists of either gender to change in private.
- Toilet/shower cubicles cannot be counted as changing facilities.

Complaint lockers:

- The number of lockers is at least equal to the number of cycle spaces provided.
- Lockers are either in or adjacent to compliant changing rooms.
- The lockers are sized appropriately for the storage of a cyclist's equipment.

Compliant drying space:

The drying space (for wet clothes) must be a specially designed and designated space with adequate heating/ventilation. A plant room is not a compliant drying space.

D2b: Tra 02 Amenities Applicable for Option 9 and 10 for Different Building Groups (BG)

Criteria	BG 1	BG 2	BG 3	BG 4	BG 5	BG 6
Proximity (metres)	500	500	500	500	500	500
Appropriate food outlet	✓	✓	✓	✓	✓	✓
Access to cash	✓	✓	✓	✓	✓	✓
Access to an outdoor open space (public or private, provided suitably sized and accessible to building users)	✓	✓	✓	✓	✓	✓
Access to a recreation or leisure facility for fitness or sports	✓	✓	✓	✓	✓	✓
Publicly available postal facility	✓	✓	✓	✓	✓	✓
Community facility	✓	✓	✓		✓	✓
Over the counter services associated with a pharmacy	✓	✓	✓	✓	✓	✓
Public sector GP surgery or general medical centre			✓		✓	✓
Child care facility or school	✓		✓		✓	✓

Key:

✓ - Amenity relevant to building type

Building Types:

BG 1: Offices, Retail, Industrial, Courts and Prisons
BG 2: Preschool, Schools, Sixth Form
BG 3: Higher Education and Further Education
BG 4: Healthcare
BG 5: Multi-residential
BG 6: Other building types

Appendix E Water

E1: Wat 01 Water Consumption

Calculating water efficiency

A non-domestic building's water efficient performance is determined using the BREEAM Wat 01 calculator. Include the efficiency of the following domestic-scale water-consuming components (where specified):

- WCs
- Urinals
- Taps (wash-hand basins and, where specified, kitchen taps and waste disposal unit)
- Showers
- Baths
- Dishwashers (domestic and commercial-sized)
- Washing machines (domestic and commercial or industrial sized).

The BREEAM Wat 01 calculator defines the building types and activity areas for which the above components must
be assessed.

Standard Wat01 Method

This method uses the building's actual component specification and default usage patterns for the building type and its activity areas to determine water efficiency (measured in litres/person/day and m^3/person/yr) for a building.

- The modelled output is compared with the output for a baseline component specification and the water demand saving determined as a percentage improvement. The percentage improvement determines the number of BREEAM credits achieved.

- The baseline component specification is equivalent to the water efficiency of industry standard components, steered by the minimum levels required by the Water Supply (Water Fittings) Regulations and Part G of the Building Regulations.

- The BREEAM percentage improvement benchmarks are based on progressively more efficient standards and product market availability for water-consuming components. For the higher levels of performance, the specification of greywater and rainwater systems is required.

The standard approach is the default method for calculating the water efficiency of the assessed building. It is used for most of the common building types, where usage data are available. For building types where usage data are not available, the standard approach cannot be used. An alternative approach to compliance described below must be used instead. Refer to the BREEAM Wat 01 calculator for the building types which can currently be assessed using the standard approach.

Alternative Wat01 Method

Where the standard approach cannot be used to determine the building's water consumption (litres/person/day), the assessment is completed on an elemental basis, as follows:

- Use the list of applicable water-consuming components and determine those that are specified or present in the assessed building.

- Use the actual specification for each component type to complete the 'Other building type calculator' worksheet of the BREEAM Wat 01 calculator.

- Weightings applied in the calculator are:

  - building type specific weightings to each component level to reflect its 'in-use' consumption relative to the other components present. A component with high 'in-use' water consumption has a higher weighting than one with lower 'in-use' consumption and therefore makes a relatively larger contribution to the building's overall level of performance.

  - derived from data on actual water consumption per day from non-domestic buildings, sourced from BNWAT22 (These are in the BREEAM Wat 01 calculator.)

- Based upon the performance level of each component type and the component weighting, the calculator determines an overall level of performance and awards the relevant number of BREEAM credits.

Component types and efficiencies

Component	Performance levels (quoted numbers are minimum performance required to achieve the level)						
	Base	1	2	3	4	5	Unit
WC	6	4.5	4	3.75	3.5	3	Effective flush volume (litres)
Wash-hand basin Taps	10	8	6	5	4	3	litres/min
Showers	12	10	8	6	5	3.5	litres/min
Baths	200	180	160	140	120	100	litres
Urinals (≥2)	7.50	6	3	1.50	0.75	0	litres/bowl/ hour
Urinal (1)	10	8	4	2	1	0	litres/bowl/ hour
Greywater/rainwater system	0%	0%	0%	25%	50%	75%	% of flush demand met by system
Kitchenette tap	10	8	7	6	5	5	litres/min
Restaurant taps: pre rinse only	10.3	9	8.3	7.3	6.3	6	litres/min
Domestic dishwasher	17	13	13	12	11	10	litres/cycle
Domestic washing machine	90	60	50	40	35	30	litres/use
Waste disposal unit	17	17	0	0	0	0	litres/min
Commercial dishwasher	8	7	6	5	4	3	litre/Rack
Commercial/ industrial washing machine	14	12	10	7.5	5	4.5	litres/kg

Table E1: water consuming components and their required efficiency levels

E2: Wat 02 Water monitoring

Special Building use water monitoring criteria

- 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.

- 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.

E3: Wat 03 Water Leak Detection and Prevention

Leak detection system

A leak detection system which is capable of detecting a major water leak on the mains water supply within the building and between the building and the utilities water meter is installed. The leak detection system must be:

- A permanent automated water leak detection system that alerts the building occupants to the leak OR an in-built automated diagnostic procedure for detecting leaks is installed.
- Activated when the flow of water passes through the water meter/data logger at a flow rate above a pre-set maximum for a pre-set period of time.
- Able to identify different flow and therefore leakage rates, e.g. continuous, high and/or low level, over set time periods.
- Programmable to suit the owner/occupiers' water consumption requirements
- Where applicable, designed to avoid false alarms caused by normal operation of large water-consuming plant such as chillers.

Flow control

Flow control devices that regulate the supply of water to each WC area/facility according to demand are installed. The following devices are acceptable:

- A time controller i.e. an automatic time switch device to switch off the water supply after a predetermined interval
- A programmed time controller i.e. an automatic time switch device to switch water on and/or off at predetermined times.
- A volume controller i.e. an automatic control device to turn off the water supply once the maximum pre-set volume is reached.
- A presence detector and controller i.e. an automatic device detecting occupancy or movement in an area to switch water on and turn it off when the presence is removed.
- A central control unit i.e. a dedicated computer-based control unit for an overall managed water control system, utilising some or all of the types of control elements listed above.

E2: Wat 04 Water Efficient Equipment

Water efficient irrigation systems

Any of the following would comply

- Drip feed subsurface irrigation that incorporates soil moisture sensors. The irrigation control should be zoned to permit variable irrigation to different planting assemblages.
- Reclaimed water from a rainwater or greywater system. The storage system must be appropriately sized i.e. storage capacity is relative to the size of the soft landscaped area.
- External landscaping and planting that relies solely on precipitation, during all seasons of the year.
- All planting specified is restricted to species that thrive in hot and dry conditions.

Appendix F Materials

F1: Mat 01 Environmental Impacts from Construction products – Building Life Cycle Assessment (LCA)

Superstructure

Comparison with the BREEAM benchmark during Concept Design (offices, industrial and retail buildings only)

During the Concept Design, demonstrate the environmental performance of the building as follows:

- Carry out a building LCA on of the superstructure design using either the BREEAM Simplified Building

LCA tool or an IMPACT Compliant LCA tool

- Submit the Mat 01/02 Results Submission Tool to BRE at the end of Concept Design, and before planning permission is applied for (that includes external material or product specifications).

Comparison with the BREEAM benchmark during Technical Design (offices, industrial and retail buildings only)

During Technical Design, demonstrate the environmental performance of the building as follows:

- Carry out a building LCA on of the superstructure design using either the BREEAM Simplified Building LCA tool or an IMPACT Compliant LCA tool
- Submit the Mat 01/02 Results Submission Tool to BRE at the end of Technical Design.

Option appraisal during concept design (all building types) requirements:

During the Concept Design, demonstrate the environmental performance of the building as follows:

- Carry out building LCA options appraisal of 2 to 4 significantly different superstructure design options (based on the selected Concept Design option and as applicable to the Technical Design stage)
- Use a building LCA tool that is recognised by BREEAM (as suitable for assessing superstructure during Technical Design)
- Each design option must fulfil the same functional requirements specified by the client and all statutory requirements (to ensure functional equivalency).
- LCA options appraisal activity to be integrated within the wider design decision making process and recorded in an options appraisal summary document.
- Record the following in the Mat 01/02 Results Submission Tool: The differences between the design options; the design option selected by the client to be progressed beyond Concept Design; the reasons for selecting it and the reasons for not selecting the other design options.
- Submit the Mat 01/02 Results Submission Tool to BRE at the end of Concept Design, and before planning permission is applied for.

Options appraisal during technical design (all building types):

During Technical Design, demonstrate the environmental performance of the building as follows:

- Carry out building LCA options appraisal of 2 to 4 significantly different superstructure design options
- Use a building LCA tool that is recognised by BREEAM
- For each design option, fulfil the same functional requirements specified by the client and all statutory requirements (to ensure functional equivalency). Where an options appraisal summary document was produced during Concept Design, update it to include the Technical Design options.
- Record the following in the Mat 01/02 Results Submission Tool and submit to the BRE at the end of the Technical Design.

Suitable building LCA tools:

- BREEAM Simplified Building LCA Tool
- Impact Compliant LCA Tool
- Other Building LCA Tools recognised by the BRE (See the Mat01/02 Result Submission tool)

Substructure and hard landscaping

Options appraisal during Concept Design (all building types)

- Carry out building LCA options appraisal of a combined total of at least six significantly different substructure or hard landscaping design options
- Using a building LCA tool that is recognised by BREEAM
- Each design option must fulfil the same functional requirements specified by the client and all statutory requirements (to ensure functional equivalency).
- LCA options appraisal activity to be integrated within the wider design decision making process and recorded in an options appraisal summary document.
- Record the following in the Mat 01/02 Results Submission Tool: The differences between the design options; the design option selected by the client to be progressed beyond Concept Design; the reasons for selecting it and the reasons for not selecting the other design options.
- Submit the Mat 01/02 Results Submission Tool to BRE at the end of Concept Design, and before planning permission is applied for.

Significantly different design options

Significantly different design options are significantly different in terms of either the types of, or quantity of, construction products specified for one or more major elemental constructions that are within the scope of the assessment. This will depend on the stage of the assessment.

During Concept Design, different options are typically at the elemental construction level. Compare the options proposed with the following examples to determine if they can be considered significantly different for the Concept Design stage:

- For the majority of the element '1. External enclosing walls above ground floor level', option 'A' has a timber cladding external finish and option 'B' has cement render (each will likely have different substrates accordingly).
- For element '2. Superstructure/1. Frame', option 'A' is a concrete based frame and option 'B' is a steel based frame.
- For element '2. Superstructure/1. Frame', option 'A' is a cast in-situ concrete based frame and option 'B' is a precast concrete based frame.
- For element '5. Central heating and cooling', option 'A' is a refrigerant distribution based system and option 'B' is an air distribution based system.

During Technical Design, different options are typically at the product level (within elemental constructions established during Concept Design). Compare the options proposed with the following examples to determine if they can be considered significantly different for the Technical Design stage:

- For element '1. External enclosing walls above ground floor level', where both options have cement render but 'A' is a different type of render from 'B'.
- For element '3. Roof', option 'A' has a one type of insulation and option 'B' has another type of insulation.
- For element '5. Central heating and cooling', the pipework manufacturer for option 'A' is different from option 'B'.

F2: Mat 02 Environmental Impacts from Construction products – Environmental Product Declaration (EPD)

EDP Points for different types of EPD

Recognised types of EPD	Validity	EPD points
EPD applicable to more than one product in the same product category, and a more than one manufacturer.	– EPD unexpired at the point of specification. – Product installed in the building by the end of construction. – EPD issued or registered by an ISO 14025 compliant programme operator. – For products covered by the Construction Product Regulations, the EPD must have been generated using product category rules based on either BS EN 15804 or ISO 21930.	0.5
EPD applicable to more than one product in the same product category, and a single manufacturer.		0.75
EPD applicable to a single product*, and a single manufacturer (the product may be manufactured in more than one location)		1.5

Material Classification

Material category	Uniclass equivalent code (for information)
Timber or timber-based	P5
Concrete or cementitious	P2
Metal	P4
Stone or aggregate	P1, P3
Clay-based	P33
Gypsum	P232
Glass	P314
Plastic, polymer, resin, paint, chemicals and bituminous	P7, P34
Animal fibre or skin, cellulose fibre	P6

F3: Mat 03 Responsible Sourcing of Materials

Sustainable Procurement Plan

A plan that sets out a clear framework for the responsible sourcing of materials to guide procurement by all involved in the specification and procurement of construction materials. The plan may be prepared and adopted at an organisational level or be site/project specific and for the purposes of BREEAM compliance, cover the following as a minimum:

- Be in place before the Concept Design

- Risks and opportunities are identified against a broad range of social, environmental and economic issues. BS ISO 20300:2017 Responsible sourcing sector certification schemes for construction products- Specification can be used as a guide to identify these issues.
- Aims, objectives and targets to guide sustainable procurement activities.
- The strategic assessment of sustainably sourced materials available locally and nationally. There should be a policy to procure materials locally where possible.
- Procedures are in place to check and verify that the sustainable procurement plan is being implemented/adhered to on the project, e.g. setting out measurement criteria, methodology and performance indicators to assess progress and demonstrate success.

Credits available for each scope level and % point achieved

Credits	Mat 03 Scope	% of available points achieved
1	Super structure	≥ 10%
2	As above + Internal finish + sub structure and hard landscaping	≥ 20%
3		≥ 30%
1	As above + core building services	≥ 50%

Responsible Sourcing

Location/use categories to be included in assessment:

New Rules of Measurement (NRM) Classification	Equivalent BREEAM Location/use category
1.0 Substructure	Structure primary & secondary
2.1 Frame	Structure primary & secondary
2.2 Upper floors	Floor (including floor finishes)
2.3 Roof	Roof (including roof finishes)
2.4 Stairs and ramps	Structure primary & secondary
2.5 External walls	External wall (including finishes, e.g. cladding, lining, render)
2.6 Windows and external doors	Door or window
2.7 Internal walls and partitions	Internal partition or internal walls (including finishes)
2.8 Internal doors	Door or window
3.1 Wall finishes	Internal partition or internal walls (including finishes)
3.2 Floor finishes	Floor (including floor finishes)
3.3 Ceiling finishes	Ceiling (including ceiling finishes)
5.5.1 Heat source	Building services
5.6 Space heating and air-conditioning	Building services
5.7 Ventilation	Building services
5.9 Fuel installations or systems	Building services
8.2 Roads, paths and pavings	Hard landscaping

Applicable materials within above elements:

- Timber/timber-based products
- Concrete/cementitious
- Metal
- Stone/aggregate
- Clay based (pavers, blocks, bricks, roof tiles, etc.)
- Gypsum
- Glass
- Plastic, polymer, resin, paint, chemicals and bituminous
- Animal fibre/skin
- Other

F4: Mat 05 Design for Durability and Resilience

Protecting vulnerable parts of the building from damage

The design incorporates suitable durability and protection measures into building design and construction to prevent damage to the buildings fabric or materials in case of accidental or malicious damage to provide protection against (but not limited to):

- Negative impacts of high user numbers in relevant areas of the building (e.g. corridors, lifts, stairs, doors etc.).
- Damage from any vehicle or trolley movements within 1m of the internal building fabric in storage, delivery, corridor and kitchen areas.
- External building fabric damage by a vehicle. Protection where parking or manoeuvring areas are within 1 metre of the building façade and where delivery areas or routes are within 2 metres of the façade, i.e. specifying bollards or protection rails.
- Potential malicious damage to building materials and finishes, in public and common areas where appropriate.

Protecting exposed parts of the building from material degradation

The relevant building elements incorporate appropriate design and specification measures to limit material degradation due to environmental factors. Key exposed building elements have been designed and specified to limit long and short term degradation due to environmental factors. This can be demonstrated through one of the following:

- The element or product achieving an appropriate quality or durability standard or design guide (see below). **OR** A detailed assessment of the element's resilience when exposed to the applicable material degradation and environmental factors.
- Include convenient access to the roof and façade for cost-effective cleaning, replacement and repair in the building's design.
- Design the roof and façade to prevent water damage, ingress and detrimental ponding.

Durability or quality standards and design guides.

Relevant Industry durability or quality standards and design guides
Timber
BS EN 350:2016. Durability of wood and wood-based products - Testing and classification of the durability to biological agents of wood and wood-based materials, BSI; 2016. WIS 4-28. Durability by design, TRADA; 2016 WIS 2/3-60. Specifying timber exposed to weathering, TRADA; 2015 WIS 1-47. Timber external doors, TRADA; 2015 BS 8605-1:2014. External timber cladding - Method of specifying, BSI; 2014
Curtain walling
Standard for systemised building envelopes, Centre for Window and Cladding Technology; 2006 CWCT Curtain Wall Installation Handbook, Centre for Window and Cladding Technology; 2006 BS EN 13830:2015. Curtain walling - Product standard, BSI; 2015
Brickwork, blockwork
BDA Design Note 7 - Brickwork durability, Brick Development Association; 2011 Severely Exposed Brickwork, Brick Development Association; 2014 BS 8297-2017. (Design, manufacture and installation of architectural precast concrete cladding. Code of practice). The standard refers to EN 13369 (Common Rules for precast concrete products) on durability requirements and requires concrete cover to be in accordance to EN 1992-1-1 and BS 8500.

BS 8500-1:2015 +A1:2016. Concrete – complementary British Standard to BS EN 2016 part 1: Method of specifying and guidance for the specifier and BS 8500-2:2015 +A1:2016. Concrete – complementary British Standard to BS EN 2016 part 2: Specification for constituent materials and concrete.
Roof elements
BR 504. Roofs and roofing: Performance, diagnosis, maintenance, repair and the avoidance of defects (Third Edition), BRE; 2009 Profiled sheet roofing and cladding. The guide to design and best practice (4th edition), National Federation of Roofing Contractors; 2016 Guidelines for the Design & Application of Green Roof Systems, CIBSE; 2013 Single Ply: Design Guide 2016 Edition, Single Ply Roofing Association; 2016SPRA: Guidance and standards LRWA: technical guidance notes
Metal cladding
Profiled sheet roofing and cladding. The guide to design and best practice (4th edition) National Federation of Roofing Contractors 2016 Metal Fabrications: Design, Detailing and Installation Guide, Metal Cladding and Roofing Manufacturers Association; 2006
Glazing
BS EN 12488:2016. Glass in building - Glazing recommendations - Assembly principles for vertical and sloping glazing, BSI; 2016
Masonry
PD 6697:2010. Recommendations for the design of masonry structures to BS EN 1996-1-1 and BS EN 1996-2, BSI; 2010 BS EN 1996-2:2006. Eurocode 6. Design of masonry structures. Design considerations, selection of materials and execution of masonry, BSI; 2006
Other useful standards or design guides
BR 292. Cracking in buildings (Second edition), BRE; 2016BRE Good Practice guidance's

Examples of suitable durability measures

In areas of higher risk, suitable durability and protection measures to vulnerable parts of the building can include:

- Bollards, barriers or raised kerbs to delivery and vehicle drop-off areas
- Robust external wall construction, up to 2m high.
- Corridor walls specified to Severe Duty (SD) as per BS 5234-2 and, for Healthcare buildings, Health Technical Memorandum 56 - Partitions.
- Protection rails to walls of corridors
- Kick plates or impact protection (e.g. trolleys) on doors
- Hard-wearing and easily washable floor finishes in heavily used circulation areas (i.e. main entrance, corridors, public areas etc.)
- Door stoppers to prevent door handles damaging walls
- Designing out the risk without the need for additional materials specification to protect vulnerable areas.

Key exposed building element

Applicable building elements to be identified from the below and included in assessment. Key exposed building elements in the context of this issue are those adding up to at least 80% by area of each of the following categories:

1. External walls and cladding
2. Roof or balconies
3. Glazing: windows, skylights
4. Hard landscaping

Environmental factors

These are natural, man-made or induced external and internal conditions that can influence performance and use of a building and its parts.

F5: Mat 06 Material Efficiency

Definition:

The process of undertaking a building project to enable the most efficient use of materials over the life cycle of the building and its components. This includes using fewer materials, reusing existing demolition/strip-out materials and, where appropriate, procuring materials with higher levels of recycled content. It may also include the adoption of alternative means of design/construction that result in lower materials usage and lower wastage levels including off-site manufacture and use of pre-assembled service pods.

At the Preparation and Brief and Concept Design stages, set targets and report on opportunities and methods to optimise the use of materials. These must be done for each of the following stages.

- Preparation and Brief
- Concept Design
- Developed Design
- Technical Design
- Construction

Develop and record the implementation of material efficiency, during:

- Developed Design
- Technical Design
- Construction

Report the targets and actual material efficiencies achieved.

Methodology:

Preparation and Brief (RIBA Stage 1):

Objective: set requirements to inform decisions throughout the project.
Participants: Client or clients' agent.
Action: Assess the site, project scale and clients functional and aesthetic requirements.
Evidence: A dedicated report which sets out a clear framework to guide material efficiency activities throughout the design and construction of the project including aims, objectives, targets, performance indicators, opportunities, constraints and responsibilities to guide material efficiency activities.

Concept design (RIBA Stage 2):

Objective: Develop strategies to implement the materials efficiency requirements set under RIBA Stage 1.
Participants: Design team (including architect, structural engineer and building services engineer)
Action: Hold workshops with the project team to identify design opportunities to reduce/ optimise materials use throughout the project.
Evidence: Minutes of workshops held and documentations demonstrating how feedback from the workshop has been incorporated in the concept design.

Developed design and Technical design (RIBA Stages 3 and 4):

Objective: Develop design proposals based on learning from concept design.
Participants: Design team
Action: incorporate material efficiency measures and strategies identified in concept design into architectural, structural and building services design as appropriate.

Evidence: A report on deviations from previous stages and documentation demonstrating the incorporation of the outcomes from the concept stage.

Construction (RIBA Stage 5):
Objective: Implement material efficiency measures in construction
Participants: Principal contractor
Action: Implement material efficiency strategies identified in previous stages, highlighting deviations and any further efficiencies appropriate for this stage.
Evidence: A report on deviations from previous stages. Documented evidence of activity to further identify efficiencies at this stage.

Examples of useful information to help in the optimisation of materials use at different RIBA Plan of Work stages:

RIBA Stage	Information / actions	Output
0. Strategic Definition		Strategic brief to include section on material efficiency which identifies client aspirations and objectives
1. Preparation and Brief	Include information from: • Pre-refurbishment audit to identify potential reuse opportunities on and off-site (Wst 1) • Waste forecasts • Assessment of site constraints that may influence material efficiency • Other project specific feasibility studies.	Project brief including Initial resource management plan • Project targets (waste arisings, percentage reuse, percentage recycled content) • Roles and responsibilities.
2. Concept Design	• Designing out waste workshop/discussions output (follow WRAP 5 principles of designing out waste) • Development of improved forecasts of types and amounts of waste • Engagement with contractors to investigate waste reduction activities • Prioritisation of ideas.	Expanded project brief summarising activities relating to material efficiency.
3. Developed Design	• Incorporation of selected ideas into drawings and outline specifications • Assessment of savings in material quantities.	Resource management plan updated to include accurate waste forecasts, opportunities to design out waste and increase reclaimed content.
4. Technical Design	• Engagement with contractors, subcontractors and suppliers • Consultations with planning or building regulation authorities.	• Report with final options from previous statements and reasons for inclusion/exclusions • Updated resource management plan including waste forecasts, design decisions.
5. Construction		• Updated resource management plan to include actual waste arisings and performance against targets (linked to Wst 1).

Examples of suitable material efficiency design measures can include:

- Increasing the utilisation factor of structural members
- Designing to standard material dimensions to reduce off-cuts and waste on site
- Removing redundant materials from the design
- Using materials that can be recycled or reused at the end of their service life
- Making use of recycled or reclaimed materials
- Designing for deconstruction and material reuse
- Using pre-fabricated elements where appropriate to reduce material waste
- Consider using an 'exposed thermal mass' design strategy to reduce finishes
- Avoiding over-specification of predicted loads
- Using lightweight structural design strategies
- Making use of bespoke structural elements where this will reduce overall material use
- 'Rationalisation' of structural elements
- Optimising the foundation design for embodied environmental impact.

Appendix G Waste

G1: Wst 01 Construction Waste Management

Pre-demolition Audit Criteria

Complete a pre-demolition audit of any existing buildings, structures or hard surfaces being considered for demolition. This must be used to determine whether refurbishment or reuse is feasible and, in the case of demolition, to maximise the recovery of material for subsequent high grade or value applications. The audit must cover the content of Pre-demolition audit scope below and:

- Be carried out at Concept Design stage (RIBA Stage 2) by a competent person prior to strip-out or demolition works
- Guide the design, consider materials for reuse and set targets for waste management
- Engage all contractors in the process of maximising high grade reuse and recycling opportunities
- Compare actual waste arisings and waste management routes used with those forecast and investigate significant deviations from planned targets.
- Be referenced in the resource management plan (RMP)

Pre-demolition audit scope

The pre-demolition audit must cover:

- Identification and quantification of the key materials where present on the project
- Potential applications and any related issues for the reuse and recycling of the key materials in accordance with the waste hierarchy
- Opportunities for reuse and recycling within the same development
- Identification of local re-processors or recyclers for recycling of materials
- Identification of overall recycling targets where appropriate
- Identification of reuse targets where appropriate
- Identification of overall landfill diversion rate for all key materials.

Resource Management Plan (RMP)

A RMP aims to promote resource efficiency and to prevent illegal waste activities. Resource efficiency includes minimising waste at source and ensuring that clients, designers and principal contractors assess the use, reuse and recycling of materials and products on site and off site. A compliant RMP defines:

- A target benchmark for resource efficiency, i.e. m^3 of waste per $100m^2$ or tonnes of waste per $100m^2$
- Procedures and commitments to minimise non-hazardous waste in line with the target benchmark
- Procedures to minimise hazardous waste; these are:
    - A waste-minimisation target and details of waste minimisation actions to be undertaken
    - Procedures to estimate, monitor, measures and report on hazardous and non-hazardous site waste and demolition waste, where relevant, arising from work carried out by the principal contractor and all subcontractors. Waste data obtained from licensed external waste contractors needs to be reliable and verifiable, e.g. using data from EA/SEPA/EA Wales/NIEA waste return forms or from a PAS402 compliant company
    - Monthly reporting of all construction waste data throughout the project checked against what would be expected based on the stage of the project, invoices, etc., to validate completeness of waste reporting data
    - Procedures to sort, reuse and recycle construction waste into defined waste groups, either on site or through a licensed external contractor
    - Procedures to review and update the plan
    - The name or job title of the individual responsible for implementing the above.

Construction waste resource efficiency benchmarks

BREEAM Credits	Amount of waste generated per 100m2 (Gross internal floor area)	
	M3 (actual, not bulk volume)	Tonnes
One credit	≤ 13.3	≤ 11.1
Two credits	≤ 7.5	≤ 6.5
Three credits	≤ 3.4	≤ 3.2
Exemplary Credit	≤ 1.6	≤ 1.9

Diversion from landfill benchmarks

BREEAM Credits	Type of waste	Volume	Tonnage
One Credit	Non Demolition	70%	80%
	Demolition	80%	90%
	Excavation	N/A	N/A
Exemplary level	Non demolition	85%	90%
	Demolition	85%	95%
	Excavation	95%	95%

G2: Wst 02 Use of Recycled and Sustainably Sourced Aggregates

- Identify all aggregate uses and types on the project
- Determine the quantity in tonnes for each identified use and aggregate type.
- Identify the region in which the aggregate source is located.
- Calculate the distance in kilometres travelled by all aggregates by transport type.
- Enter the information into the BREEAM Wst 02 calculator to calculate the Project Sustainable Aggregate points

Aggregate types:

- Hard rock (including limestone and granite)
- Land-based sand or gravel
- Marine-dredged sand or gravel
- Recycled
- Secondary

Aggregate uses:

	Reference	Conversions	Potential applications on project
Engineered fill	Aggregates compliant with Class 6 or Class 9 under the Specification for Highways Works (SHW) Series 600 Earthworks	requires 1 tonne of coarse aggregate (or 0.5 tonnes in the case of lightweight aggregate)	Backfill to basement walls; Sub-base and base courses for hard landscape and local roads
Concrete coarse aggregate	4mm–20mm aggregate produced in accordance with EN 12620: Aggregates for concrete Or EN 13055 Lightweight aggregates Part 1	Assume 1m³ of concrete requires 1 tonne of coarse aggregate (or 0.5 tonnes in the case of lightweight aggregate)	Foundations, frame, floors as ready-mix concrete or precast concrete
Concrete fine aggregate	0mm–4mm aggregate produced in accordance with EN 12620: Aggregates for concrete	Assume 1m³ of concrete requires 0.7 tonne of fine aggregate	Foundations, frame, floors as ready-mix concrete or precast concrete
Asphalt aggregate	Aggregates produced in accordance with EN 13043: Aggregates for bituminous mixtures and surface treatments for roads, airfields and other trafficked areas	Assume 1m³ of asphalt requires approximately 2.1 tonnes of aggregate	Access roads and external circulation areas
Granular bedding for pipes	Aggregates produced in accordance with EN 13242: Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction	Assume 1m³ of pipe bedding is approximately 2.0 tonnes	Bedding for surface water drainage and sewage pipes installed in external areas
Granular bedding for hard landscape products	Aggregates produced in accordance with EN 13242: Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction	Assume 1m³ of hard landscaping is approximately 2.0 tonnes	Bedding for concrete paving stones, natural stone or concrete blocks in external circulation areas
Hydraulic bound materials	Aggregates produced in accordance with EN 13242: Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction	Assume 1m³ of hydraulically bound materials requires approximately 2.1 tonnes of aggregate	Piling mats; Sub-base and base courses for hard landscape and local roads; Utility trench reinstatement

The recycled or secondary aggregates are EITHER:

- Construction, demolition and excavation waste obtained on-site or off-site OR
- Secondary aggregates obtained from a non-construction post-consumer industrial by-product source.

Secondary aggregates

Recognised non-construction post-consumer or post-industrial by-products include:

- China clay waste
- By-product of dredging for al purposes
- Slate overburden
- Lightweight aggregate manufactured from PFA
- Ground Granulated Blast Furnace Slag (GGBFS)
- Air-cooled blast furnace slag
- Steel slag
- Furnace bottom ash (FBA)
- Incinerator bottom ash
- Quarry overburden, or other material not subject to the aggregates levy
- Foundry sands
- Recycled glass
- Recycled plastic
- Spent oil shale
- Colliery spoil
- Municipal Solid Waste Treatment Residues

PFA and GGBFS, used as a cement replacement, should not be included in these calculations.

Project sustainable aggregate Credit break points

Project sustainable aggregate credits	Project sustainable aggregate points
1	3.5 - 6
1 Exemplary performance credit	>6

G3: Wst 03 operational waste

- Provide a dedicated space for the segregation and storage of operational recyclable waste generated. The space is:
  - Clearly labelled, to assist with segregation, storage and collection of the recyclable waste streams
  - Accessible to building occupants or facilities operators for the deposit of materials and collections by waste management contractors
  - Of a capacity appropriate to the building type, size, number of units (if relevant) and predicted volumes of waste that will arise from daily or weekly operational activities and occupancy rates.
- For consistent and large amounts of operational waste generated, provide:
  - Static waste compactors or balers; situated in a service area or dedicated waste management space Vessels for composting suitable organic waste OR adequate spaces for storing segregated food waste and compostable organic material for collection and delivery to an alternative composting facility
  - A water outlet provided adjacent to or within the facility for cleaning and hygiene purposes where organic waste is to be stored or composted on site.

Additionally for healthcare buildings only

- The specified or installed operational waste facilities are compliant with the relevant NHS guidelines for that part of the UK.

Additionally for multi-residential buildings with self-contained dwellings or bedsits only

- Provide three internal storage containers for each dwelling or bedsit with:
  - A minimum total capacity of 30 litres
  - No individual container smaller than 7 litres
  - All containers in a dedicated non-obstructive position
  - Storage containers for recycling in addition to non-recyclable waste storage.
- Provide home composting facilities and a home composting information leaflet within the kitchen area or communal space for each self-contained dwelling or bedsit.

Additionally for multi-residential buildings with individual bedrooms and communal facilities only

- Meet criteria 4.a and 4.b for self-contained dwellings or bedsits for every six bedrooms.
- Locate recyclable storage in a dedicated, non-obstructive position in communal kitchens or other appropriate communal space.
- Provide home composting facilities and a home composting information leaflet within the kitchen area or communal space.
- Provide a minimum of 10 litres of internal storage for compostable waste

G4: Wst 05 Adaptation to Climate Change

Adaptation to climate change – structural and fabric resilience

Conduct a climate change adaptation strategy appraisal for structural and fabric resilience by the end of Concept Design (RIBA Stage 2), in accordance with the assessment structure laid out below.

Carry out a systematic (structural and fabric resilience* specific) risk assessment** to identify and evaluate the impact on the building overs its projected life cycle from expected extreme weather conditions arising from climate change and, where feasible, mitigate against these impacts. The assessment should cover the following stages:

- Hazard identification
  - Review the evidence/information from the relevant bodies to identify and understand the expected impacts of increased extreme weather events climate change for on the building
  - As a guide all plans should consider the following impacts and describe how the design mitigates against them where appropriate:
    - Storms (including high winds)
    - Cold events
    - Heat waves (including temperature increases)
    - Drought (including reduced summer rainfall)
    - Milder winters
    - Wetter winters (including increased moisture and driving rain)
    - Warmer summers and increased solar radiation
    - Temperature variation
    - Precipitation, e.g. rain and snow
    - Subsidence or ground movement.
  - Identify likely hazards
- Hazard assessment
  - Identify the likelihood and magnitude or scale of hazards identified
- Risk estimation. This should identify the risk presented by these hazards to the building and the likely impact of the hazards considering the following aspects as a minimum:
  - Structural stability
  - Structural robustness
  - Weather proofing and detailing
  - Material durability
  - Health and safety of building occupants and other
  - Impact on building contents and business continuity
- Risk evaluation
  - Evaluate the potential impact of these risks on the building
  - Determine the tolerable risk threshold
  - Check the sensitivity of the risk assessment
  - Identify areas where the risks are unacceptable in health and safety, life cycle assessment and financial terms
- Risk management
  - Identify risk reduction measures
  - Mitigate the hazards as far as is practically feasible
  - Adapt the design/specification to incorporate the measures identified by the risk assessment in the final design

*Structural and fabric resilience
BREEAM defines this as the ability of a structure to withstand an increased burden of weather/increase pressure/hazards associated with climate change. Examples of increased pressures/hazards include:

- Warmer summers and increased solar radiation
- Temperature variation
- Cold events
- Heat waves (including temperature increase)
- Drought (including reduced summer rainfall)
- Milder winters
- Wetter winters (including water/moisture)
- Precipitation e.g. rain and snow
- Extreme weather conditions: high wind speeds and storms, flooding, driving rain, snow, rainwater ponding
- Subsidence/ground movement.

**Systematic risk assessment
A structured approach to help professionals identify, evaluate and manage risk, where the reduction of the risks identified is integral to the process.
It includes:

1. Identifying the hazards
2. Eliminating the hazards, as far as reasonably practicable
3. Reducing the risks from each hazard, as far as reasonably practicable
4. Developing the building design to be robust.

Innovation Credit

For this credit to be achieved the following credits must also have also been achieved:

- Wst 05 - Adaptation to climate change
- Hea 04 – Thermal comfort – criterion 6 of the second credit
- Ene 01 – Reduction of energy use and carbon emissions – at least eight credits must have been achieved
- Ene 04 – low carbon design – passive design analysis credit
- Wat 01 – Water Consumption – minimum of three credits must have been achieved
- Mat 05 – Design for durability and resilience – criterion 2-4 must have been achieved
- Pol 3 – Surface water run-off – Flood risk a minimum of one credit and surface water run-off two credits have been achieved

G4: Wst 06 Functional Adaptability

- A building-specific functional adaptation strategy study has been undertaken by the client and design team by Concept Design (RIBA Stage 2), which includes recommendations for measures to be incorporated to facilitate future adaptation.
- Functional adaptation measures (see table below for examples) have been adopted in the design by the Technical Design Stage (RIBA Stage 4) in accordance with the functional adaptation strategy recommendations, where practical and cost effective. Omissions have been justified in writing to the assessor.
- The functional adaptation strategy study should consider the following:
  - Feasibility: The likelihood to contain multiple or alternative building uses, area functions and different tenancies over the expected life cycle, e.g. related to the structural design of the building.
  - Accessibility: Design aspects that facilitate the replacement of all major plant within the life of the building (e.g. panels, in floors/walls that can be removed without affecting the structure)
  - Versatility: The degree of adaptability of the internal physical space and external shell to accommodate change in-use

  - Adaptability: The potential of the building ventilation strategy to adapt to future building occupant needs and climatic scenarios.
  - Convertibility: The degree of adaptability of the internal physical space and external shell to accommodate changes of in-use.
  - Expandability: The potential for the building to be extended, horizontally or vertically.
  - 'Refurbishment Potential': The potential for major refurbishment, including façade replacement
- Ease of disassembly is facilitated by principles allowing the building or parts of the building to be disassembled at the end of its life, or to be renovated rather than demolished, with individual components being used for other purposes. The study should consider the following as a minimum:
  - Accessibility
  - Durability: use materials which require less frequent maintenance, repair or replacement, considering them within the context of the life span of the building.
  - Exposed and reversible connections: making the connections more visible provides opportunities to optimise material and product reuse. Welded connections prohibit disassembly and it is preferable to use screws and bolts to allow for disassembly and material reuse.
  - Layer independence: designing building systems and components in layers so that removal, adjustment or replacement of some elements is feasible, especially when different components have different life spans and maintenance needs.
  - Avoidance of unnecessary toxic treatments and finishes. Some finishes can contaminate the substrate in a way that they are no longer reusable or recyclable. This should be avoided unless finishes serve a specific purpose.
  - Standardisation can accommodate reuse and upgrading. It involves aspects such as dimensions, components, connections and modularity.
- The functional adaptation implementation will be specific to the building and scope of project, but information should be made available to the assessor covering:
  - Options for multiple building users and area functions based on design details (e.g. modularity)
  - Routes and methods for major plant replacement (e.g. networks and connections have flexibility and capacity for expansion)
  - Accessibility for local plant and service distribution routes (e.g. detailed information on building conduits and connections infrastructure)
  - The potential for the building to be extended, horizontally and/or vertically

Assessment Type	Accessibility	Spatial adaptability	Expandability
Part 1: Fabric and structure - External walls - Cladding - Ground and first floor - Roof	Use of products or systems which allow easy replacements	Location of structural components within the floor space	Provision to add extensions or alterations to increase building capacity
Parts 2 and 3: Core and local services - Mechanical and electrical - Plumbing - Stairs and lifts - Fire	Inclusion of facilities management requirements and CDM feedback for future operational needs		Provision of capacity in infrastructure to enable future expansion and adaptation
Part 4: Interior design - Finishes - Floors - Interior walls - Connections	Use of products or systems which allow easy replacements	Layout in standardised grids Use of inherent finishes to allow replacement Use of standardised material sizes	Identifying or recognising potential future functional requirements Efficient use of space to allow for any increase in occupancy

Principles for disassembly	Examples of deign measures and aspects to consider
Durability	• Durability of different building elements based on warranties and risk of being broken during disassembly • Consider building elements within the context of the building life span and the building sector • Use of temporary structures when a short life span is expected
Exposed and reversible connections	• Exposed and reversible connections facilitate disassembly • Consider space availability between building elements when aiming to accommodate disassembly • Poured and welded connections are likely to harm components and prevent disassembly
Layer independence	Layers standing independently, especially when components have different lifespans. The following principal layers can be identified as follows: • Structure: foundation and load-bearing elements • Skin: exterior surfaces • Services • Space plan: the interior layout • Stuff: furnishings and carpets
Standardisation	• Standard-size materials can accommodate multiple uses, reuse and upgrading • Standard types of connections can be separated and reused more easily • Modularity allows elements to be slotted together or taken apart to promote disassembly and flexible environments

Appendix H: Land Use & Ecology

H1:LE01 Site Selection

Evidence showing that at least 75% of the proposed developments footprint lies on previously developed land is required to show:

- Type and duration of previous land use
- Area (m2) of previous land use
- Proposed site plan showing location and footprint (m2) of proposed development and temporary works

H2: LE02 Identifying and Understanding the Risks and Opportunities for The Project

Route 1: For sites where ecological opportunities and risks are limited in nature
This route is only appropriate where the level of ecological risk associated with the site is of a level that can practically be understood and addressed by a project team member using general observation, non-specialist knowledge and publicly available resources and information. This would be assessed by completing the Ecological Risk Evaluation Checklist. A lower level of reward is available as this route does not involve the same level of input and expertise that would be available when using a Suitably Qualified Ecologist.

For Route 2 Assessments: For sites where complex ecological systems are likely to be present
This is the more comprehensive route of assessment and therefore can achieve a higher level of reward than Route 1. It must be conducted by a Suitably Qualified Ecologist. This route will be mandatory for more sensitive sites and optional for those eligible for assessment under Route 1. This would be assessed by completing the Ecological Risk Evaluation Checklist.

Survey and evaluation

Route 1:
- Completion of the BREEAM Ecological Risk Evaluation Checklist indicates Assessment route 1 can be used as the Assessment. Where this indicated that Route 1 can be used, no further survey and evaluation work is required.
- Determining the ecological outcomes for the site (see below).

Route 2
- A Suitably Qualified Ecologist (SQE) is appointed at a project stage that ensures early involvement in site configuration and, where necessary, can influence strategic planning decisions.
- Prior to the completion of the preparation and brief, an appropriate level of survey and evaluation has been carried out to determine the ecological baseline of the site, taking account of the zone of influence to establish:
    - Current and potential ecological value and condition of the site, and related areas within the zone of influence.
    - Direct and indirect risks to current ecological value
    - Capacity and feasibility for enhancement of the ecological value of the site and, where relevant, areas within the zone of influence.
- Data is collated and shared with project team to inform the site preparation, design or construction works.
- Survey: as a minimum the following must be considered –
    - Determining the zone of influence for the site including neighbouring land and habitats. These areas can be adjacent to the site or can be areas that are dependent on the site but not physically linked, including areas downstream from a site. Areas within the zone of influence can be negatively affected by changes on an assessment site but they also provide further opportunity to maximise enhancement activities.
    - Current flora, fauna (including permanent and transient species) and habitat characteristics (including but not limited to ecological features in or on built structures)
    - Habitat extent, quality, connectivity and fragmentation
    - Recent and historic site condition
    - Existing management and maintenance levels and arrangements
    - Existing ecological initiatives within the zone of influence
    - Identification of, and consultation with, relevant stakeholders impacted or affected by the site.
    - Local knowledge or sources of information.
- Evaluation: as a minimum the following must be considered –
    - Current value and condition of the site and, where relevant, the zone of influence in terms of:
        a. Features including habitats, species, food sources and connectivity
        b. Broader biodiversity and ecosystem services benefits or opportunities
    - Direct and indirect risks to current ecological value:
        a. Sensitive areas and features on or near the site
        b. Direct risks including those from, human activity (e.g. construction work), habitat fragmentation, and potentially harmful species
        c. Indirect risks including water, noise and light pollution
    - Capacity and feasibility to enhance the ecological value
    - Habitat restoration and creation potential
    - Impact of the proposed design, construction works and operations on site

NB: There may be some projects where not all items listed above will be applicable or appropriate to the site. In these cases, the ecologist should justify why the items are considered not applicable.

Determining the ecological outcomes for the site

- During Concept Design, the project team liaise and collaborate with representative stakeholders to identify and consider ecological outcome for the sites (appropriate to the scale and type of development) for the project.
- When determining the ecological outcome for the site, this must involve the identification, appraisal and selection of specific solutions and measures sufficiently early to influence key project planning decisions. This must be done in accordance with the following hierarchy of action:
    a. Avoidance (Prevention of impacts occurring as a result of the project, having regard to predications about potentially negative environmental effects (e.g. project decisions about site location, design or timing of works).
    b. Protection
    c. Reduction or limitation of negative impacts
    d. On site compensation (Measures taken to make up for the loss of, or permanent damage to, ecological features despite mitigation, e.g. replacement habitat or improvements to existing habitats similar in terms of biological features and ecological functions to that lost or damaged. Compensation can be provided either within or outside the project site, in line with the following hierarchy: within site, adjacent to site and off site (offsetting) as a last resort.)
    e. Enhancement, considering the capacity and feasibility within the site, or where viable, off-site.
- Following this the optimal ecological outcome for the site is selected after liaising with representative stakeholders and the project team.

Project team liaison and collaboration with relevant stake holders:
Relevant project team members liaise with each other at appropriate times to support optimisation of the ecological outcomes for the site. Project members would include, but are not limited to:
- The client, owner, occupier
- Design, project, facilities team
- Specialist consultants. Examples could include:
    - Drainage engineer
    - Acoustic consultant
    - Landscape architect.

Where feasible, and where relevant project team members collaborate with relevant stakeholders at appropriate times to support optimisation of the ecological outcomes for the site. Relevant stakeholders may include, but are not limited to:

- Local government and other statutory relevant organisations
- Local community groups or organisations or charities. Examples could include:
  - the Wildlife Trusts
  - Local, regional and or national fauna focused groups (e.g. Buglife, RSPB, Bat Conservation Trust etc.)

Coordination of the liaison and collaboration is likely to happen by a central project team member with an overview of the project, its members, specialist contractors etc. and has the ability to instruct the work associated with delivering the ecological outcome for the site selected.

General Considerations during liaison discussions

Consider the following as appropriate to the nature and scale of the project:

- Ecology focused topic areas include:
  a. Ecological value and benefit offered (pre-, during and post-asset maintenance or project completion)
  b. Biodiversity and ecosystem services benefits offered pre-, during and post-asset maintenance or project completion
  c. Local microclimatic conditions
  d. Habitat extent, quality, connectivity and fragmentation
  e. Opportunities to enhance the value of existing habitats and biodiversity, or to restore or create new, more valuable ones
  f. Opportunities to align and integrate with existing ecological features and initiatives in the zone of influence
  g. The viability of assessment requirements points 9 (hierarchy of actions list and capacity and feasibility for enhancement).

Identification and selection of solutions and measures

When determining the associated solutions for the site the following should be considered:

- Ecological, biodiversity and ecosystem services benefits, accounting for:
  a. Local priorities.
  b. Long term viability of the outcome or option.
  c. Alignment with the sites function, amenity and value.
- Practicality, including consideration of:
  a. Timing and duration of implementing and realising the outcome and associated options.
  b. Outline up-front and ongoing management and maintenance costs.
  c. Long term management and maintenance implications.
  d. Opportunities and barriers arising from management or procurement structures.
  e. Availability of appropriate skills, budgets and other resources at all stages.

Determining the ecological outcomes for the site (sustainability-related activities)

- When determining the optimal ecological outcome for the site consider the wider site sustainability-related activities and the potential for ecosystem service related benefits.

Wider site sustainability related activities and ecosystem service related benefits

Opportunities for integrating ecology with wider site sustainability-related activities and ecosystem service related benefits, including as a minimum:

- Landscape
  a. Landscape design
  b. Heritage and local charter
  c. Green infrastructure
- Health and wellbeing
  a. Recreational space (including growing space, community agriculture or horticultural and allotment activities)
  b. Water quality measures
  c. Noise mitigation measures
  d. Air quality control measures
  e. Light pollution control measures
- Resilience:
  a. Climate change mitigation
  b. Management of surface water run-off
  c. Flood risk management
  d. Climate-sensitive urban design (heat island effect, thermal mass, shading, biotic cooling etc.)
- Infrastructure:
  a. Maximising the benefits of green infrastructure and optimising alignment with existing infrastructure on the site and the zone of influence.
- Community and end user involvement:
  a. Life cycle costing and service life planning

H2: LE03 Managing Negative Impacts on Ecology

Planning, liaison, implementation and data

- Roles and responsibilities for managing negative impacts on the ecology are clearly defined and allocated to support successful delivery of project outcomes at an early enough stage to influence the Preparation and Brief or Concept Design.
- The potential impact of site preparation and construction works on ecology are identified at an early project stage to optimise benefits and outputs.
- The project team, liaising and collaborating with representative stakeholders and, taking into consideration data collated and shared, have proposed solutions and selected measures to be implemented during site preparation and construction works.

Planning, liaison, implementation and roles and responsibilities

The relevant project team member ensures that clear roles and responsibilities are in place and are appropriate to the scale of the project. This should allow for the implementation of the solutions and measures, in line with the delivery of the assessment requirement for this issue, incorporating

- Responsibilities, relationships and management required for implementation, including clear ownership of each task
- Allocation of roles and responsibilities and identification of when these apply
- Allocation of resources (including financial, time, technical and skills)
- Procedures to promote effective implementation, monitoring and feedback for continual improvement
- Alignment with and, where relevant, integration into related activities and processes
- Effective handover and collaborative activities where responsibility is transferred and shared, including transition to long term management and maintenance arrangements

Planning, liaison, implementation and delivery considerations

The relevant project team member liaises and, where feasible, collaborates with relevant stakeholders at appropriate times to support optimisation of ecological outcome for the sites.

Relevant project team member ensures that clear roles and responsibilities are in place and are appropriate to the

scale of the project. This should allow for the implementation of the solutions and measures, in line with the delivery
of the assessment requirement for this issue, incorporating:

- Responsibilities, relationships and management required for implementation, including clear ownership of each task
- Allocation of roles and responsibilities and identification of when these apply
- Allocation of resources (including financial, time, technical and skills)
- Procedures to promote effective implementation, monitoring and feedback for continual improvement
- Alignment with and, where relevant, integration into related activities and processes
- Effective handover and collaborative activities where responsibility is transferred and shared, including transition to long term management and maintenance arrangements.

Timescales, implementation and delivery considerations

Implementation of selected solutions and measures for the delivery of the ecological outcome for the sites in a technically robust focused, practical, feasible and cost-efficient way, including the following:

- Implementation timescales taking into consideration:
    - Ecological seasonality requirements and limitations that may impact on implementation activities
    - Integrating with existing planned activities and processes on or near the site (including impacts of project phasing), or in the wider local area.
- Reducing and managing potential knock-on impacts of works (e.g. pollution and disturbance).
- Contractual and other handover project milestones.
- Long term management, maintenance and monitoring requirements and outline costs.

Timescales for implementing solutions and measures should take into consideration, where relevant:

- Which roles and responsibilities apply
- Ecological seasonality
- Alignment with existing and planned activities and processes
- Project phasing.

Contract requirements focus on:

- Reducing and managing potential knock-on impacts of works (e.g. pollution and disturbance)
- Contractual and other handover project milestones
- Long term management, maintenance and monitoring requirements and outline costs.

Data collation and application throughout the project lifecycle

Data collated during assessment of this issue should be shared with the project team to inform decision relating to the site preparation, design or construction works.

Managing negative impacts of the project

Negative impacts from site preparation and construction works have been managed according to the hierarchy (see Methodology below) and either:

- No overall loss of ecological value has occurred
- The loss of ecological value has been minimised

Assessment route 1: Methodology For sites with ecological opportunities and risks of a limited nature

The following hierarchy must be followed when managing negative impacts of the site preparation and construction works:

- Avoidance of negative impacts on habitats and features of ecological value on the site.
- If it is not possible for avoidance of negative impacts, protect habitats and features of ecological value from damage in accordance with best practice guidelines during development works.
- If it is not possible for avoidance of all negative impacts or to protect habitats and features of ecological value, reduce, limit or control negative impacts as far as possible.

Assessment route 2: Methodology For sites where complex ecological systems are likely to be present

The following hierarchy must be followed when managing negative impacts of the site preparation and construction works.

- Avoidance of negative impacts of habitats and features of ecological value on the site.
- If it is not possible for avoidance of negative impacts, protect habitats and features of ecological value from damage in accordance with best practice guidelines during development works.
- If it is not possible for avoidance of all negative impacts or to protect habitats and features of ecological value, reduce, limit or control negative impacts as far as possible.
- Where it is not possible for avoidance, protection, limitation or control of the negative impacts on features of ecological value on site, compensation has taken place to ensure the existing ecological value maintained during and after the project.

H3: LE04 Change and Enhancement of Ecological Value

Assessment route 1: For sites where ecological opportunities and risks are limited in nature

The project team, liaising and collaborating with representative stakeholders and taking into consideration data collated and shared, have implemented locally relevant ecological solutions and measures which enhance the site. The solutions and measures adopted are based on recommendations from recognised 'local' ecological expertise and specialist input and guidance.

Enhancing ecology on site

Solutions should be specific to the site and may include:

- Implementing relevant recommendations from Biodiversity actions plans
- Planting of ecologically appropriate species or those with a known attraction or benefit to local wildlife
- Adopting horticultural good practice (e.g. no or low use of residual pesticides)
- Installing features to encourage existing local wildlife (such as nesting, roosting insect boxes) at appropriate locations on the site
- Increasing the porosity and texture of surfaces on site to encourage wildlife
- Introducing water into the environment to encourage birds and other wildlife
- Only ecologically appropriate floral species or those with a known attraction or benefit to local wildlife for the purpose of enhancing the ecological value of the site, except where explicitly recommended by an ecologist

Recommendations made should be locally relevant to the site and its zone of influence.

Assessment route 2: For sites where complex ecological systems are likely to be present

- The project team, liaising and collaborating with representative stakeholders and taking into consideration data collated and shared, have implemented the solutions and measures selected in a way that enhances ecological value in the following order:
    - On site, and where this is not feasible
    - Off site within the zone of influence
- Data collated are provided to the local environmental records centres nearest to, or relevant for, the site

Determining the change in ecological value of the site using the full or simplified methodology

BREEAM's Change in Ecological Value methodology builds on the existing 'Defra biodiversity metric' which is habitat based. The attributes used in the Defra biodiversity metric are the habitat types, their distinctiveness, condition and area / length throughout the assessed project life cycle. This methodology follows the Defra metrics principles to quantify the impact of a development in terms of 'biodiversity units'. The calculation methodology has two routes applicable depending on the scale and size of the project and distinctiveness of the habitats on the site. The two routes are summarised as:

1. Full methodology - Biodiversity units are calculated where the pre-development habitats are above the set size threshold or are of high distinctiveness.
2. Simplified methodology - Biodiversity units are calculated using the where the pre-development habitats are below the set size threshold and are of low or medium distinctiveness.

Enhancement of Ecological Value in addition to the calculator tool

Enhancement of ecological value can take place through a variety of means including enhancement of biodiversity (habitats and species). Where the ecological enhancement recommended is not covered by BREEAM Change in Ecological Value Calculator, the ecologist report should clearly identify the enhancement options selected and implemented, outline why this was viable and meaningful solution, action, measure to enhance the ecological value of the site.

Collating evidence

Guidance Note 40: Ecology Assessment Reporting Template can be referred to and used to collate information and evidence for the assessment.

H4: LE05 Long Term Ecological Management and Maintenance

Planning, liaison, data, monitoring and review management and maintenance

- The project team liaise and collaborate with representative stakeholders, taking into consideration data collated and shared, on solutions and measures implemented to:
    - Monitor and review the effectiveness with which the plans for LE 03 & LE 04 are implemented
    - Develop and review management and maintenance solutions, actions or measures.
- In support of the above and to help ensure their continued relevance over the period of the project the following should be considered:
    - Monitoring and reporting of the ecological outcomes for site implemented at the design and construction stage
    - Monitoring and reporting of outcomes and successes from the project
    - Arrangements for the ongoing management of landscape and habitat connected to the project (on and, where relevant, off site)
    - Maintaining the ecological value of the site and its relationship or connection to its zone of influence
    - Maintaining the site in line with the any sustainability linked activities, e.g. ecosystems benefits (LE 02).
    - Remedial or other management actions are carried out which relate to those identified in LE 02, LE 03 and LE 04.
- As part of the tenant or building owner information supplied, include a section on Ecology and Biodiversity to inform the owner or occupant of local ecological features, value and biodiversity on or near the site.
- The landscape and management plan or similar is updated as appropriate to support maintenance of the ecological value of the site.

Landscape and ecology management plan (or similar) development

Landscape and ecology management plan, or similar, is developed in accordance with BS 42020:2013 covering as a minimum the first five years after project completion and includes:

- Actions and responsibilities, prior to handover, to give to relevant individuals
- The ecological value and condition of the site over the development life.
- Identification of opportunities for ongoing alignment with activities external to the development project and which supports the aims of BREEAM's Strategic Ecology Framework
- Identification and guidance s to trigger appropriate remedial actions to address previously unforeseen impacts
- Identification and guidance to trigger appropriate remedial actions to address previously unforeseen impacts
- Clearly defined and allocated roles and responsibilities.

The landscape and management plan or similar is updated as appropriate to support maintenance of the ecological value of the site.

For Route 2 Assessments:

<u>Tenant/occupier/building manager</u>

This information pack should include the following content, as appropriate:

- Details of the ecological value within the property boundary (e.g. public and private gardens, green roofs), common areas (e.g. communal garden), and the surrounding area (e.g. public recreational space).
- The benefits of the ecological value to the occupants and the broader community.
- Guidance on how the occupants can make the most of the local ecology and contribute to its management, (e.g. planting ecologically appropriate species in their property), as well as things that should be avoided doing (e.g. disrupting wildlife corridors);
- Highlight relevant actions that can be taken to enhance value within the property that is owned or occupied to help ensure its ongoing management and maintenance.
- Contact details for those responsible for the management and maintenance of the local ecology and sources of local information on biodiversity and ecological management including management companies and local wildlife trusts.

Appendix J Pollution

J1: Pol 01 Impact of Refrigerants

BREEAM Pol 01 calculator

The BREEAM Pol 01 calculator is used to determine the number of credits achieved. The direct effect life cycle CO_2-eq emissions (DELC) per kW of cooling and heating capacity are calculated using the following equation:

$$\frac{[\text{Refrigerant loss operational} + \text{refrigerant loss system retirement}] \times GWP}{\text{Cooling Capacity (kW)}}$$

Where:

Refrigerant loss operational: (Refcharge x Sys op-life x (L1 + L2 + S1 + S2))/100
Refrigerant loss system retirement = Refcharge x (1 - (Ref RecEff/100))

Where:

- Ref_{charge}: Refrigerant charge (kg)
- $Sys_{op\text{-}life}$: System operational lifetime (years)
- Ref_{RecEff}: Refrigerant recovery efficiency factor (%)
- L1: Annual leakage rate (units: % Refrigerant charge)
- L2: Annual purge release factor (% Refrigerant charge)
- S1: Annual service release (% Refrigerant charge)
- S2: Probability factor for catastrophic failure (% refrigerant charge loss/year)
- GWP: global warming potential of refrigerant
- Cooling and heating capacity (kW).

Where possible, manufacturer data should be used, where this is not available, default values can be found in the

Refrigerant leak detection

- All systems are hermetically sealed or only use environmentally benign refrigerants

OR

- Where the systems are not hermetically sealed systems have:
  - A permanent automated refrigerant leak detection system, that is robust and tested, and capable of continuously monitoring for leaks.
  - An inbuilt automated diagnostic procedure for detecting leakage is enabled.

  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.

J2: Pol 02 Local Air Quality

Maximum NO_x emission levels by application, type fuel and location.

Appliance type and unit	Fuel	1 Credit (low pollution)	1 credit (high pollution)	2 credits (low pollution)	2 credits (high pollution)
Boiler (mg/kWh)	Gas	27	27	24	24
Boiler (mg/kWh)	Oil	56	56	55	50
Boiler (mg/m³)	Biomass and solid fossil fuel	130		70	
Cogeneration or heat pumps using external combustion (mg/kWh)	Gas	34	34	30	30
Cogeneration or heat pumps using external combustion (mg/kWh)	Oil	96	56	70	50
Cogeneration - using internal combustion engine (mg/kWh)	Gas	199			
Cogeneration - using internal combustion engine (mg/kWh)	Oil	140			
Local space heaters (mg/kWh)	Gas and oil	76			
Closed fronted local space heaters (mg/m³)	Biomass and solid fossil fuel	130			

Maximum particulate matter and volatile organic compound emissions for appliances using biomass, solid fuel and wood pellets.

Appliance type and unit	Fuel	1 credit (low pollution)		1 credit (high pollution)		2 credits (low pollution)		2 credits (high pollution)	
		PM10	VOC	PM10	VOC	PM10	VOC	PM10	VOC
Boiler (mg/m³)	Biomass	14	7	6	7	11	5	4	5
Boiler (mg/m³)	Solid fossil fuel	19				17			
Closed face local space heater (mg/m³)	Wood pellets	26	26	20	20	22	22	10	10
Closed face local space heater (mg/m³)	Biomass and solid fuel	50	50			25	25		
PM10 = particulate matter < 10 micrometres and VOC = volatile organic compounds. For the purposes of BREEAM, PM and VOC emissions are only relevant to the assessment of biomass and solid fuel fired technologies.									

High pollution location

Determine the pollution level of a site using - uk-air.defra.gov.uk/data/gis-mapping

Any developments where any portion of the site is within a local authority Air Quality Management Area (AQMA) are automatically considered to be in a high pollution location. For developments that are wholly outside of an AQMA, the following levels define high pollution locations:
– NO_x > 15 µg/ m³ averaged over a year
– PM10 > 10µg/ m³ averaged over a year

Low pollution location

Any location that does not meet the definition of a high pollution location.

J3: Pol 03 Surface Water Runoff

Prerequisite

- An appropriate consultant is appointed to carry out and demonstrate the development's compliance with all criteria.

Low flood risk

- A site-specific flood risk assessment (FRA) confirms the development is in a flood zone that is defined as having a low annual probability of flooding. The FRA takes all current and future sources of flooding into consideration

Medium or high flood risk

- A site-specific FRA confirms the development is in a flood zone that is defined as having a medium or high annual probability of flooding and is not in a functional floodplain. The FRA must take all current and future sources of flooding into consideration.
- For smaller sites:
  - Level of detail required in the FRA for smaller sites
  - For smaller sites, e.g. less than 1 ha (10,000m^2), the level of detail required in the FRA will depend on the size of the site and the arrangement of buildings on that site. For a small site with a relatively simple arrangement of buildings this might consist of a brief report. For larger sites with a higher density of buildings a more detailed assessment would be appropriate.
  - For small simple sites (2000m^2 and less), an acceptable FRA could be a brief report carried out by the contractor's engineer confirming the risk of flooding. This must include the risk from all sources of flooding, and information obtained from the Environment Agency, water company or sewerage undertaker, other relevant statutory authorities, site investigation and local knowledge.
- To increase the resilience and resistance of the development to flooding, one of the following must be achieved:
  - The ground level of the building and access to both the building and the site, are designed (or zoned) so they are at least 600 mm above the design flood level of the site's flood zone as follows:
    - For buildings located in medium and high risk flood zones it is accepted that areas of the car park and site access may be below the 600mm threshold and may therefore be allowed to flood. In such cases, the credit is still achievable provided safe access to the site and the ground floor of the building can be maintained, i.e. they are 600mm above the design flood level. This is to ensure the building and site do not become an 'island' in the event of a flood. Where the ground levels of the topography or infrastructure immediately adjacent to the site fall below the 600mm threshold, the credit can still be awarded. There must be no other practical solutions for access to the site above this level and the assessed building, and access to it, meet the assessment criteria. As much of the external site area as possible (or as required by an appropriate statutory body) should be designed at or above the threshold. For buildings located in medium or high flood risk zones, any areas used to store sensitive, historical, hazardous, valuable and perishable materials must be located above the 600mm threshold. Examples of these materials include radioactive materials, microbiological facilities, server rooms, libraries, etc.
  - The final design of the building and the wider site reflects the recommendations made by an appropriate consultant in accordance with the hierarchy approach outlined in section 5 of BS 8533:2017

Surface water run-off

Prerequisite for surface water run-off credits:

- Surface water run-off design solutions must be bespoke, i.e. they must take account of the specific site requirements and natural or man-made environment of and surrounding the site. The priority levels detailed in the Methodology must be followed, with justification given by the appropriate consultant where water is allowed to leave the site.

Surface Water Run-Off – Rate

- For brownfield sites, drainage measures are specified so that the peak rate of run-off from the site to the watercourses (natural or municipal) shows a 30% improvement for the developed site compared with the predeveloped site. This should comply at the 1-year and 100-year return period events.
- For Greenfield sites, drainage measures are specified so that the peak rate of run-off from the site to the watercourses (natural or municipal) is no greater for the developed site than it was for the pre-development site. This should comply at the 1-year and 100-year return period events.
- Relevant maintenance agreements for the ownership, long term operation and maintenance of all specified Sustainable Drainage Systems (SuDS) are in place.
- Calculations include an allowance for climate change. This should be made in accordance with current best practice planning guidance

Surface Water Run-Off – Volume

- Flooding of property will not occur in the event of local drainage system failure (caused either by extreme rainfall or a lack of maintenance); AND

EITHER

- Drainage design measures are specified so that the post-development run-off volume, over the development lifetime, is no greater than it would have been prior to the assessed site's development. This must be for the 100-year 6-hour event, including an allowance for climate change
- Any additional predicted volume of run-off for this event is prevented from leaving the site by using infiltration or other SuDS techniques.

OR (only where the above criteria cannot be achieved):

- Justification from the appropriate consultant indicating why the above criteria cannot be achieved, i.e. where infiltration or other SuDS techniques are not technically viable options.
- Drainage design measures are specified so that the post-development peak rate of run-off is reduced to the limiting discharge. The limiting discharge is defined as the highest flow rate from the following options:
  - The pre-development one-year peak flow rate
  - The mean annual flow rate (Qbar)
  - 2L/s/ha.

For the one-year peak flow rate, the one-year return period event criterion applies.

- Relevant maintenance agreements for the ownership, long term operation and maintenance of all specified SuDS are in place.
- For either option, above calculations must include an allowance for climate change; this should be made in accordance with current best practice planning guidance.

Minimising watercourse pollution

- There is no discharge from the developed site for rainfall up to 5mm as confirmed by the Appropriate Consultant.
- In areas with a low risk source of watercourse pollution, an appropriate level of pollution prevention treatment is provided, using appropriate SuDS techniques.
- Where there is a high risk of contamination or spillage of substances such as petrol and oil (see Compliance notes for a list of areas), separators (or an equivalent system) are installed in surface water drainage systems.
- Where the building has chemical/liquid gas storage areas, a means of containment is fitted to the site drainage system (i.e. shut-off valves) to prevent the escape of chemicals to natural watercourses (in the event of a spillage or bunding failure).

- All water pollution prevention systems have been designed and installed in accordance with the recommendations of documents such as Pollution Prevention Guideline 3 (PPG 3) and/or where applicable the SUDS manual. For areas where vehicle washing will be taking place, pollution prevention systems must be in accordance with Pollution Prevention Guidelines 13
- A comprehensive and up-to date drainage plan of the site will be made available for the building/site occupiers.
- Relevant maintenance agreements for the ownership, long term operation and maintenance of all specified SuDS must be in place.
- Where present, all external storage and delivery areas designed and detailed in accordance with the current best practice planning guidance.

J4: Pol 05 Reduction of Noise Pollution

Where the building has noise-sensitive areas or buildings within 800m radius of the site:

- A noise impact assessment in compliance with BS 7445 has been carried out and the following noise levels measured/determined:
    - Existing background noise levels at the nearest or most exposed noise-sensitive development to the proposed development or at a location where background conditions
    - can be argued to be similar.
    - The rating noise level resulting from the new noise source through the use of calculations or scale model predictions.
- The noise impact assessment must be carried out by a suitably qualified acoustic consultant holding a recognised acoustic qualification and membership of an appropriate professional body.
- The noise level from the proposed site/building, as measured in the locality of the nearest or most exposed noise-sensitive development, is a difference no greater than +5dB during the day (07:00 to 23:00) and +3dB at night (23:00 to 07:00) compared to the background noise level.
- Where the noise source(s) from the proposed site/building is greater than the levels described in item 4, measures have been installed to attenuate the noise at its source to a level where it will comply with item 4.

*Suitably qualified acoustician (SQA)
An individual meeting the following can be considered to be 'suitably qualified' for the purposes of a BREEAM assessment:

- Holds a degree, PhD or equivalent qualification in acoustics/sound testing.
- Has a minimum of three years' relevant experience (within the last five years). Such experience must clearly demonstrate a practical understanding of factors affecting acoustics in relation to construction and the built environment; including, acting in an advisory capacity to provide recommendations for suitable acoustic performance levels and mitigation measures.
- An individual who holds a recognised acoustic qualification and membership of an appropriate professional body. The primary professional body for acoustics in the UK is the Institute of Acoustics.

Where a suitably qualified acoustician is verifying the acoustic measurements/calculations carried out by another acoustician who does not meet the SQA requirements, they must, as a minimum, have read and reviewed the report and confirm in writing that they have found it to:

- Represent sound industry practice
- Be appropriate given the building being assessed and scope of works proposed
- Avoid invalid, biased and exaggerated recommendations.

Additionally, written confirmation from the third-party verifier that they comply with the definition of a Suitably Qualified Acoustician is required.