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TECHNICAL MANUAL

BREEAM New Construction

UK | Version 7

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BREEAM New Construction
UK
Version 7.0.0

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Cover image

Nova, Oxford: A Wrenbridge and Buccleuch Property development. Image by Daniel Graves Photography.

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About BRE Global

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BRE Global's mission is to 'Protect People, Property and the Planet'.

We aim to achieve this by:

1. Researching and writing standards
2. Testing and certification in the areas of fire, electronics, security and sustainability
3. Developing world-leading sustainability assessment methods
4. Undertaking research and consultancy for clients and regulators
5. Promulgating standards and knowledge throughout the industry through publications and events
6. Developing and delivering training.

BRE Global's product testing and approvals are carried out by recognised experts in our world renowned testing laboratories.

BRE Global is custodian of a number of world-leading brands including:

1. BREEAM (Building Research Establishment's Environmental Assessment Method) – the world's leading environmental assessment method for buildings.
2. LPCB (Loss Prevention Certification Board) – for approval of fire and security products and services.

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About this document

This document is the technical manual for BREEAM UK New Construction Version 7. It describes an environmental performance standard against which new, non-domestic buildings in the UK can be assessed and achieve a BREEAM New Construction rating.

The scheme document and the information detailed within is intended for use by trained, qualified and licensed BREEAM Assessors in accordance with the procedural and operational requirements of BREEAM (as described in the BREEAM Operations Manual, SD5070) under the terms and conditions of a BREEAM licence. This document should be used by non-BREEAM Assessors for reference purposes only.

Changes to this document

This document is subject to revision and can be reissued from time-to-time by BRE Global. A schedule of the publication date for each issue is provided below.

Document reference	Version / issue number	Issue date
SD6074	7.0.0	16/07/2025

Introduction

About BREEAM

BREEAM is the world's first and leading holistic framework for assessing asset sustainability performance in the global built environment. It is driven by a mission to enable projects of any size to protect and enhance asset value on the way towards a healthy and resilient future in the built environment.

Launched in 1990 and applied in more than 100 countries, BREEAM has certified more than a million assessments from infrastructure, through building design, to existing assets.

How BREEAM drives asset value

Defined by science and informed by the global real estate and construction industry, BREEAM standards reflect and drive market shifts by encouraging data-driven strategies that deliver quantifiable environmental, social and economic performance. By using a holistic and flexible approach that encourages positive outcomes, BREEAM delivers a tailored roadmap to drive asset value from a financial, environmental, performance, risk, health, and social perspective.

BREEAM has provided robust and credible third-party certification for over three decades, delivering sustainability performance transparency across every phase of the built environment, from new builds to operations, refurbishments, and fit outs.

BREEAM certification involves a rigorous assessment process that recognises and reflects the value in higher performing assets and encourages excellence. BREEAM certification provides a proven value-generation tool to deliver sustainability performance, manage sustainability risk, enhance marketability and provide validation of sustainability performance claims.

The BREEAM schemes

BREEAM schemes are based on an international version that is applicable in any country that doesn't have a country-specific scheme, and are operated by BRE Global. In some countries, BREEAM schemes are adapted to the local market while maintaining the BREEAM rigour. These are typically operated by National Scheme Operators (NSOs).

Each scheme assesses the environmental performance at each stage in the life cycle including:

- **BREEAM Communities** for the master-planning of a larger community of buildings.
- **BREEAM Infrastructure** for civil engineering, infrastructure, landscaping and public realm works.
- **BREEAM New Construction** for new-build domestic and non-domestic buildings.
- **BREEAM New Construction Residential** for new-build dwellings (in the UK only).
- **BREEAM In-Use** for existing buildings in operation.
- **BREEAM Refurbishment and Fit-out** for domestic and non-domestic building fit-outs and refurbishments.

The BREEAM certification process

BREEAM certification requires an asset to demonstrate how it performs against the standard appropriate for the relevant life cycle phase.

Independent BREEAM assessors – who are trained, qualified, and licensed by the organisation operating the applicable BREEAM scheme – can carry out a BREEAM assessment using the relevant scheme document and associated scoring and reporting tools. The assessor independently verifies performance of the asset against the applicable BREEAM standard and awards the score and associated rating.

The assessor submits their assessment to the organisation operating the applicable BREEAM scheme where it undergoes a rigorous quality assurance process. Only once the assessment has passed this process will the organisation operating the applicable BREEAM programme issue a BREEAM certificate. The BREEAM certificate provides formal verification that the assessor has assessed the building in accordance with the requirements of the scheme and its quality standards and procedures. For more information, please visit the BREEAM website (www.breeam.com).

A BREEAM certificate provides assurance that a building's BREEAM rating, at the time of certification, accurately reflects its performance against the BREEAM standard.

Interested parties can verify the BREEAM rating of a building by searching the BREEAM buildings listings on BREEAM Projects (www.breeam.com/projects).

Figure 1: The BREEAM certification mark

Ensuring quality and consistency

All BREEAM schemes are developed and operated by National Scheme Operators (NSOs) in accordance with the BREEAM Process Manual and Product Structure. These documents ensure that a common scientific and performance basis is used by all compliant schemes operated by NSOs, while ensuring that these are relevant to local demands, standards and practices.

To ensure competence, impartiality, and performance capability, all NSOs are required to maintain scheme operations to internationally agreed standards and seek accreditation from a national accreditation body.

BRE Global is certified to ISO 9001:2015 Quality management systems, the scope of which covers the operation of all BREEAM schemes. BRE Global maintains an impartiality committee to safeguard impartiality in the development and operation of BREEAM schemes.

BRE Global operates technical working groups, providing access to experts who can review BRE Global's standards and BREEAM schemes. These technical working groups ensure BREEAM's robustness from a scientific, technical and market perspective as well as ensuring the development of the standards and schemes is open to greater external and independent scrutiny.

BREEAM is a building level certification scheme and as such, there are no "BREEAM certified" products. BREEAM provides credits where the process, and in some cases the performance, meet a specific standard. It does not recognise specific products as "BREEAM compliant".

Value of data collection

The journey to obtaining a BREEAM rating begins with collecting quality data to measure, verify and understand the environmental impact of buildings. Effective data collection helps to:

- Verify that buildings meet the requirements for the certification standard.
- Inform business decisions that may impact sustainability risk and asset value.
- Demonstrate compliance with technical screening criteria in sustainable finance taxonomies being developed in multiple jurisdictions like the EU Taxonomy.
- Compare performance against other buildings in the sector.
- Set industry standards and encourage competition towards higher sustainability goals.
- Ensure transparency in the certification process.

Sustainable finance and alignment with the EU Taxonomy

The 2015 Paris Agreement set out the global commitment to act on climate change and transition to a low-carbon economy. Sustainable finance has a key role to play in realising this commitment. It generally refers to the process of taking due account of environmental and social considerations in investment decision-making, leading to increased investments in longer-term and sustainable activities. One of the essential elements of this process is around developing a universal definition for sustainable investment – a common language for investors, regulators, and other stakeholders. Sustainable finance taxonomies, which codify this common language, have been introduced or are in various stages of development in more than 20 jurisdictions worldwide.(1) Even jurisdictions that lack a local taxonomy are being influenced by those already in place as investors bring their expectations and requirements to assets they own or invest in across the world.

One highly influential taxonomy is the EU's Sustainable Finance Taxonomy. This science-based taxonomy is framed around six environmental objectives and forms part of the European Green Deal which aims to transform the European Union and the wider European economy into a sustainable and climate-neutral society by 2050. Large companies, banks and insurance companies operating in the EU, as well as companies with securities listed on EU-regulated markets (with exception of listed micro-enterprises) need to demonstrate that their economic activities make a substantial contribution towards achieving one of the six objectives, while doing no significant harm to the other five. This is achieved by complying with technical screening criteria and minimum safeguards.

BREEAM standards provide a solution for real estate funds, asset owners, developers and occupiers look for a truly independent mark to validate their sustainability achievements and navigate the pathway towards decarbonisation, net zero, EU Taxonomy compliance and future asset resilience. Most technical screening criteria for construction and real estate activities in the EU Taxonomy are embedded in BREEAM Version 7. A BREEAM assessment provides an asset-level EU Taxonomy report, which shows the level of alignment with those technical screening criteria. The report gives companies and stakeholders in financial markets with assurance of the extent to which the asset meets the requirements of the EU Taxonomy. The report should be used for guidance purposes only and does not guarantee that all Taxonomy requirements have been met.

Full alignment maps are available online at:
www.bre.group/a-guide-to-the-eu-taxonomy-and-breeam/mapping-details

These provide an overview of issues and criteria where BREEAM fully aligns with the EU Taxonomy.

Minimum safeguards include criteria about the governance of a company or entity. As BREEAM measures sustainability in buildings and not companies, minimum safeguards are not included.

The EU Taxonomy is in continuous development and is subject to the addition of new activities and updates, as necessary. BREEAM's alignment with the EU Taxonomy is based on our interpretation of the Climate Delegated Act (Commission Delegated Regulation (EU) 2021/2139 and 2023/2485) and Environmental Delegated Act (Commission Delegated Regulation (EU) 2023/2486). BREEAM will endeavour to update the alignment whenever new content is formally added to an Annex including any changes to the criteria or in the interpretation of the technical screening criteria.

As these global taxonomies evolve, BREEAM will continue to monitor and ensure that the data captured as part of BREEAM assessments supports reporting to sustainability finance taxonomy criteria.

When and how to engage with BREEAM New Construction

Early engagement with the BREEAM New Construction scheme and appointment of a licensed BREEAM Assessor is important to optimize sustainability performance in design and ensure the requirements are delivered during construction. At this early stage, the performance of the building and the desired BREEAM rating can be achieved in the most cost-effective way while there is greater flexibility and choice in design solutions and spending decisions.

Figure 2 on the next page shows the link between the assessment and certification stages for BREEAM New Construction and the Royal Institute of British Architects (RIBA) Plan of Work 2020.

Clients can use this to understand when is best for them to engage with BREEAM and appoint a BREEAM Advisory Professional and BREEAM Assessor.

Up-to-date listings of licensed BREEAM New Construction Assessors and credentialed BREEAM Advisory Professionals are available on BREEAM Projects (www.breeam.com/projects).

BREEAM primarily reflects the overall performance of the building rather than just the opportunities or limitations placed on specific stakeholders involved in the process. In the case of new builds, this means that the client, design team, principal contractor, as well as other specialist disciplines, have an important role to play throughout the design and construction process, if the desired performance level is to be achieved and reflected through the certified BREEAM rating. The assessor verifies the impact of design and construction decisions to the score and rating as the project progresses, ensuring that the implications of decisions made are understood by all parties.

Aligning the brief to meet the BREEAM requirements for the rating desired will simplify the assessment process and reduce risk. Clients and their project teams are encouraged to engage with a licensed BREEAM Assessor and BREEAM Advisory Professional no later than the Preparation and Brief stage (RIBA Stage 1 or equivalent). This will ensure that realistic targets are set and can be met, appropriate responsibilities can be defined and understood, and low or no cost solutions which deliver the most holistic sustainability benefits can be sought and applied wherever possible.

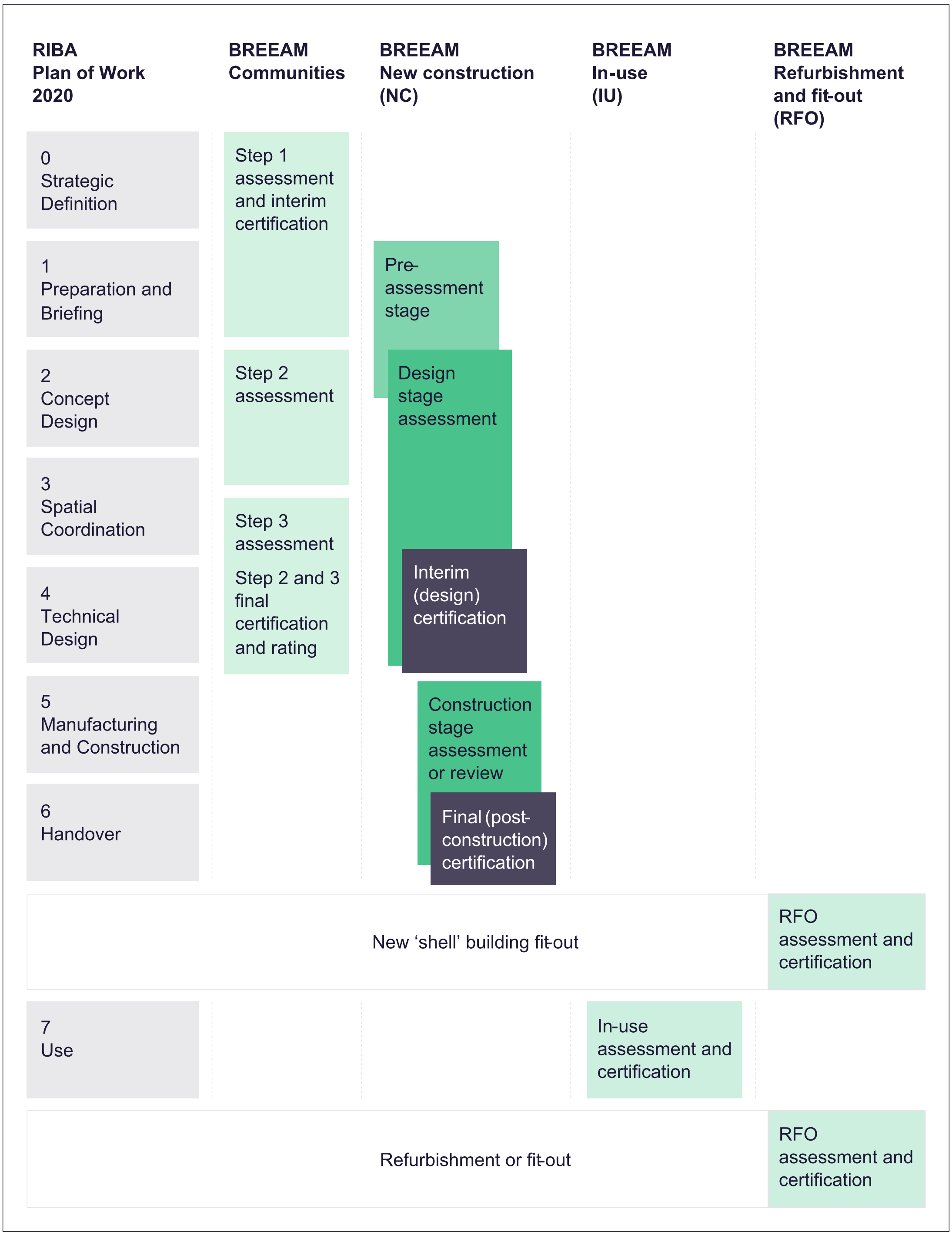

Figure 2: BREEAM assessment and certification stages

About this technical manual

This BREEAM technical manual has been created to:

1. Enable qualified and licensed BREEAM Assessors to complete BREEAM assessments and determine a rating.
2. Enable BRE Global to complete quality assurance reviews of a BREEAM Assessor's assessment, in accordance with the standards to which BRE Global is accredited.
3. Act as an aid for BREEAM Advisory Professionals (AP) to undertake project team facilitation, in terms of defining, monitoring and successfully achieving the desired BREEAM rating.
4. Act as a reference for clients and members of the project team whose proposed building is being BREEAM-assessed.

How to use this technical manual

This technical manual sets out the essential and in-depth requirements for this BREEAM scheme.

The technical manual is divided into the following sections:

1. Introduction
2. Scope
3. Scoring and rating, including minimum standards
4. Evidence requirements
5. Assessment issues, arranged in categories
6. Appendices

The **scope** section describes the types of buildings and stages of assessment that this version of BREEAM can be applied to. The scope section can be used by clients and BREEAM Assessors to check whether this is the correct BREEAM scheme to use for a project.

The **scoring and rating** section illustrates how a building's assessed performance is measured and rated. It outlines the rating level benchmarks, the minimum standards for each rating level, and the category weightings. It also includes a description of the BREEAM assessment issues and credits awarded for the performance achieved (both standard and for innovation) and how the credits are used to calculate the score and the BREEAM rating.

The **evidence requirements** section provides guidance to assessors and project teams on the various types and forms of evidence required by the BREEAM Assessor to verify compliance with assessment criteria. This includes a description of why BREEAM requires an auditable trail of evidence.

The **assessment issues** section includes the individual BREEAM assessment issues, arranged in categories. Each issue defines a level of performance (the assessment criteria) against which the assessed building demonstrates compliance by providing evidence in order to achieve a corresponding number of available BREEAM credits.

While clients and their project team can pick and choose which issues to target in order to build their BREEAM performance score and achieve the desired BREEAM rating, the categories are weighted in the scoring methodology to encourage focus on performance that has the greatest impact to the overall sustainability performance of the asset. Minimum standards of performance are linked to some BREEAM ratings, ensuring that specific credits or criteria must be achieved in order to achieve those ratings. BREEAM's minimum standards are outlined in the Scoring and rating section. Clients and their project team should review these carefully when selecting a rating target.

The **appendices** provide supporting information for completing a BREEAM assessment.

Assessment issue structure

Each assessment issue is structured as follows:

1. **Issue title**: the assessment issue reference and title.
2. **Aim**: the objective of the issue and the impact it measures or mitigates.
3. **Overview**: the number of credits available for each assessment type and whether the issue forms part of the BREEAM minimum standards. For some assessment issues the number of credits available can also vary by building type. Assessment type and building type specific information is given in:
    a. **Assessment type specific notes**: information that affects specific assessment types (such as 'shell only' or 'shell and core').
    b. **Building type specific notes**: information that affects the assessment of specific building types (such as 'Industrial' or 'Hotels').
    c. **Issue specific notes:** information that affects the applicability of an issue based of the features present in a particular asset (such as no water fittings being present).
4. **Assessment criteria**: the good and best practice performance level benchmarks and criteria. Where the building complies with the assessment criteria, as determined by the BREEAM Assessor, the relevant number of BREEAM credits can be awarded. Some issues have exemplary level criteria; where a building demonstrates that it meets exemplary level criteria, a BREEAM innovation credit can be awarded (for more details, refer to Inn 01 Innovation on page 382). Up to a maximum of 10 innovation credits are available.
5. **Methodology**: includes a description of any methodology used to determine the number of credits achieved for a given level of building performance. It includes, for example, calculation procedures or guidance on how to relate non-BREEAM schemes, standards or qualifications referenced to the assessment criteria.
6. **Compliance notes**: additional guidance that supports the application and interpretation of the main assessment criteria, including how to assess compliance in particular scenarios.
7. **Evidence**: describes the types of project information that the design team or client must provide to the licensed BREEAM Assessor to enable verification of the building's performance against the assessment criteria and justification of credits awarded.
8. **Definitions**: specific definitions of terms used in the assessment issue.

Some assessment issues also include:

9. **Checklists and tables**: a separate section for checklists or tables referenced in the assessment criteria. This can include tables of benchmarks or building type specific performance criteria.
10. **Additional information**: further information relevant to the application of the assessment criteria, or sources of information that may be of use in addressing the issue.

Scope

Scope of BREEAM New Construction

BREEAM New Construction can be used to assess the environmental life cycle impacts of new buildings at the design and construction stages. 'New Construction' is defined as development that results in a new standalone structure, or a new extension to an existing structure, which will come into operation or use for the first time upon completion of the works.

Building location

BREEAM UK New Construction is applicable to new non-domestic buildings in the United Kingdom only.

Building types

Asset categories which can be assessed and rated using BREEAM UK New Construction Version 7 are outlined in Table 2.1 below. A full list of asset types and sub-types can be found in Appendix A.

Table 2.1: List of building types covered under BREEAM UK New Construction Version 7

Asset category
Commercial laboratory
Community
Culture and entertainment
Education
Government services
Healthcare
Hospitality
Industrial
Office
Residential institution
Retail
Sports and leisure
Transport hub

Building types that are not listed in Table 2.1 above must undergo a scoping and tailoring exercise to facilitate an assessment and rating. For an individual project this involves BRE Global selecting appropriate issues from the existing pool of assessment issues to provide criteria against which the building can be assessed. Further guidance on this 'bespoke' process can be found in Guidance Note 23.

Mixed-use developments and building types

BREEAM defines different criteria and benchmarks for some assessment issues according to building type, function and use. Developments which comprise separate buildings with different function types, or a single building that includes different functions, e.g. office and retail , can be assessed under a single BREEAM assessment. Each area will need to comply with the relevant criteria for the building type. BREEAM credits that are awarded based on performance scales will be calculated on an area weighted basis.

Building that are a mix of commercial and residential asset types will need separate BREEAM assessments.

Further guidance can be found in Guidance Note 20.

Part new-build, part refurbishment projects

For developments that include both new-build and refurbished areas, the choice of scheme depends on the scope of the new-build and refurbishment works.

For smaller projects, where the total development area is less than 1000 m², a single BREEAM assessment can be undertaken to cover both the new-build and refurbished areas. The BREEAM New Construction or BREEAM Refurbishment and Fit-out scheme choice will be based on whichever (new-build or refurbishment) constitutes the majority of the assessed floor area.

For larger projects, a single New Construction assessment can be undertaken, as the refurbished areas would then have to reach the more challenging New Construction criteria. If the development is predominantly refurbishment with a new-build extension, then the BREEAM Refurbishment and Fit-out scheme contains thresholds under which a single Refurbishment and Fit-out assessment can be completed.

Where the new extension is above these thresholds and a single BREEAM Refurbishment and Fit-out assessment is not appropriate, there are two options as described below.

Option 1: Separate BREEAM New Construction and BREEAM Refurbishment and Fit-out assessments

Under option 1, two separate BREEAM assessments are conducted with a BREEAM New Construction assessment undertaken on the new extension and a BREEAM Refurbishment and Fit-out assessment undertaken on the existing building refurbishment or fit-out. Two separate certificates and ratings can be obtained to indicate the performance of both the new extension and existing building refurbishment or fit-out.

Option 2: Bespoke BREEAM combined New Construction and Refurbishment and Fit-out assessment

Under option 2, BRE Global produces a bespoke criteria appendix document that determines, for specific BREEAM issues, which issues and assessment criteria are applicable to the part new-build, part-refurbishment project. It refers to both the BREEAM Refurbishment and Fit-out manual and the BREEAM New Construction manual. A bespoke Scoring and Reporting tool is also produced for the project.

As part of the bespoke criteria development for Ene 01 Energy and carbon performance for regulated energy uses we allow the new-build to be assessed against the New Construction scheme and the refurbishment against the RFO scheme. The tool performs an area-weighted average score.

In determining the appropriate option for a part new-build, part-refurbishment project, the BREEAM Assessor should review the scope of the proposed works and consider in particular the scope of the refurbished elements, i.e. is it a major refurbishment, will there be a significant change of use and will the building's thermal and structural elements remain ‘as existing’? Using this information, the assessor should advise the client on the most suitable option in terms of which BREEAM version or scheme is most appropriate for maximising the building's environmental performance.

Assessment types

Within BREEAM UK New Construction a number of assessment types are defined and can be used to assess and rate a new building's performance. These are:

- Fully fitted
- Shell and core
- Shell only

The assessment criteria for these options are clearly identified in this technical manual. The assessor, in collaboration with the client and design team as necessary, should determine which BREEAM assessment type is relevant for their project.

Speculative buildings: Shell and core, and Shell only

Non-fitted out ‘speculative’ new buildings, often referred to as either shell and core, or shell only buildings, can be assessed using BREEAM New Construction.

Shell only assessment

This is where the developer's scope of works covers new build works to the fabric, substructure and superstructure of the building only, including:

- External walls, windows, doors (external), roof, core internal walls, structural floors
- Hard and soft landscaping areas (where present and within the scope of works).

Shell and core assessment

This is where the developer's scope of works covers shell only, plus:

- Core building services. The systems will typically be centralised and may have capped-off distribution to each tenanted area (for future connection as part of a tenant's fit-out works).

Small areas with a lower level of fit-out

Assessment should aim to assess the highest level of fit-out, i.e. fully-fitted / shell and core. Where there are small areas with a lower level of fit-out, these can be disregarded when deciding the fit-out level of an assessment provided that these constitute:

- 5% or less of the GIA

  AND

- a combined GIA of 100 m² or less

For more details on 'Shell and core' and 'Shell only' assessment types, see Appendix B – Shell only and Shell and core project assessments on page 389.

Similar building types (or units) on the same site

It is possible to assess and rate a number of separate but similar non-residential buildings, or individual units within a larger building development, within one BREEAM assessment report. Further guidance on this type of assessment can be found in Guidance Note 20.

Building types not covered

Building types not listed in Scope of BREEAM New Construction - Table 2.1: on page 20 will fall into one of two categories:

- Those for which a current but separate BREEAM New Construction technical manual exists.
- Those which currently do not have an existing and current technical manual.

Data centres

BREEAM Data Centres 2010 (SD5068) should be used for the assessment and certification of data centres in the UK.

BREEAM UK New Construction: Residential

BREEAM UK New Construction: Residential Version 6.1 (SD260) should be used for the assessment and certification of new-build dwellings in the UK.

Non-standard building types

If the building type requiring assessment is not defined in the scope of this manual, it can still be assessed using BREEAM New Construction. Such building types will be assessed using a bespoke set of BREEAM criteria. For further information, BREEAM Assessors and clients should refer to Guidance Note 23 (GN23).

Building life cycle stages covered

BREEAM New Construction can be used to assess and rate the environmental impacts arising from a newly constructed building development (including external site areas), at the following life cycle stages:

1. New build design stage (DS) (optional) – leading to an interim BREEAM rating and certificate of assessment.
2. New build post-construction stage (PCS) – leading to a final BREEAM rating and certificate of assessment.

Design stage

The design stage (DS) assessment and interim BREEAM rating is optional and can be used to demonstrate the proposed new building's performance at the design stage of the life cycle. It is strongly recommended that assessment and certification should occur prior to the beginning of operations on site. The BREEAM rating at this stage is labelled as 'interim' because it does not represent the building's final, new construction BREEAM performance.

To complete an assessment at this stage, the design must be advanced to a point where the relevant design information is available to enable the BREEAM Assessor to evaluate and verify the building's performance against the criteria defined in this scheme document. The interim DS assessment will therefore be completed and certified at the scheme design or detailed design stages.

Post-construction stage

The post-construction stage (PCS) assessment and BREEAM rating is a mandatory certification stage that can be used to demonstrate the final 'as-built' performance of the building at the new construction stage of the life cycle. A final PCS assessment is completed and certified after practical completion of the building works.

There are two approaches to assessment at the post-construction stage:

1. A post-construction review (PCR), based on a completed interim design stage assessment
2. A standalone post-construction assessment (PCA).

A PCR serves to confirm the assessment of a building's 'as-built' performance and rating and where appropriate that it is in accordance with the assessment certified at the interim design stage. Where an interim DS assessment has not been carried out and a BREEAM assessment and rating is required, a full post-construction stage assessment can be conducted.

Building life cycle stages not covered

BREEAM New Construction is not designed to assess the environmental impacts of:

— Existing buildings in operation or existing unoccupied buildings (see BREEAM In-Use)
— Existing building refurbishment and fit-outs (see BREEAM Refurbishment and Fit-out)
— Masterplanning projects (see BREEAM Communities)
— Infrastructure projects (see BREEAM Infrastructure)

Scoring and rating

Rating benchmarks

There are a number of elements that determine the overall performance of a project assessed using BREEAM:

1. The scope of the assessment
2. The BREEAM rating level benchmarks
3. The minimum BREEAM standards
4. The category weightings
5. The BREEAM assessment issues and credits

How these elements combine to produce a BREEAM rating for a project is summarised in the following sections. This is followed by a description and example describing the methodology for calculating a rating.

The BREEAM rating benchmarks for projects assessed using BREEAM New Construction Version 7 are shown in Table 2.2 below.

Table 2.2: BREEAM rating benchmarks

BREEAM rating	Overall score
Outstanding	≥ 85%
Excellent	≥ 70%
Very Good	≥ 55%
Good	≥ 40%
Pass	≥ 25%
Unclassified	< 25%

The BREEAM rating benchmarks enable a client and all other stakeholders to compare the performance of a building with other BREEAM rated buildings of the same type, and the typical sustainability performance of a stock of buildings.

In this respect each BREEAM rating broadly represents performance equivalent to:

1. Outstanding: Less than the top 1% of buildings (innovator)
2. Excellent: Top 10% of buildings (best practice)
3. Very Good: Top 25% of buildings (advanced good practice)
4. Good: Top 50% of buildings (intermediate good practice)
5. Pass: Top 75% of buildings (standard good practice)

An unclassified BREEAM rating represents performance that is non-compliant with BREEAM, in terms of failing to meet either the BREEAM minimum standards of performance for key environmental issues or the overall threshold score required to achieve at least a Pass rating.

Minimum standards

To ensure performance against fundamental environmental issues is not overlooked in pursuit of a particular rating, BREEAM sets minimum standards of performance in key areas, e.g. energy, water, waste etc. The majority of BREEAM credits can, however, be traded, so non-compliance in one area can be offset through compliance in another to achieve the target BREEAM rating.

The minimum acceptable levels of performance for each rating are summarised in Table 2.3 below.

To achieve a particular BREEAM rating, the minimum overall percentage score must be achieved as well as the minimum standards detailed in Table 2.3 below.

Table 2.3: Minimum BREEAM standards by rating level

BREEAM issue	Minimum standards by BREEAM rating level				
	Pass	Good	Very Good	Excellent	Outstanding
Man 03 Responsible construction				- Basic responsible construction practices One credit (Responsible construction management)	- Advanced responsible construction practices Two credits (Responsible construction management)
Man 04 Commissioning and handover			- Commissioning of building systems One credit (Schedule and responsibilities)		
Man 04 Commissioning and handover			- Technical and non-technical building user guide written Criterion 12 (Handover)		
Man 05 Aftercare				- Commitment to 12 month in-use commissioning One credit (In-use commissioning)	
Hea 01 Natural light					- Relevant areas have access to natural light Criterion 1 (Natural light)
Hea 04 Indoor air quality			- Indoor air quality plan Criterion 1		
Ene 01 Energy and carbon performance for regulated energy uses				- Significant improvement over energy regulations Four credits	- Best practice improvement over energy regulations Six credits
Ene 02 Prediction of operational energy and carbon					AND - Predictive energy modelling Three credits
Ene 02 Prediction of operational energy and carbon				OR Three credits - operational energy performance score	OR Five credits - operational energy performance score
Ene 02 Prediction of operational energy					No fossil fuels combusted on-

BREEAM issue	Minimum standards by BREEAM rating level				
	Pass	Good	Very Good	Excellent	Outstanding
and carbon					site
Ene 03 Energy monitoring			- Monitoring for 90% energy consumption by end use One credit (Energy monitoring by end-use)		
Wat 01 Water consumption		- 15% improvement over baseline One credit			- 30% improvement over baseline Two credits
Wat 02 Water monitoring		- A water meter is installed Criterion 1			
Mat 01 Building life cycle assessment				Any project stage LCA and embodied carbon reporting Criteria 1 to 6	All project stage LCA and embodied carbon reporting Five credits
Mat 03 Responsible sourcing of construction products	- Legally harvested and traded timber Criterion 1				
Wst 01 Construction waste management					- Pre-demolition audit OR - Resource management plan One credit
Wst 03 Operational waste				- Recycling facilities provided One credit	
Pol 01 Impact of refrigerants					- No refrigerant use OR - Refrigerants have an emissions rate < 1000 $kgCO_2e$ per kW One credit

Category weightings

Category weightings provide a means of defining, and therefore ranking, the relative impact of environmental categories.

Table 2.4: Category weightings for BREEAM UK New Construction Version 7 (using comprehensive route for Land use and ecology)

Category	Weighting		
	Fully fitted	Shell and core	Shell only
Management	11.00%	10.00%	12.50%
Health and wellbeing	15.00%	10.00%	9.50%
Energy	16.50%	18.00%	8.00%
Transport	8.50%	9.00%	13.50%
Water	7.50%	8.00%	2.00%
Materials	16.00%	17.50%	22.00%
Waste	7.00%	7.00%	10.00%
Land use and ecology	10.50%	11.50%	16.50%
Pollution	8.00%	9.00%	6.00%
Total	100.00%	100.00%	100.00%
Innovation (additional)	10.00%	10.00%	10.00%

Each category in BREEAM consists of a differing number of assessment issues and credits (as defined in the technical sections of this document).

Assessment issues and credits

BREEAM UK New Construction Version 7 consists of 49 individual assessment issues across nine environmental categories, plus a tenth 'Innovation' category. Each assessment issue addresses a specific building related environmental impact or issue and has a number of credits assigned to it.

BREEAM credits are awarded where a development meets the best practice performance levels defined for an assessment issue, i.e. it has mitigated an impact or, in the case of Health and wellbeing on page 79, addressed a specific building occupant-related issue, e.g. good thermal comfort, daylighting, or acoustics.

The number of credits available for an individual assessment issue will vary and generally reflect the importance of mitigating the impact of the assessment issue. In most cases, where there are multiple credits available, the number awarded is based on a sliding scale or benchmark, where progressively higher standards of building performance are rewarded with a higher number of credits.

It is worth noting that, in addition to the category scores and overall score and BREEAM rating, verified performance against individual assessment issues also provides users with a credible set of key building performance indicators for a range of embodied, operational and construction phase building impacts. In this respect, in addition to using BREEAM to define overall targets, it is possible to use the method to define performance levels in support of specific organisational policy objectives for individual environmental issues. Care should be taken when setting design targets using individual issues and credit levels in this way as it can limit design flexibility and have an impact on project costs.

Awarding credits for innovation

One of the aims of BREEAM is to support innovation within the construction industry and its supply chain. "Innovation" credits recognise sustainability benefits or performance levels that go beyond standard BREEAM assessment issues and criteria.

Awarding credits for innovation enables clients and design teams to boost their building's BREEAM performance and, in addition, helps to support the market for new innovative technologies, and design or construction practices.

BREEAM awards 'innovation credits' in two ways. First, by meeting exemplary performance criteria defined within an existing BREEAM issue, i.e. going beyond the standard BREEAM assessment criteria and therefore best practice. Not all assessment issues have exemplary performance criteria. Second, where an application is made to BRE Global by the registered project's BREEAM Assessor to have a particular building technology or feature, design or construction method or process recognised as 'innovative'. If the application is successful and subsequently compliance is verified, an 'Approved Innovation credit' can be awarded.

An additional 1% can be added to a building's overall score for each 'innovation credit' achieved. The maximum number of 'innovation credits' for any building is 10; therefore the maximum available additional score for 'innovation' is 10%. The building's final BREEAM score will be capped at 100%. Innovation credits can be awarded regardless of the building's final BREEAM rating, i.e. they can be awarded at any BREEAM rating level. For more detail, refer to Inn 01 Innovation on page 382.

Calculating a BREEAM rating

A BREEAM Assessor must determine the BREEAM rating using the BREEAM Platform.

The process of determining a BREEAM rating is outlined below and an example calculation included in Table 2.5.

1. Determine the scope of the project being assessed, i.e. Shell only or Shell and core.
2. The BREEAM Assessor will then award credits in accordance with the criteria of each assessment issue (as detailed in the technical sections of this document).
3. The percentage of credits achieved is then calculated for each category.
4. The percentage of credits achieved in each section is multiplied by the category weighting, giving the overall category score.
5. The category scores are added together to give the overall BREEAM score.
6. The overall score is then compared to the BREEAM rating benchmark levels and, provided all minimum standards have been met, the relevant BREEAM rating is achieved.
7. An additional 1% can be added to the final BREEAM score for each 'innovation credit' achieved (up to a maximum of 10% and with the total BREEAM score capped at 100%).

Table 2.5: Example BREEAM score and rating calculation (using comprehensive route)

Category	Credits achieved	Credits available	Credits achieved, %	Category weighting (fully fitted)	Category score, %
Management	19	21	90.48%	0.110	9.95%
Health and wellbeing	16	21	76.19%	0.150	11.43%
Energy	12	41	29.27%	0.165	4.83%
Transport	6	12	50.00%	0.085	4.25%
Water	10	11	90.91%	0.075	6.82%
Materials	6	14	42.86%	0.160	6.86%
Waste	7	10	70.00%	0.070	4.90%
Land use and ecology	9	13	69.23%	0.105	7.27%
Pollution	11	13	84.62%	0.080	6.77%
Innovation	2	10	20.00%	0.100	2.00%
Final BREEAM score					65.08%
BREEAM rating					VERY GOOD

Table 2.6: Minimum standards for a BREEAM Very Good rating

Minimum standards for BREEAM 'Very Good' rating	Achieved?
Man 04 Commissioning and handover	Yes
Hea 04 Indoor air quality	Yes
Ene 03 Energy monitoring	Yes
Wat 01 Water consumption	Yes
Wat 02 Water monitoring	Yes
Mat 03 Responsible sourcing of construction products	Yes

Evidence requirements

This section provides guidance to assessors and project teams on the types of evidence required to demonstrate compliance with BREEAM issues.

The BREEAM Assessor role

The role of the BREEAM Assessor is to objectively assess performance of an Asset against the BREEAM scheme and to gather project information to demonstrate compliance. To award a BREEAM credit, the assessor must be satisfied that the evidence gathered demonstrates unambiguous compliance with all relevant criteria defined in the BREEAM scheme. All evidence must be referenced appropriately by the assessor in the BREEAM Platform for quality assurance checks.

Clear and concise validation statements, referencing the evidence, must be provided for each BREEAM issue to demonstrate how each of the criteria have been addressed and credits awarded. This facilitates efficient quality assurance and certification decisions.

The BREEAM Assessor determines the BREEAM rating and their BREEAM Platform submission is the formal record of an assessor's audit against the criteria defined in the technical manual for a BREEAM scheme. The BREEAM certificate issued by BRE Global provides assurance that the service provided by the assessor, i.e. the assessment and determination of the BREEAM rating has been conducted in accordance with the requirements of the scheme.

Evidence types

Evidence does not necessarily need to be prepared specifically for the purpose of the BREEAM assessment. In many instances, the assessor should source readily available and prepared project information to demonstrate compliance.

The BREEAM Assessor and project team will find that many assessment issues require more than one piece or type of information to demonstrate compliance with one criterion. Alternatively, one piece of information may be sufficient to demonstrate compliance with multiple criteria.

Evidence must be provided to verify compliance with the relevant criteria for every BREEAM credit awarded by the assessor. Evidence should also be provided to justify when credits have been filtered out of a BREEAM assessment. The Schedules of Evidence in each issue only provide a guide to support the assessors when working with the project teams to identify what can be deemed acceptable for that particular issue or criterion. Alternative evidence can be provided as long as it clearly demonstrates compliance to support the justification provided by the licensed assessor for the awarding of the credit and is referenced appropriately in the assessment submission. If the evidence provided does not clearly demonstrate compliance, or is not clearly referenced, the Quality Assurance audit will identify it is a non-conformance and a certification decision will be delayed until such time as the non-conformance is addressed.

Other types of evidence provided by a client or design team not listed in Table 2.8 on page 33 or the 'Evidence' section for each issue, can still be used. To avoid non-conformities and delays in certification, other types of evidence must be credible, robust and traceable to the same assurance level as, or better than, specified evidence types defined in the technical manual.

Written commitments at the interim stage of assessment (design stage)

At the interim design stage of assessment, letters or emails to demonstrate intent to comply with BREEAM criteria can be used, provided they meet the requirements for communication records. Such evidence must make clear the actions that will be undertaken and evidence that will be provided, i.e. the commitment to ensure the project's compliance, particularly at the final stage of assessment. The party who makes the commitment must be clearly aware of the actions and evidence that needs to be undertaken and supplied to demonstrate compliance with BREEAM at the final stage of assessment. For example, in many circumstances it would not be acceptable for the design team to simply copy and paste the BREEAM criteria into a written commitment (BREEAM criteria do not generally prescribe solutions). The commitment should specifically detail how criteria are to be achieved (the solution) in the context of the assessment, and often copying and pasting the BREEAM criteria will not provide this detail. This therefore does not demonstrate the degree of confidence in the solution necessary for certification.

While letters of commitment can play a role in demonstrating compliance, they are not a replacement for more formal and established types of project information. The assessor must not award credits where they have a reason to doubt the validity or intent of written commitments, or where it is reasonable to expect formal design or specification information to be available to confirm compliance.

The evidence schedules are generally based upon submission of the assessment at Technical Design. Where submission is required to take place at an earlier stage, when some design information may not be advanced enough to satisfy all of the BREEAM design stage requirements, we request assessor's provide justification for the early submission and alternative evidence must be robust and contractually binding.

The assessor must ensure that the evidence used is the most robust available for the project stage at the time of submission and therefore, should not always accept letters of commitment at design stage where more detailed design evidence is expected to be available.

Written commitments at the final stage of assessment (post-construction stage)

Two types of assessment can be carried out at the post-construction stage, a post-construction review of a design stage assessment, or a post-construction assessment where no design stage assessment has been carried out. The 'Final post-construction stage' column of the evidence table in each issue assumes that a design stage assessment has been completed and certified. Where a design stage assessment has not been completed, the assessor will need to review both the 'Interim design stage' and 'Final post-construction stage' evidence listed in the evidence table and ensure sufficient evidence is submitted with the assessment to demonstrate compliance with the criteria.

Evidence supplied at the post-construction stage must reflect the completed building and must therefore demonstrate what has actually been implemented. For example, if sub-meters have been specified at the design stage, evidence at the post-construction stage would need to demonstrate that these have actually been installed. Appropriate evidence may be a site inspection report with supporting photographs or final construction drawings or equivalent showing the location of the sub-meters. Where commitments or contract clauses rather than full design information was used to demonstrate compliance at design stage, or the design information is superseded, more detailed evidence will be required post-construction to confirm the final detailed design as well as verification that it has been implemented.

Letters of commitment cannot be used to demonstrate compliance at the final, post-construction stage of assessment. The only exception to this is where the criteria require an action to take place after handover and possibly during the initial stages of building operation, i.e. after completion of the post-construction stage of assessment. An example could be a written commitment from the building owner or occupier making a commitment to conduct post occupancy evaluation.

Evidence principles

To determine whether evidence types are appropriate for an assessment issue, the BREEAM Assessor must consider the BREEAM evidence principles in Table 2.7 below. Where the 'evidence types' meet the principles outlined in Table 2.7 below and the guidance provided in the 'robustness of evidence' section, where appropriate, such evidence is admissible for the assessment and the BRE Global Quality Assurance audit.

These principles are not listed in a hierarchical order and are all equally important when considering which evidence type to assess, reference and submit.

Table 2.7: BREEAM evidence principles

Principle	Objective	A question to ask to check
1. Evidence for all criteria and all credits sought		
Evidence demonstrates that ALL relevant criteria and sub-criteria are achieved for each credit sought and where relevant, is provided to support compliance notes, definitions etc. Where the assessor or design team deem specific criteria not relevant to the assessment, a full justification should be	Completeness	Are all criteria covered? Have all relevant compliance notes, knowledge base entries (KBCNs) and definitions been addressed?

Principle	Objective	A question to ask to check
collated and then submitted as a technical query for review by BRE Global.		
2. Unambiguous assessment		
The assessment demonstrates unambiguous compliance and the evidence supports this assessment. Evidence (and supporting notes) clearly demonstrate to a third-party reviewer that the criteria have been met.	Independent review compatibility	Would a third party (e.g. BRE Global) come to the same assessment decision as me based on the evidence submitted?
3. Robust		
Always ensure the evidence type selected is robust and relevant to the stage of assessment. Evidence selected contains all relevant basic information along with robust constituent parts that are needed. (For further details, see Robustness of evidence below.)	Proof that evidence is robust and from a reliable source	Using an assessor's judgement, is the evidence robust enough to demonstrate compliance with the criterion? Does the evidence contain all the relevant basic information? Does it provide a fully auditable trail of compliance?
4. Use existing evidence		
Use existing project information to demonstrate compliance. A significant proportion of the evidence should not need to be 'created' for BREEAM compliance purposes.	Minimises evidence and reduces time and cost of compliance	Does an existing type of project information robustly demonstrate compliance for the credits sought?

Robustness of evidence

Robust evidence provides confirmation that the assessment has been carried out correctly and the building complies with the criteria for the BREEAM credits sought. The assessor should consider the following when gathering project information and evaluating whether the evidence provided is as 'robust' as possible:

- Is there more than one piece of evidence that could be used to demonstrate compliance?
- Is the chosen evidence robust and appropriate to demonstrate that a particular criterion has been achieved?
- Is there a clear auditable trail with the document including key information such as the project name, the author, date, revision numbers (etc.)?

Any evidence submitted for a BREEAM assessment must be robust in terms of its source and its traceability. As a minimum, the assessor should identify within their validation statement the relevant page numbers, both of the document and if applicable PDF, and sections for the document where compliance has been confirmed.

Table 2.8: Evidence types

Document or evidence type	Description and notes
As constructed information	Information produced at the end of a project to represent what has been constructed. This will comprise a mix of 'as-built' information or drawings and surveys from specialist subcontractors and the 'final construction issue' from design team members.
BRE Global correspondence reference number	For example, the reference number for a BRE Global response to an assessor's technical query.
BREEAM Assessor's site inspection report	A formal report based on the BREEAM Assessor's own survey of the site or building to confirm compliance with BREEAM criteria. This must include site photographs, which are linked to specific criteria, to verify the that the building has been constructed in line with the design specification or drawings provided.
Building contracts	The building contract (or excerpts or clauses from it) between the client and the contractor for the construction of the project. In some instances, the building contract may contain design duties for specialist subcontractors or design team members.
Building information model (BIM)	The BIM (or BIM files) used for the project containing relevant information or evidence of compliance.
Certificates of compliance (third party)	Examples include ISO 14001, BES 6001, FSC (Forest Stewardship Council), EPC (environmental profile certificate), EPD (environmental product declaration), Considerate

Document or evidence type	Description and notes
	Constructors etc.
Communication records	Formal communication records between or from relevant project stakeholders or other third parties confirming an appointment, action or outcome. This may be in the form of a letter, meeting minutes, email correspondence, publication or another form of media (see also additional guidance on following pages).
Communication strategy	The strategy that sets out when the project team will meet, how they will communicate effectively and the protocols for issuing information between the various parties, both informally and at information exchanges.
Construction specification	The specification for the project or building. For the purpose of BREEAM, the specific clause of the specification must be referenced within the report.
Construction stage data and information	For example, purchase orders, metering data, log books, commissioning records, reports etc.
Cost information	Project costs, including the cost estimate and life cycle costs.
Design drawings	Developed Design and Technical Design, including the coordinated architectural, structural and building services design, site plans, drainage designs. All drawings have the building or site name, phase (if applicable), title of drawing, author, date, revision number and a scale.
Design programme	A programme setting out the strategic dates in relation to the design process. It is aligned with the Project Programme but is strategic in its nature, due to the iterative nature of the design process, particularly in the early stages.
Design responsibility matrix	A matrix that sets out who is responsible for designing each aspect of the project and when. This document sets out the extent of any performance-specified design.
Feasibility study	Studies undertaken to test the feasibility of the Initial Project Brief for the site or in a specific context and to consider how site-wide issues will be addressed.
Formal correspondence	The document should be on company or organisation letterhead and include a signature (electronic signatures are acceptable). The document should be secured to prevent unauthorised access or modification. Though, where letters are provided as attachments to emails which are presented in their original format, offer a clear auditable trail and are provided by appropriate team members, the assessor can use their judgement on the robustness of the document. For further details, please refer to the sections on written commitment.
Meeting minutes	Include date, location and attendee information (names, organisations and roles), along with a record of the meeting and agreed actions.
Modelling results and outputs	Examples include thermal modelling, flooding, life cycle assessment, life cycle costing, ventilation modelling etc.
Other third-party information	For example, maps, public transportation timetables, product data or details, manufacturers' literature, government or EU standards or codes, EU labelling.
Professional services contract	An agreement to provide professional or consulting services such as designing, feasibility studies, or legal or technical advice.
Professional specialist reports	Professional reports resulting from specialist surveys, studies or test results, e.g. contaminated land, ecology, flood risk assessment, surface water run-off report, site investigation, acoustics, indoor air quality plan, low and zero carbon technologies study, transportation analysis, commissioning reports, passive design analysis report, free cooling analysis report, life cycle assessment, landscape and habitat management plan etc.
Project Execution or Quality Plan	The Project Execution Plan is produced in collaboration with the project lead and lead designer, with contributions from other designers and members of the project team. The Project Execution Plan sets out the processes and protocols to be used to develop the design.
Project programme	The overall period for the briefing, design, construction and post-completion activities of a project.
Project roles table	A table that sets out the roles required on a project as well as defining the stages during which those roles are required and the parties responsible for carrying out the roles.

Document or evidence type	Description and notes
Project strategy	The strategies developed in parallel with the Concept Design to support the design and, in certain instances, to respond to the Final Project Brief as it is concluded. Examples include strategies for sustainability, acoustics, handover, maintenance and operational, fire engineering, building control, technology, health and safety, construction, travel plan, sustainable procurement plan.
Risk assessment	The risk assessment considers the various design risks and other risks on a project and how each risk will be managed and the party responsible for managing each risk.
Schedule of services	A list of specific services and tasks to be undertaken by a party involved in the project which is incorporated into their professional services contract.
Strategic or initial project brief	The brief prepared following discussions with the client to ascertain the project objectives, the client's business case and, in certain instances, in response to site feasibility studies.

Management

Summary

This category encourages the adoption of sustainable management practices in connection with design, construction, commissioning, handover and aftercare. This ensures that robust sustainability objectives are set and followed through into the operation of the building. Issues in this section focus on embedding sustainability through the key stages of design, procurement and initial occupation, from the initial project brief stage to the appropriate provision of aftercare.

Assessment issues

Man 01 Project brief and design	4 credits
Man 02 Life cycle cost and service life planning	4 credits
Man 03 Responsible construction	6 credits + 1 exemplary
Man 04 Commissioning and handover	4 credits
Man 05 Aftercare	3 credits + 1 exemplary

Man 01 Project brief and design

Aim

To recognise and encourage an integrated design process that optimises building performance resulting from robust stakeholder engagement.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	4	None	All
Shell and core	4	None	All
Shell only	4	None	All

Assessment type specific notes

Ref	Assessment type specific note
-	None

Building type specific notes

Ref	Building type specific note
2.0	**Small-scale projects** For small-scale projects, a BREEAM New Construction Assessor can act as the BREEAM Advisory Professional (AP), without being a registered BREEAM AP. In this situation it will still be necessary to manage any conflicts of interest that could arise.
2.1	**Education, Healthcare, Courts and Major transportation hub building types** An independent party must carry out the consultation exercise. See criterion 7.

Assessment criteria

One credit – Project planning

1 A clear brief is developed prior to completion of the concept design, to include input from all design team members and this information is shared with all relevant parties. This clear briefing document sets out the particular ambitions for the project:

- 1.a Client requirements, e.g. internal environmental conditions required.
- 1.b Sustainability objectives and targets, including BREEAM performance targets and any wider business or project sustainability objectives.
- 1.c Timescales and budget.
- 1.d List of consultees and professional appointments that may be required, e.g. suitably qualified acoustician (SQA) etc.
- 1.e Constraints for the project, e.g. technical, legal, physical, environmental.

2 Prior to completion of the concept design, the project team (Client, Design Team and Principal Contractor (see M1 where not yet appointed)) meet specifically to discuss, identify and define the roles, responsibilities and contributions for each key phase of the project. When defining responsibilities, the following must be considered:

- 2.a Building user requirements.
- 2.b Aims of the design and design strategy.

2.c Particular installation and construction requirements and limitations.

2.d Design and construction risk assessments, e.g. national health and safety regulations or best practice, legionella risk assessment.

2.e Legislative requirements, e.g. local building regulations, heritage requirements.

2.f Sustainability objectives for the project.

2.g Ecological protection measures (where required).

2.h Procurement and supply chain – responsible and ethical sourcing.

2.i Identifying and measuring project success in line with project brief objectives.

2.j Building manager's or occupiers' budget and technical expertise in maintaining any proposed systems.

2.k Maintainability and adaptability of the proposals.

2.l Requirements for the production of project and end user documentation.

2.m Requirements for commissioning, training and aftercare support.

3 The project team demonstrate how the project delivery stakeholders' contributions and their input in the design process have influenced the following:

3.a Initial Project Brief.

3.b Project Execution Plan.

3.c Communication Strategy.

3.d Concept Design.

3.e Final Design.

One credit – Stakeholder consultation

4 Prior to completion of the Concept Design, the design team consult with all interested parties on matters that covers the minimum consultation content (see M2).

5 The project must demonstrate concisely how the interested party contributions and outcomes of the consultation exercise have influenced or changed the initial project brief and concept design; and these changes were implemented within the final design at post-construction.

6 Prior to completion of the detailed design (Technical Design or equivalent), consultation feedback has been given to, and received by, all relevant parties.

Additionally, for Education, Healthcare, Courts, and Major transportation hub building types only:

7 An independent party carries out the consultation exercise. The Design Quality Indicator (DQI) and the Achieving Excellence Design Evaluation Toolkit (AEDET) could be used as methods to assess the design quality of buildings.

One credit – BREEAM AP – Concept design

8 A BREEAM Advisory Professional (AP) has been appointed to facilitate the setting and achievement of BREEAM performance targets for the project. Their involvement must be early in the design process (see M3.2) to:

8.a Work with the project team, including the client, to consider the links between BREEAM issues and assist them in maximising the project’s overall performance against BREEAM, from their appointment and throughout Concept Design.

8.b Monitor progress against the agreed performance targets throughout all stages after their appointment where decisions critically impact BREEAM performance.

8.c Proactively identify risks and opportunities related to the achievement of the agreed targets.

8.d Provide feedback to the project team as appropriate, to support them in taking corrective actions and achieving their agreed performance targets.

8.e Monitor and, where relevant, coordinate the generation of appropriate evidence by the project team.

9 The defined BREEAM performance targets have been formally agreed between the client and design or project team no later than the concept design work stage.

10 To achieve this credit at the interim design stage assessment, the agreed BREEAM performance targets must be demonstrably achieved by the project design. This must be demonstrated via the BREEAM Assessor's design stage assessment report.

One credit – BREEAM AP – Monitoring progress

11 Achieve the credit for BREEAM AP – Concept design (criteria 8 to 10).

12 A BREEAM Advisory Professional (AP) has been appointed to monitor progress against the agreed BREEAM performance targets throughout the design process and formally report progress to the client and design team. They must:

12.a Work with the project team, including the client, to consider the links between BREEAM issues and to assist them in maximising the project's overall performance against BREEAM throughout Developed Design.

12.b Monitor progress against the performance targets agreed under criterion 9 throughout all stages where decisions critically impact the specification and tendering process and the BREEAM performance.

12.c Proactively identify risks and opportunities related to the achievement of the targets agreed under criterion 9.

12.d Provide feedback to the project team as appropriate, to support them in taking corrective actions and achieving their agreed performance targets.

12.e Monitor and, where relevant, coordinate the generation of appropriate evidence by the project team.

13 The BREEAM AP – Design must attend key project and design team meetings during the concept design, developed design and technical design work stages. Reporting must be carried out during and prior to completion of each stage, as a minimum.

Methodology

M1: Project planning

The contractor's role is to comment on the practicality and buildability of (one or more) design solutions and their impact on programming, costs etc. BREEAM recognises that traditionally for some projects, the contractor for the works might not be appointed at the early stages of the project and therefore compliance with criterion 3 would not be possible. In these instances, criteria 1 to 3 will be met provided that a **suitably experienced person with substantial construction or contracting experience** in similar projects is involved prior to appointment of the contractor. A suitably experienced person could be a contractor appointed as a consultant for this stage or a construction project manager.

M2: Minimum consultation content

The minimum consultation content (see criterion 4 on the previous page) of the consultation plan is dependent on the building but, where relevant, must include:

1. Functionality, build quality and impact (including aesthetics).
2. Provision of appropriate internal and external facilities (for future building occupants, visitors and users).
3. Management and operational implications.
4. Maintenance resources implications.
5. Impacts on the local community, e.g. local traffic or transportation impact – during and post construction.
6. Impacts on local wildlife and local ecology.
7. Opportunities for shared use of facilities and infrastructure with the community or appropriate stakeholders (this includes any existing shared facilities which are relied upon as well as any new facilities).
8. Compliance with statutory (national or local) consultation requirements.
9. Energy use and sustainability measures.
10. Implementing principles and processes that deliver an inclusive and accessible design.

In the case of educational building types, minimum content also includes:

11. How the building or grounds could best be designed to facilitate learning and provide a range of social spaces appropriate to the needs of a diverse range of pupils, students and other users, including people of all abilities.

In the case of building types containing technical areas or functions, e.g. laboratories, workshops etc., minimum content also includes:

12. The end users' broad requirements for such facilities, including appropriate sizing, optimisation and integration of equipment and systems.

In the case of transportation hubs, minimum content also includes:

13. How to ensure a smooth, safe and secure transition between different modes of transport (air, rail, road, bike and pedestrian, recognising the diversity of user needs including people of all ages and abilities).

M3: BREEAM AP

M3.1: Change of BREEAM AP during the project

The BREEAM AP must keep records of targets, reasons behind decisions, any risks and opportunities identified, and any feedback or advice provided to the project team to fully document their involvement. Whilst it is generally preferable to retain the same individual throughout the project for continuity, this may not always be feasible. The credits may still be awarded where the individual performing the role changes, provided the ongoing involvement of an AP is maintained in accordance with the criteria and all previous records and information handed over to the new BREEAM AP.

M3.2: Early in the design process

The project team, including the client, agree performance targets early enough to enable a smooth process without posing unnecessary barriers to achievements of criteria at a later stage. This is to ensure the performance targets will have an influence throughout the project, including prior to planning approval.

Compliance notes

Ref	Terms	Description
Project planning		
CN1	Building users unknown	Where the building user is unknown, it is still possible to achieve the credit. The building user requirements must be assumed and considered by other project parties (e.g. client, design team, etc.) using their experience and judgement until such time as the occupier is known.
BREEAM AP – Concept design / Monitoring progress		
CN2	Assessing and awarding the available credits for an Advisory Professional	There is an additional credit for appointing a BREEAM Advisory Professional whose qualification (credential) includes Site during the construction and handover phase (see Man 03 Responsible construction on page 50). The aim of the credit in Man 03 Responsible construction is to encourage and reward contractors and project teams that appoint a suitably qualified BREEAM AP and therefore ensure continuation of the sustainability objectives during the construction phase, and that the constructed building meets the client's target BREEAM rating. Note: Where the BREEAM AP holds the AP Design qualification, they may perform the role at design *and* during the construction stage.
CN3	Retrospectively applying AP status	The AP status cannot be applied retrospectively. The purpose of using an AP on a project is that they can advise and steer the development from the outset to maximise its BREEAM and sustainability performance for the least cost/risk. If early AP appointment and involvement does not occur, then the aims and criteria of this BREEAM issue are not being met.
CN4	Achieving the design credit on a post-construction stage assessment (PCA)	Where a project will be undertaking a post-construction stage assessment only (with no interim assessment), to demonstrate that the criteria were met at the design stage a “BREEAM credit monitoring report” should be provided when the assessment is submitted, which shows that at the design stage of the project the building was still on target for the proposed BREEAM rating. This could be an excel document showing the issues that the design is on target for achieving, with a short summary of how the

Ref	Terms	Description
		BREEAM AP is steering the project towards the correct rating. As long as the criteria are met and the correct information can be gathered for your evidence, a design stage certification is not required. The performance target must be achieved at post-construction where no design stage certification is available.
CN5	BREEAM-related performance targets. See criteria 8 to 13.	If the BREEAM-related performance targets set at the end of the Concept Design stage have not been achieved by the interim design stage assessment, the credits for the BREEAM AP within Man01 must be withheld.
CN6	BREEAM AP and BREEAM Assessor	An individual can be appointed as a BREEAM Assessor and BREEAM AP for the same project, where the Assessor also holds current and applicable AP credentials. If this route is chosen, it must be made clear when submitting the assessment that both roles are being carried out by the same person and confirmed how potential conflicts of interest are identified and managed.
BREEAM AP – Monitoring progress		
CN7	Assessment submitted prior to Technical Design	Where submission of the assessment takes place during the Developed Design stage, the credit may be awarded at design stage on the basis of a commitment to carry out the role for the Technical Design phase of the project. Full evidence will be required at post-construction.

Evidence

Criteria	Interim design stage	Final post-construction stage
Project planning		
1	A clear brief.	No further actions required post-construction. No additional evidence is required other than that listed for the design stage.
2	List in a responsibility matrix (or equivalent) who will be responsible for each role and specific responsibilities at each assessment stage. Provide minutes of the key initial meetings to demonstrate that responsibilities were allocated and discussed at the appropriate project stage.	Updated responsibility matrix confirming who was responsible for each role and their specific responsibilities at each assessment stage.
3	Concise report or summary document, with supporting evidence where required, to demonstrate how the project delivery stakeholders influenced the initial project brief, the project execution plan, communication strategy, and the concept design.	Assessor site inspection report and photographic evidence to show examples of how the early stage project delivery stakeholder's input influenced the final design.
Stakeholder consultation		
4	List all interested parties consulted. Records of consultation, as per M2.	No further actions required post-construction. No additional evidence is required other than that listed for the design stage.
5, 6	Documentary evidence or summary report on how the interested party stakeholder contributions and consultation outcomes influenced or changed the initial project brief and concept design. Documentation demonstrating the dissemination of feedback to all relevant parties.	Assessor site inspection report and photographic evidence to show examples of how the outcomes of the consultation with interested party stakeholder have been implemented within the final design.
7	In addition to the items listed against criterion 4 to 6, evidence to confirm the consultation exercise was completed by an independent party and results from DQI or AEDET where	No further actions required post-construction. No additional evidence is required other than that listed for the design stage.

Criteria	Interim design stage	Final post-construction stage
	used.	
BREEAM AP		
8–13	The BREEAM AP appointment letter and verification of the AP status. Relevant section or clauses of the building specification or contract or other formal documentation to confirm BREEAM performance target. Project programme or evidence indicating the dates for the key project design stages. Meeting minutes, communication records, formal notes of conversations or other statements reporting on discussions related to performance targets and maximising performance, to demonstrate ongoing involvement and AP attendance at key project meetings. BREEAM AP progress reports (for each work stage: Concept Design, Developed Design and Technical Design).	No further actions required post-construction. Interim design stage certificate showing performance target has been achieved. Please see CN5 where undertaking a PCA.

Definitions

BREEAM Advisory Professional (AP) – Design and Site

An individual trained and qualified by BRE as a specialist in built environment sustainability, environmental design and assessment. The role of the BREEAM AP is to facilitate the project team's efforts to successfully schedule activities, set priorities and negotiate the trade-offs required to achieve a target BREEAM rating when the design is formally assessed. Only qualified individuals who are members of BRE's associated membership scheme comply with the BREEAM requirements. This membership ensures an adequate level of competence is maintained through regular continuing professional development (CPD) in key relevant areas. For a list and contact details of BREEAM APs, visit: www.greenbooklive.com.

The assessor must ensure that the BREEAM AP qualification was valid at the time of appointment and maintained throughout their involvement in the relevant project stages.

BREEAM AP Design and Site can function as AP during the design phase.

BREEAM AP Operations (US) are able to function during the in-use phase of BREEAM and are not compliant for this issue.

Communication strategy

The communication strategy is defined as a strategy that sets out when the project team will meet, how they will communicate effectively, and the protocols for issuing information between the various parties, both informally and at information exchanges. This does not have to be contained within standalone, specific communication strategy plan and may form part of another project procedural plan.

Concept design

The concept design work stage includes the development of strategies and outline proposals for site planning, built form, structural design, building services systems, outline specifications and preliminary cost information.

Constraints

Some projects may have limitations applied, such as certain size and height restrictions, limited by planning authorities. The project could also be in a conservation area, or protected by historic building status. Other factors could be legal covenants, ecology or biodiversity protection laws, or flood risk considerations. Normal national or local construction standards are not considered to be constraints in this context.

Consultation feedback

This is feedback which focuses on the stakeholder suggestions, comments, recommendations and the consultation outcomes. This includes how the suggestions and outcomes influenced, or resulted in modifications to, the proposed design and building operation and use.

Design team meetings

Design team meetings can be defined as those where fundamental decisions that influence or affect the building's proposed design and its construction in accordance with the design (and therefore the building's sustainability impacts and BREEAM performance), are discussed and made. Design team meetings can be conducted via conference calls. These meetings would typically include representatives from at least three of the parties listed below:

1. Representatives of the client or developer
2. The principal contractor
3. The architect
4. Structural engineers
5. Building services engineers
6. Cost consultants
7. Environmental consultants
8. Project management consultants.

Developed design

The developed design work stage includes the coordination and updating of proposals for structural design, building services systems, outline specifications, cost information and project strategies.

Facilities management

Facilities management is the integration of processes within an organisation to maintain and develop the agreed services which support and improve the effectiveness of its primary activities. For the purposes of the assessment, the term 'agreed services' is taken to mean those relating to the maintenance and management of the building, its services and surroundings, including the interaction with related activities within, and users of, the building.

Formally agreed

The term 'formally agreed' relates to BREEAM performance targets. Examples of formal agreements include:

- A contract or letters of appointment with the architect and other relevant project team members.
- Meeting minutes dated at the appropriate project stage where design team members are present or are on the distribution and the rating has been confirmed as a client requirement.
- Evidence that the BREEAM rating is a planning requirement.
- Confirmation from the client in the form of a letter/email issued at an appropriate project stage to the relevant parties confirming the performance requirements or stating that a document such as pre-assessment report forms part of the contract documentation (where dated early in the design process).

Independent party

To comply with building type specific note 2.1, relating to the use of an independent party, the client or design team needs to demonstrate EITHER of the following options:

1. They have used a party independent of the design process to conduct the necessary consultation exercise, using a compliant method OR
2. If the consultation is to be carried out by an organisation involved with the design of the building, e.g. the project architect, then they must present the assessor with evidence that robustly demonstrates the independence of the consultation process. BREEAM has not attempted to define what form this evidence must take. The onus is on the design team or relevant individual to clearly demonstrate to the BREEAM Assessor a credible level of independence.

Interested parties

This includes, but is not limited to the following:

1. Actual or intended building users (if known) including facilities management (FM) staff or those responsible for the day-to-day operation of the building and grounds.
2. A representative consultation group from the existing community (if the building is a new development in an existing community) or for a community still under construction.
3. Existing partnerships and networks that have knowledge of, and experience of working on, existing buildings of the same type.
4. Any neighbours, local community groups and wildlife groups likely to have interests or concerns on the potential impacts relating to the site and adjoining areas before, during and after construction.
5. Potential users of any shared facilities, e.g. operators of clubs and community groups.

AND the following where relevant:

6. In educational buildings, representatives from the local education authority, school board etc.
7. Local or national historic or heritage groups (over and above any requirements relating to statutory consultees)
8. Specialist service and maintenance contractors and representatives where the building function has particular technical requirements in complex environments, e.g. buildings containing laboratories.

Key phases

The definition of key phases of project delivery includes the following:

- Concept design
- Developed design
- Technical design
- Construction
- Commissioning and handover
- In-use occupation.

Performance targets

BREEAM performance targets refer specifically to the BREEAM rating and minimum standards required. This does not necessarily include individual targeted BREEAM issues or credits, which may be traded over the course of the project as it evolves. In agreeing a BREEAM target, it is recommended that individual BREEAM issues, credits and criteria are targeted or prioritised. This is to ensure that the agreed target is achievable and achieved without potentially costly alterations to the design at a later stage. (Only the overall BREEAM rating is required to be targeted (e.g. Excellent) and not a specific percentage score.)

Project delivery stakeholders

The project delivery stakeholders include the client, the building occupier (where known), the design team and the principal contractor. See also M1.

Project execution plan

The project execution plan is defined as a plan produced in collaboration between the project lead and lead designer, with contributions from other designers and members of the project team. The project execution plan sets out the processes and protocols to be used to develop the design. It is sometimes referred to as a 'project quality plan'. This does not have to be contained within standalone, specific project execution plan and may form part of another project procedural plan.

Project team

The project team includes the client, the design team, and the principal contractor.

Small-scale projects

For the purposes of this issue, small-scale projects are defined as projects up to 500 m² gross internal floor area.

Technical design work stage

The technical design work is the stage at which all architectural, structural and building service design information, specialist subcontractor design and specifications are finalised.

Additional information

None.

Man 02 Life cycle cost and service life planning

Aim

To deliver whole life value by encouraging life cycle costing and service life planning. This entails improving design, project specification, life-cycle maintenance and operation. Additionally, this issue emphasizes the importance of transparent capital cost reporting to promote economic sustainability.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	4	None	All
Shell and core	4	None	All (see ref 1.0)
Shell only	4	None	All (see ref 1.0)

Assessment type specific notes

Ref	Assessment type specific notes
1.0	**Shell and core / Shell only – Component level LCC plan** Component level LCC plan must include all component types installed by the developer.

Building type specific notes

Ref	Building type specific notes
-	None

Assessment criteria

Two credits – Elemental LCC options appraisal

1 A competent person carries out an outline, entire asset elemental life cycle cost (LCC) options appraisal (at least two) at the Concept Design stage in line with ISO 15686-5:2017.(2)

2 The elemental LCC plan:

2.a Provides an indication of future replacement costs over a period of analysis as required by the client (e.g. 20, 30, 50 or 60 years);

2.b Includes 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).

3 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.

One credit – Component level LCC options appraisal

4 A competent person develops a component level LCC options appraisal (at least two) by the end of Technical Design stage in line with ISO 15686-5:2017, and includes the following component types (where present):

4.a Envelope, e.g. cladding, windows, or roofing

4.b Services, e.g. heat source, cooling source, or controls, also intelligent lighting controls against standard controls.

4.c Finishes, e.g. walls, floors or ceilings

4.d 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.

5 Demonstrate, using appropriate examples provided by the design team, how the component level LCC options appraisal has been used to influence building and systems design and specification to minimise life cycle costs and maximise critical value.

One credit – Capital cost reporting

6 Report the capital cost for the building in pounds per square metre (£/m²) of gross internal area (GIA).

> This is to collect and share anonymised costs and savings of developing sustainable, BREEAM-assessed buildings to support the business case for sustainability. For more details, see M2 and Additional information.

Methodology

M1: Appropriate LCC examples

The options selected to minimise life cycle costs and maximise critical value, shall be appropriate in terms of their relative impact on project costs, future building maintenance burden and size (volume or area) and the project stage of the project (see criteria 3 and 5 above).

The LCCs at each stage should consider:

- At least **two** design option appraisals and,
- Include comparison cash flow scenarios for each design stage option appraisal in order to determine the most appropriate option.

This allows project teams and clients to make informed choices about the long-term financial implications of different design decisions.

At Concept Design (RIBA Stage 2), when considering the outputs from the elemental LCC plan, examples could be in the form of elemental appraisals (where appropriate), evolutions in concept design to reduce maintenance or replacement costs or contracts for further elemental analysis.

At Technical Design (RIBA Stage 4), when considering the outputs from the component level option analysis, examples are likely to be in the form of component specifications coupled with justifications for their selection (i.e. how they reduce life cycle costs or maximise critical value). Please note that LED lamps are not to be included as an option, as these are now a standard form of lighting. As a principle, only make meaningful comparisons between systems which would genuinely be used in the project.

BSRIA Guide BG 67/2016 provides examples on identifying alternative solutions, calculating their life cycle costs and interpreting the results.

The professional guidance note by the Royal Institution of Chartered Surveyors (RICS) on LCC[3] defines LCC and whole life costing service for both new construction works and for the refurbishment of existing assets.

M2: Capital cost reporting

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.

It should be clear what the figures for capital cost include and exclude, in line with the definition for capital cost.

M3: Pre-defined specifications

Where the building is constructed to a pre-defined set specification, such as a company-wide building standard or specification document which limits the options which can be considered due to all buildings within a chain being required to be constructed to the same standard and branding, either:

- Complete LCC with options appraisals based on those items which are subject to change.
- Where there is no scope to make changes for all or some of the building elements, credits may only be achieved where a compliant LCC plan and options appraisals was carried out for pre-defined company specification.

Compliance notes

Ref	Terms	Description
CN1	Independent assessment of the sections of the criteria	All three sections of the criteria can be awarded independently from one another. For example, the project team can still target the one credit for the component level LCC option appraisal at stage 4 even if they have not been awarded the first two credits at stage 2 for developing an elemental life cycle cost plan. The capital cost reporting credit can also be awarded independently from the other two parts.
CN2	Life cycle cost – Multiple assessments on the same site	Where there are multiple assessments on a site and a single life cycle cost (LCC) plan will be carried out, it is acceptable to use this plan as evidence provided that the results of the LCC plan can be applied to all of the assessed buildings and therefore may have a positive influence on the material specification of such buildings. Where the design of some assessments differ to the extent that the LCC plan cannot reasonably be applied, a separate LCC plan is necessary to achieve credits for this issue. Where multiple assessments are covered under a single LCC plan, there must be sufficient detail for each building to enable them to be adequately assessed.

Evidence

Criteria	Interim design stage	Final post-construction stage
Elemental LCC options appraisal		
1, 2	Elemental LCC plan.	No further actions required post-construction. No additional evidence is required other than that listed for the design stage.
3	Confirmation from the design team as to how the LCC has influenced design/specification and drawings/specifications to support this.	Assessor site inspection report and photographic evidence to show how the outcomes of LCC options appraisal have been implemented within the final design.
Component level LCC options appraisal		
4	Component level LCC options appraisal.	No further actions required post-construction. No additional evidence is required other than that listed for the design stage.
5	Confirmation from the design team as to how the LCC has influenced design/specification	Assessor site inspection report and photographic evidence to show how the

Criteria	Interim design stage	Final post-construction stage
	and drawings/specifications to support this.	outcomes of LCC options appraisal have been implemented within the final design.
Capital cost reporting		
6	Predicted capital cost.	Final capital cost.

Definitions

Capital cost

The capital cost for the building includes the expenses related to the initial construction of the building:

1. Construction, including preparatory works, materials, equipment and labour
2. Site management
3. Construction financing
4. Insurance and taxes during construction
5. Inspection and testing

Costs related to land procurement, clearance, design, statutory approvals and post occupancy aftercare are not included.

Competent person

An individual who has acquired substantial expertise or a recognised qualification for undertaking life cycle costing studies and is not professionally connected to a single manufacturer. It is the responsibility of the assessor to determine whether an individual meets this definition, and they must provide evidence and justification (if necessary) in their assessment.

Component level LCC options appraisal

A component level LCC options appraisal is commonly used for cost planning specification choices of systems or component levels during design development. Component level LCC options appraisal for service life planning requires the environment of the building and other local conditions to be identified and the fundamental requirements to be met in planning the service life of the building. Decisions should be made on:

— The likely design life of the building (rather than the contractual design life).
— Minimum functional performance criteria for each component over the building's design life.
— Components that must be repairable, maintainable or replaceable within the design life of the building. Only the key differentiators between components and systems need to be comparatively modelled.

Critical value

Critical value aims to maximise whole life value of the building based on client requirements and differs from minimising life cycle cost. This is a more specific analysis of how the building's ongoing maintenance and operation can impact business needs. For instance:

— Where any disruption to business is costly, a specification with long periods between maintenance cycles and reduced maintenance time may be desirable.
— Where maintaining aesthetics are important, a maintenance cycle may be based on aesthetic upkeep rather than functional lifespan.
— Where maximum recyclability and re-usability is important, an alternative, costlier specification may be required.
— Where capital costs are constrained, the specification with the lowest LCC may not be affordable, and instead, the best available option within the budget is chosen.

Elemental LCC plan

This is commonly used for developing solutions at project level during options appraisals. Costs are normally at building elemental level on the entire asset. Information may be a mix of typical benchmark costs for key elements, comparative cost modelling or approximate estimates. It is expressed as cost per square metre of gross internal area (GIA) and presented for elemental analysis, aligned to the level of capital cost plans.

Life cycle cost (LCC)

The cost of an asset or its parts throughout its life cycle, while fulfilling the performance requirements; a methodology for systematic economic evaluation of life cycle costs over a period of analysis, as defined in the agreed scope.

Additional information

BSRIA Guide BG 67/2016

BSRIA Guide BG 67/2016[4] on Life Cycle Costing presents a practical approach LCC for the construction and operation of buildings and is compatible with the parts of ISO 15686 that provide recommendations for life cycle costing.

This document can be used as guidance illustrating the principles of LCC. It provides examples of considering alternative solutions, calculating and fine-tuning life cycle costs, as well as interpreting the results of this analysis.

Capital cost reporting

The lack of data related to capital and life cycle costs and benefits arising from more sustainable building design presents a major barrier to the uptake of more sustainable solutions. This part of the issue seeks to encourage the sharing of data to break down these barriers and to ensure that BREEAM continues to encourage cost-effective and financially beneficial solutions. This information is collected to assist research into the cost and savings of developing sustainable or BREEAM-assessed buildings, to inform the business case for sustainability and the ongoing development of BREEAM. All data submitted will only be used anonymously to create new products and services.

When to undertake LCC

LCC is relevant throughout the constructed asset's life cycle, in particular during the project planning, design and construction and also during the in-use phases. For further information please refer to guide ISO 15686-5:2017.

Standardised method for life cycle costing (SMLCC) for construction

The guide ISO 15686-5:2017 describes the SMLCC for construction procurement. The objectives of this guide are to provide:

1. A UK standard cost data structure for LCC, which aligns with BS ISO 15686-5 and with the Building Cost Information Service (BCIS) Standard Form of Capital Cost Analysis (SFCA) and industry recognised occupancy cost codes. (Refer to Annexes A, B and C) (www.rics.org).
2. LCC practitioners with a standardised method of applying LCC, applicable to the construction industry and to the key stages of the procurement process.
3. Process mapping the LCC stages – to help structure how to plan, generate, and interpret and present the results for a variety of different purposes and levels of life cycle cost planning.
4. Instructions on how to define the client's specific requirements for LCC and the required outputs and forms of reporting – and to decide on which method of economic evaluation to apply.
5. Simplification and demystification – by providing practical guidance, instructions and definitions, together with informative worked examples on how to undertake LCC (for construction).
6. An industry accepted methodology to facilitate a more accurate, consistent and robust application of LCC estimation and option appraisals, thereby creating a more effective and robust basis for LCC analysis and benchmarking. ISO 15686-5:2017 also seeks to help eliminate confusion over scoping and terminology and to address concerns over the uncertainty and risks that are undermining confidence in life cycle costs used for construction procurement.

Man 03 Responsible construction

Aim

To encourage construction sites which are managed in an environmentally and socially considerate, responsible and accountable manner.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	6 + 1 exemplary	Excellent, Outstanding	All
Shell and core	6 + 1 exemplary	Excellent, Outstanding	All
Shell only	6 + 1 exemplary	Excellent, Outstanding	All
EU Taxonomy	-	-	4 and/or 8–9 (items d and e in Table 4.1) (see also M5)

Assessment type specific notes

Ref	Assessment type specific notes
-	None

Building type specific notes

Ref	Building type specific notes
2.0	**Small-scale projects** For small-scale projects, a BREEAM New Construction Assessor can act as the BREEAM Advisory Professional (AP), without being a registered BREEAM AP. In this case, potential and actual conflicts of interest must be identified by the assessor and acknowledged in a written statement submitted alongside the assessment.

Assessment criteria

Prerequisite – Legal and sustainable site timber

1 All temporary site timber and timber-based products (excluding reused timber) used during the construction process of the project must be legal and sustainable timber.

Prerequisite – For Healthcare NHS buildings only

2 To award any of the credits available for this issue, any party who at any stage manages the construction site (e.g. the principal contractor, the demolition contractor) must operate an Environmental Management System (EMS) (see requirements of criterion 3 below).

One credit – Environmental management

3 All parties who manage the construction site at any stage must operate an EMS covering their main operations. The EMS must be third-party certified to ISO 14001, EMAS (EU Eco-Management and Audit Scheme), or an equivalent standard.

4 All parties who manage the construction site at any stage must implement best practice pollution prevention policies and procedures on site. To demonstrate compliance, the project team should complete the checklist given in Table 4.2 on page 54, showing how the intent of every section (e.g. air quality) has been met, even if by different means than the actions suggested. For EU Taxonomy alignment, please refer to M5.

One credit – BREEAM Advisory Professional – Site

5 The client must formally agree with the contractor the performance targets relating to the BREEAM certification that have been set for the project.

6 A BREEAM AP must be involved in the project at an appropriate time and level to ensure that the agreed performance targets are met. Specifically, the AP must:

6.a Work with the project team, including the client, to help them maximize performance against the agreed targets throughout construction, handover and closeout. This support will include considering links between the criteria that need to be met across all project areas to be assessed by BREEAM (e.g., Management, Energy, Ecology etc), going beyond the design intent wherever possible.

6.b Monitor progress against the agreed performance targets throughout all stages of the construction, paying particular attention wherever decisions are made that could critically impact the BREEAM performance, and keeping all records needed as evidence for the assessment.

6.c Proactively identify risks and opportunities related to the procurement and construction processes and the achievement of the targets agreed under criterion 5 above.

6.d Feedback promptly and regularly to the contractor and project team helping the project stay on track to meet its targets and supporting any necessary corrective actions.

6.e Where appropriate, coordinate and help the project team to provide the assessor with the necessary evidence to achieve the credits.

7 To achieve this credit at the final post-construction stage of assessment, the submitted assessor's report must show that a BREEAM AP was appointed and that the agreed performance targets have been demonstrably achieved by the project.

Up to two credits – Responsible construction management

8 For small-scale projects:

8.a The contractor must achieve items listed f, h, i, j and m (as listed within Table 4.1 below) to achieve one credit.

8.b Where the contractor achieves those items checked as 'required for one credit (for standard projects)' in Table 4.1 below, the small-scale project may achieve two credits.

9 All buildings not defined as small-scale projects are considered to be standard projects and credits are awarded as follows:

9.a All items checked as 'required for one credit (for standard projects)' in Table 4.1 below must be achieved for one credit to be awarded.

9.b Projects achieving criterion 9.a plus six additional items in Table 4.1 below may be awarded a second credit.

Table 4.1: Checklist of the required criteria to achieve credits for responsible construction management

Ref.	Criteria	Required for one credit (for standard projects)
Risk evaluation and implementation		
The principal contractor evaluates the risks (on site and off site), plans and implements actions to minimise the identified risks, covering the following, as appropriate:		
Vehicle movement		
a	Manage the construction site entrance to minimise the impacts (e.g. safety, disruption) arising from vehicles approaching and leaving the development footprint.	✓
b	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	

Ref.	Criteria	Required for one credit (for standard projects)
	loading or unloading. Where on-street loading is unavoidable, this should be appropriately managed.	
c	Identify access routes to the development footprint, including for heavy vehicles to minimise traffic disruption and safety risks to others.	
Pollution management		
d	Minimise the risks of air, land and water pollution (for EU Taxonomy compliance, see M5).	✓
e	Minimise the risks of nuisance from vibration, light and noise pollution.	✓
Tidiness		
f	Implement practices to ensure the development footprint is safe, clean and organised at all times. This includes, but is not limited to, facilities, materials and waste storage.	✓
g	Ensure clear and safe access in and around the buildings at the point of handover.	✓
Health and wellbeing		
h	Provide processes and equipment required to respond to medical emergencies.	✓
i	Identify and implement initiatives to promote and maintain the health and wellbeing of all site operatives within the development footprint. This can involve site facilities, site management arrangements, staff policies etc.	✓
j	Establish management practices and facilities encouraging equality, fair treatment and respect of all site operatives and visitors.	✓
k	Provide secure, clean and organised facilities (e.g. welfare, changing and storage facilities) for site operatives within the development footprint.	
Security processes		
l	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		
See Methodology M3. The principal contractor is responsible for:		
m	Minimising nuisance and intrusion on the lives of the local community, and engaging with the community and neighbourhood to ensure that any unavoidable impacts of construction are communicated regularly and sensitively.	✓
n	Ensuring ongoing and up-to-date training is provided for personnel and visitors (covering items a to l, as appropriate.)	
o	Ensuring all site operatives are trained for the tasks they are undertaking (including any site-specific considerations).	
p	Promoting safety on and off-site by ensuring driving and operator training and safety awareness have been undertaken for any company vehicles (cars and vans), movable plant and equipment (such as dumpers, diggers, cranes), trucks, lorries or waste removal wagons whether owned, leased or hired by the principal contractor.	
Monitoring and reporting		
The principal contractor ensures:		
q	Any vehicular accidents, incidents and near misses, on-site or in the vicinity of the site entrance and relating to site activities, are recorded, investigated and analysed and that learnings are incorporated in updated policies and training.	
r	All visitor, workforce and community accidents, incidents and near misses are recorded and action is taken to reduce the likelihood of them reoccurring.	✓
s	Processes are in place to facilitate collecting and recording feedback from the community and to address any concerns related to the development footprint.	

Up to two credits – Site monitoring

10 Assign responsibility for site monitoring to a named individual. This is a prerequisite for the award of any of the site monitoring credits as set out below. The responsible individual must have the appropriate authority and experience to access the data required. They may be the BREEAM AP, where one has been appointed. They will be required to monitor, record and report energy use, water consumption and transportation data (where measured) resulting from all on-site construction processes (and dedicated off-site manufacturing) throughout the build programme. Report the project value.

One credit – Monitoring utility consumption

Energy consumption

11 Set targets at design stage for the site energy consumption in kWh (and where relevant, litres of fuel used) resulting from the use of construction plant, equipment (mobile and fixed) and site accommodation.

12 Monitor and record data for the energy consumption described in criterion 11 and show that the consumption targets have been achieved.

13 Report the total carbon dioxide emissions (total $kgCO_2e$) and energy consumption (electricity in kWh or litres of fuel) resulting from the construction process.

Water consumption

14 Set targets at design stage for the potable water consumption (m^3) arising from the use of construction plant, equipment (mobile and fixed) and site accommodation.

15 Monitor and record data for the potable water consumption described in criterion 14 and show that the consumption targets have been achieved.

16 Use the collated data to report the total net water consumption resulting from the construction process (m^3), i.e. consumption minus any recycled water use.

One credit – Monitoring transport of construction materials and waste

17 Set targets at design stage and monitor and record data relating to transport movements and other impacts resulting from delivery of the majority of construction materials to the site and removal of construction waste from the site (see M4). As a minimum this must cover:

17.a Transport of materials from the point of supply to the building site, including any transport, intermediate storage and point of supply.

17.b The scope of this monitoring must cover the materials used within the following as a minimum:

17.b.i Superstructure, as listed in Table 9.6 in Mat 03.

17.b.ii Internal finishes, as listed in Table 9.7 in Mat 03.

17.b.iii Substructure and hard landscaping, as listed in Table 9.8 in Mat 03.

17.b.iv Core building services, as listed in Table 9.9 in Mat 03.

17.c Transport of construction waste from the construction gate to waste disposal processing or recovery centre gate. Monitoring must cover the construction waste groups outlined in the project's resource management plan.

18 Using the collated data, report separately for materials and waste, the total transport-related carbon dioxide emissions ($kgCO_2e$), plus total distance travelled (km) and amount of fuel used (litres).

One exemplary credit – Responsible construction management

19 Achieve all items in Table 4.1 on page 51.

Checklists and tables

The project team will need to complete this checklist as part of the credit for 'Environmental management' (see criterion 4). The assessor and project team must ensure that the intent of each section is met through measures appropriate to the site, which may be different to the examples given here. Areas outside the site boundary with special permission for enabling works should be included.

Table 4.2: Checklist of measures to minimise air and water pollution during construction works

Section and intent	Examples of actions

1. Pollution prevention planning
To allow time to plan and prepare before work begins on site. This can significantly reduce the risk of a pollution incident.
	Possible activities to consider before works begin on site:
	— Review the site and site plans for possible sources of pollution, pollution pathways and vulnerable areas.
	— Review any environmental information about the site such as ecology reports or site investigation reports and highlight potential issues. This could include site working restrictions relating to noise or deliveries.
	— Identify:
	    — Potential pollutants
	    — The potential to cause pollution on site.
	    — All interested groups i.e. regulators and neighbours.
	    — Surface waters and ground waters adjacent to the site.
	    — Drainage on site.
	— Confirm any legislation that applies to the project.
	— Plan appropriate control measures that are required.
	— Designate a responsible person to monitor high risk activities and with sufficient authority to prevent them.

2. Noise and vibration Minimise the impact of noise and vibration in the local community.	Measures may include where applicable: — Planning the noisiest activities for times that will result in the least disturbance to the local community. — Putting together a traffic management plan. — Use of barriers or deflectors for impact and blasting activities. — Using plant or machinery with noise controls measures – silencers, mufflers, acoustic covers. — Avoiding or minimising construction transport through community areas, use of one-way traffic to minimise reversing, agreed delivery times.
3. Air quality To prevent dust and other air pollution on site and in the local community.	This may include where applicable: — Minimising dust from materials or waste ensuring these are adequately protected, covered, or damped down. — Reducing dust from vehicle movements through damping down roads, wheel washers, and road sweeping. — Avoiding burning of materials on site. — Ensuring plant and vehicles are regularly maintained and meet necessary exhaust emission standards.
4. Watercourse pollution To prevent water pollution from on-site activities.	This may include where applicable: — Marking up a plan identifying all watercourses and existing drains on site, any existing protection in place or protection measures required to capture, contain, and treat possible contaminants or run-off. — Controls to prevent silt entering watercourses and drains including features such as cut-off trenches or vegetation corridors. — Ensuring fuel, chemical and waste storage areas and activities such as cement mixing or washing out are located away from rivers, boreholes, gullies or other water courses. — Storing all chemicals and hazardous substances in a contained, bunded areas on an impermeable surface and ensuring all containers are free from damage and disposed of correctly. — Training staff on the correct transfer and handling of fuels and chemicals, and emergency procedures. — Providing portable spill containment and clean-up equipment on site and training staff to use it. — Where there is a risk to water quality, carrying out an Environmental Impact Assessment and developing a water use and protection management plan (for EU Taxonomy compliance, see M5).

Methodology

M1: Scope of Man 03 Responsible construction

This issue encompasses the responsible management of all activities on site, and relating to the site from the beginning of demolition to the completion of construction. All criteria detailed in this issue, and the aim of the issue overall, are considered the responsibility of any party who at any stage manages the construction site, e.g. the principal contractor and the demolition contractor, even (or in particular) when this is not consistent throughout a project.

The above notwithstanding, if the developer or client has taken ownership of a site following completion of demolition works, those works can be excluded from the assessment of this issue.

M2: The role of the BREEAM AP

M2.1: Change of BREEAM AP during the project

The BREEAM AP must keep records of targets, reasons behind decisions, any risks and opportunities identified, and any feedback or advice provided to the project team to fully document their involvement. If the person carrying out this role changes during the course of the project, as may be unavoidable at times. Credits may still be awarded provided there has been a robust handover of records and information to a new BREEAM AP and the role is seamlessly maintained in accordance with the criteria.

M2.2: BREEAM AP monitoring construction progress

To monitor the construction progress against the agreed performance targets (see criterion 6.b on page 51), the BREEAM AP should ideally be site based. If based elsewhere, they must visit the site sufficiently regularly to monitor activities, carry out spot checks, identify risks of non-compliance and advise on how to address any such shortcomings.

The BREEAM AP must as a minimum visit the site at key stages of the construction process, such as at times when:

- Works can be observed before they are covered up or new works or trades start.
- There are significant risks of conflicts or errors occurring.
- Timing is critical for demonstrating compliance.
- Key evidence is required to be produced at specific times. This includes, but is not limited to, photographic evidence, delivery notes and other documentary evidence.
- Different trades and systems working simultaneously risk harming one another's integrity or compliance in terms of BREEAM requirements.

M3: Training

For the purposes of this issue, appropriate training can mean teaching, or developing for oneself or others, areas of skill and knowledge relating to relevant competencies (e.g. manual handling, safe working practices, regulations, project management, vocational skills, site supervision).

Training includes, but is not limited to:

1. Formal external training.
2. On site learning from trained or experienced people.
3. Provision of training material or instructions for carrying out tasks.

M4: Transport of construction materials – Data and methodology

To ensure comparability across assessments, the information completed in the BREEAM Platform should be restricted to the minimum data specified.

Recording of data for deliveries to site must include all materials applicable to the scope of works as set out within criteria 17.b.i to 17.b.iv. Records should be available to verify that monitoring has been completed in line with the requirements. Final reporting of the transportation of construction materials figures, such as total carbon dioxide emissions and distance travelled, is to be based on the total figures for all such deliveries. Data for the collection of waste from site must be reported separately to the delivery of materials.

The aim of this requirement is to encourage developers to consider the impacts of transporting products and materials to site. As such, the criteria seek only to address only those impacts over which the developer has influence.

In reporting for this issue, the distances travelled by materials should be calculated from the point at which the products or materials were dispatched for the project, whether this be directly from a builders' merchant or distributor, or direct from manufacturer. To clarify:

— For products or materials purchased directly from a manufacturer or quarry the distance should be calculated from the 'factory gate', including any intermediate transport.

— For products or materials purchased from a merchant or distributor, only the distance from the seller's depot needs to be reported.

Where products cannot be sourced locally, for example on small islands, the transport required to import the materials or products can be discounted, and only the local onward transport to the site need be recorded.

M5: Environmental management and EU Taxonomy alignment

In addition to the general measures outlined in Table 4.2 on page 54 relating to measures taken to reduce noise, dust and pollutant emissions during construction works, together with items d and e in Table 4.1; it will need to be confirmed that the following requirements have also been addressed:

Where there is a risk to water quality, it must be demonstrated that the environmental degradation risks related to preserving water quality and avoiding water stress are identified and addressed, with the aim of achieving good water status and good ecological potential, as defined in Article 2, points (22) and (23), of Regulation (EU) 2020/852, in accordance with Directive 2000/60/EC of the European Parliament and of the Council. This should include:

— An assessment of the impact on water and how risks have been addressed. This could be addressed by an Environmental Impact Assessment, carried out in accordance with Directive 2011/92/EU of the European Parliament and of the Council which includes an assessment of the impact on water in accordance with Directive 2000/60/EC.
— A water use and protection management plan, developed for the potentially affected water bodies, in consultation with relevant stakeholders.

Where compliance is demonstrated for criteria 8 and 9 using the Considerate Constructors Scheme, additional evidence may be required to show how items d and e have been met for EU taxonomy, if not covered within the Monitor's Report.

Compliance notes

Ref	Terms	Description
Environmental management		
CN1	No principal contractor. See criteria 3 and 4.	In order to achieve compliance where there is no principal contractor, the criteria must be met by the party which fulfils an equivalent role in managing the construction. The intent of this issue is to ensure that the site is managed in accordance with demonstrably sustainable principles by whichever party has overall control of site management and operations.
CN2	Certificate validity. See criterion 3.	The requirement for the principal contractor to operate an EMS relates to the duration of operations on site. Certification against ISO 14001 or EMAS must be valid at the design stage and post-construction stage submissions and cannot be expired, pending or applied retrospectively.
CN3	Timing of obtaining EMS certification. See criterion 3.	The contractor must be in possession of the ISO 14001 or EMAS certification prior to starting works on the development under assessment. This is to ensure that the aim of the issue, to 'encourage construction sites managed in an environmentally sound manner', can be achieved. To uphold the robustness of BREEAM, the date of certification to ISO 14001 or EMAS must be prior to initial works starting on the site.
BREEAM AP		
CN4	Retrospectively applying AP status.	The AP status cannot be applied retrospectively. The purpose of using an AP on a

Ref	Terms	Description
	See criterion 6.	project is so that they can influence and maximise the development the BREEAM and sustainability performance of the project for the least cost/risk. If the AP is not appointed and involved from at least the beginning of work on site, and preferably in the planning of such work, then the aims and criteria of this BREEAM issue are not being met.
CN5	BREEAM Assessor as the BREEAM AP. See criterion 6.	Where an assessor holds current and applicable AP credentials, the same individual can be appointed as both BREEAM Assessor and BREEAM AP for the project. In such a case, it must be made clear when submitting the assessment that both roles are, or were, being carried out by the same person and explain in writing how potential conflicts of interest have been identified and managed.
Responsible construction management		
CN6	Compliance with responsible construction management items. See criteria 8, 9 and 19.	In instances where items in Table 4.1 on page 51 are not relevant due to the project scope of works on site, the assessor should clearly justify and robustly demonstrate why the project is compliant without these items having been achieved.
General		
CN7	Change in main contractor	If the main contractor changes mid-project (for example where the original contractor goes into administration and is replaced) it is acceptable for the post-construction credits to be based on the activities of the new contractor providing the change takes place prior to works commencing on site. However, if the project has already started on site and information about the site activities of the previous contractor is not available it would not be appropriate to award the credit based solely on the new contractor's activities. Where it is not possible in this situation to demonstrate compliance retrospectively, for example because there are no appropriate records of site actions or monitoring, the relevant credits must be withheld. However, this kind of incomplete evidence will not, in itself, prevent the project from achieving a BREEAM rating and, where relevant, a prerequisite or minimum standard can be waived. For example: — UK NC V7 Man 03 Prerequisite – Legal and sustainable site timber. This is based on the assessor/client demonstrating appropriate efforts to obtain relevant evidence from the company in administration and providing the following: — Evidence of the company going into administration. — Evidence of compliance from the company in administration, where available. — Evidence of compliance from the date a new company was engaged.
CN8	Multiple contractors on the same project	The aim of this issue is that the construction site complies with BREEAM criteria rather than any specific contractor. Several different contractors may have obligations to meet compliance criteria. One of the contractors and/or site managers may have responsibility for ensuring compliance during site operations. It is ultimately the client/project team’s responsibility to determine and demonstrate compliance.

Evidence

Criteria	Interim design stage	Final post-construction stage
Prerequisite – Legal and sustainable site timber		
1	Relevant section or clauses of the building specification or contract. OR	Confirmation of all temporary site timber used and for what purpose.

Criteria	Interim design stage	Final post-construction stage
	A signed and dated letter of commitment to meet the relevant criteria.	Where certified materials were used, copies of all relevant certificates or chain of custody evidence. Robust post-construction evidence to verify proof of purchase such as delivery tickets, invoices, purchase orders, confirmation from suppliers or site photographs.
Environmental management		
2, 3	Relevant section or clauses of the building specification or contract. OR A signed and dated letter of commitment to meet the relevant criteria. OR A copy of the principal contractor's EMS/EMAS certificate, where contractor is appointed.	A copy of the principal contractor's EMS/EMAS certificate.
4	Relevant section or clauses of the building specification or contract. OR A signed and dated letter of commitment to meet the relevant criteria. OR A copy of the checklist (Table 4.2 on page 54) and supporting evidence confirming the proposed measures and procedures against each section.	A copy of the checklist (Table 4.2 on page 54) confirming how each section has been addressed by the referenced evidence. Evidence to support that procedures and policies for pollution prevention management were in place and implemented such as construction environmental management plans, site procedures, site plans, site records and site photographs.
BREEAM AP		
5	Relevant section or clauses of the building specification, contract documents or formal agreement stating the required BREEAM performance rating.	No further actions required post-construction. No additional evidence is required other than that listed for the design stage.
6	Relevant section or clauses of the building specification or contract. OR A signed and dated letter of commitment to meet the relevant criteria.	Evidence to confirm the appointment of the BREEAM AP and confirming their AP status. Supporting evidence such as reports, correspondence and meeting minutes to verify their ongoing involvement in the project and attendance on site and at relevant project team meetings.
Responsible construction management		
8, 9, 19	Relevant section or clauses of the building specification or contract. OR A signed and dated letter of commitment to meet the relevant criteria. Note: It must be clear which responsible construction management items within Table 4.1 on page 51 are being targeted.	Supporting evidence such as site plans, procedures or policies, site inspection reports or photographs, site records or letters. Where applicable, CCS certificate and monitor's final report. Note: it must be confirmed how each point in Table 4.1 on page 51 has been evidenced (except where met by CCS certification).
Site monitoring		
10 to 18	Confirmation of the targets that have been set for the project. Details of the predicted project value.	Name of the individual appointed for monitoring, recording and reporting site data. Confirmation of the final project value.

Criteria	Interim design stage	Final post-construction stage
	AND Relevant section or clauses of the building specification or contract. OR A signed and dated letter of commitment to meet the relevant criteria.	Monitoring records showing the collated construction phase data including: — Total site energy consumption. — Total site net water consumption. — For both materials and waste, the total transport-related carbon dioxide emissions plus total distance travelled and fuel consumption. — Evidence to validate figures provided such as photos of meter readings or invoices.
EU Taxonomy		
M5	Where a risk to water quality occurs provide: — An assessment of the impact on water and how risks have been addressed. — A copy of the water use and protection management plan. — Confirmation that the assessment is in line with the listed directives.	Where a risk to water quality occurs provide: — Evidence to show that any identified measures to reduce risks during the design stage assessment were implemented.

Definitions

BREEAM Advisory Professional (AP)

An individual trained and qualified by BRE as a specialist in built environment sustainability, environmental design and assessment. Under this definition, the BREEAM AP must remain a member of BRE's associated membership scheme throughout the project, ensuring their competence has been maintained through continuing professional development. For a list and contact details of BREEAM APs, visit: www.greenbooklive.com.

The assessor must ensure that the BREEAM AP qualification was valid at the time of appointment and maintained throughout their involvement in the relevant project stages.

BREEAM AP - Design and Site or *BREEAM AP - Site* may perform the role during the construction stages of the project. The AP does not need to be the same person as appointed under Man 01.

BREEAM-recognised responsible construction management schemes

These are third-party schemes evaluated by BRE Global for recognition under BREEAM. For further guidance on recognised schemes and the way in which they support compliance with these BREEAM criteria, see Guidance Note 54 (GN54).

This is a list of existing schemes that we are currently aware of that may support the achievement of the responsible construction management criteria:

- **Considerate Constructors Scheme:** The Considerate Constructors Scheme (CCS) is a national initiative set up by the UK construction industry to improve its image. The scheme is a self-financing, independent organisation owned by the Construction Umbrella Bodies (Holdings) Ltd (made up of the Construction Products Association and the Construction Industry Council). Sites and companies that register with the scheme sign up and are monitored against a Code of Considerate Practice, designed to encourage best practice beyond statutory requirements.
- **Fleet Operator Recognition Scheme:** The Fleet Operator Recognition Scheme (FORS) is a voluntary accreditation scheme that promotes best practice for commercial vehicle operators. FORS encompasses all aspects of safety, efficiency, and environmental protection by encouraging and training fleet operators to measure, monitor and improve performance. FORS provides accreditation pathways for operators of any type, and for those organisations that award contracts and specify transport requirements

Construction process

The construction process includes the enabling works, assembly, installation and dis-assembly activities necessary for servicing the construction and completion of a new building.

Dedicated off-site manufacturing or fabrication

Production of a component or material carried out in an off-site manufacturing or processing facility specifically set up for the development project. This excludes manufacturing from 'off the shelf' products.

Development footprint

The development footprint includes any land used for buildings, hardstanding, landscaping, site access or where construction work is carried out (or land is being disturbed in any other way), plus a 3 m boundary in every direction around these areas. It also includes any areas used for temporary site storage and buildings. If it is not known exactly where buildings, hardstanding, site access, temporary storage and buildings will be located, it must be assumed that the development footprint is the entire development site.

Exhaust emission standards

This may include demonstrating that the following standards are being met. Where local authority or national guidelines are in place, these may be used instead.

— Non-Road Mobile Machinery (NRMM) Regulation (EU) 2016/1628.
— For road going vehicles: Euro emission standards (Euro 1 to 7).

Formally agreed

The term 'formally agreed' relates to performance targets. Examples of formal agreements include a contract or letters of appointment with the architect and with other relevant project team members.

Performance targets

Performance targets refer to the BREEAM rating and minimum standards required. Where appropriate, performance targets can be related to individual BREEAM credits.

However, performance targets may also involve other targets related to issues covered in BREEAM assessments, e.g. energy, health and wellbeing.

Point of supply

For the purposes of this issue, point of supply is the point from which the product was supplied to the site. This may be the factory gate or the distribution centre, depending on the product type.

The factory gate is defined as the product manufacturer's gate (i.e. where manufacture and pre-assembly finishes and the material is in its final product form). Examples might include:

1. Steel, concrete or glass manufacturers for cladding, windows and beams etc.
2. Quarry gate for aggregate and sand.
3. Concrete plant for concrete.
4. Saw mill and timber processing plant for timber.

Principal contractor

The company that has overall responsibility for overseeing the construction stage of the project, whether that is a contractor or managing agent.

Project team

The composition of the project team may change through the duration of a project and may include several members. This includes but is not limited to the client, the design teams, contractors etc.

Project value

The term 'project value' represents the total project cost, which includes all costs such as construction, design, land acquisition, etc.

Small-scale projects

For the purposes of this issue, small-scale projects are defined as projects up to 500m² gross internal floor area.

Small-scale projects may follow full requirements where preferred.

Timber – including legal and sustainable; legally harvested and traded; recycled / reclaimed

Legal and sustainable timber

BREEAM follows the UK government's definition of legal and sustainable timber, as outlined in the Central Point of Timber (CPET) 5th Edition of the UK Government Timber Procurement Policy (TPP). At the time of writing, the policy requires all timber and wood-based products to be covered by at least one of the following (but the webpage below should be checked for changes):

1. Third party, independent forest certification schemes – Category A (e.g. FSC or PEFC).
2. Evidence on a case-by-case basis in line with the Framework for Evaluating Category B evidence – Category B.

For the avoidance of doubt, 100% of the timber and timber-based products must be compliant.

Further information on the UK Government's TPP and compliant responsible sourcing certification schemes is available from: www.gov.uk/guidance/timber-procurement-policy-tpp-prove-legality-and-sustainablity.

Reused timber formwork automatically complies. Reusable timber formwork itself does not automatically comply. All timber used in the manufacturing of the formwork must be covered by a responsible sourcing certification scheme (RSCS) recognised by BREEAM. See Guidance Note 18 (GN18) for the BREEAM recognised RSCS schemes.

Legally harvested and traded timber – examples

The following examples are considered compliant for BREEAM purposes.

Legally harvested:

1. Evidence of compliance with the CPET (see here, timber bought inside the UK only).
2. FSC, PEFC or SFI certification (this includes products labelled FSC Mix or PEFC mixed sources).
3. Evidence of compliance with the EUTR (timber bought inside the EU only).
4. Risk assessment/due diligence documentation demonstrating a low risk of non-compliance with the 'legally harvested' requirements given in the manual.

Legally traded:

1. Evidence of compliance with the CPET (see here, timber bought inside the UK only).
2. FSC, PEFC or SFI certification (this includes products labelled FSC Mix or PEFC mixed sources).
3. Risk assessment/due diligence documentation demonstrating a low risk of non-compliance with the 'legally traded' requirements given in the manual.

Products labelled as FSC Controlled Wood only minimise the risk that wood comes from illegal or controversial sources, and does not eliminate the risk fully. Therefore, products labelled as such do not meet the prerequisite for legally harvested and traded timber.

Old timber formwork, that is being reused and verified as such, can be excluded from the requirements. The criteria only applies to new formwork or scaffolding boards.

Recycled / reclaimed timber

This is recovered wood that prior to being supplied to the project had an end use as a standalone object or part of a structure that has completed its lifecycle, and which would otherwise be disposed of as waste. The term covers the following categories:

- Pre-consumer recycled wood and wood fibre or industrial by products but excluding sawmill co-products (sawmill co-products are deemed to fall within the category of virgin timber).
- Post-consumer recycled wood and wood fibre.
- Drift wood.

The term "recycled" also covers reclaimed timber that was abandoned or confiscated at least ten years previously.

Additional information

Examples of evidence for BREEAM AP criteria

Examples of evidence that could be used to demonstrate compliance with some of the requirements of the BREEAM AP related criteria include, but are not limited to the following:

- Meetings minutes, communication records, formal notes of conversations and other statements reporting on discussions related to performance targets and maximising performance.
- Risks and opportunities documentation.

Examples of evidence for responsible construction management

Examples of evidence that satisfy criteria 8 to 9 on page 51 include, but are not limited to the following:

- Company's policy and procedure documents (including environmental management, pollution prevention, security)
- Construction logistics plan
- Responsibility matrix
- Training records
- Photographic evidence
- Records of communication with the neighbouring community (e.g. letters, newsletters and campaigns)
- Contracts or formal agreements – Reporting documents and logs
- Reporting procedures
- Records of improvements and of no complaints
- Lessons learned
- Evidence produced by third party schemes (e.g. CCS monitor's report, FORS, CLOCS, Yellow Jacket documentation).

CO_2e reporting protocols

At time of publication, the following guidance is available for CO_2e measuring protocols.

1. Encord: www.encord.org
2. Greenhouse Gas Protocol: www.ghgprotocol.org
3. Defra guidance for business: www.gov.uk/guidance/measuring-and-reporting-environmental-impacts-guidance-for-businesses

Tools for monitoring and targeting construction site impacts

BRE's online environmental reporting tool, SmartWaste, enables users to capture, monitor and target a project's on-site energy consumption and produce a CO_2 footprint, water consumption and responsible sourcing of timber. transportation and CCS data can also be collected. The system can be used as a tool to help meet the criteria of this issue and as a source of evidence for demonstrating compliance. It is available through the SmartWaste membership scheme by developing tailor-made versions of SmartWaste. More details on the tool and membership are available at www.smartwaste.co.uk.

The value of the BREEAM AP

The BREEAM AP can be called on and provide 'scheme-related' expertise to design teams, specifiers, constructors and other key stakeholders. This will inform decision-making and therefore identify opportunities to maximise performance and work towards a targeted rating in the most cost-effective, timely and solutions-orientated way.

An AP can work for a construction organisation frequently undertaking BREEAM-related work. Moreover, the BREEAM AP can be the same person as the BREEAM Assessor. This allows flexibility and versatility in the use of the role.

Cost efficiencies are expected where the appointed licensed assessor also acts as the BREEAM AP for a project.

In either case, an efficient AP will coordinate with the BREEAM Assessor to ensure an efficient and smooth assessment process, aiming to maximise the performance of the assessed project.

Tools and schemes for responsible construction management

Other tools and schemes can contribute to achieving the credits for responsible construction management, including the Considerate Constructors Scheme and Fleet Operator Recognition Scheme. For more information, see Guidance Note 54 (GN54).

Pollution Prevention Guidance documents

On 17 December 2015, the Pollution Prevention Guidance documents (PPGs) published by the Environment Agency were withdrawn. These can still be found in the National Archives or on the Scottish Environment Protection Agency website where they are still current documents.

PPG6 can still be used to provide guidance on best practice policies and procedures which may be adopted in order to demonstrate compliance.

Man 04 Commissioning and handover

Aim

To encourage a properly planned handover and commissioning process that reflects the needs of the building occupants.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	4	Very Good	All
Shell and core	4	Very Good	All (see ref 1.0 and 1.1)
Shell only	1	None	9 and 10
EU Taxonomy	-	-	9–10 (see M1.6)

Assessment type specific notes

Ref	Assessment type specific notes
1.0	**Shell and core** Commissioning testing schedule and responsibilities and design and preparation is applicable according to the scope of services being specified or installed.
1.1	**Shell and core – Guides and training schedules** The guides and training schedules include, as far as possible, all relevant sections regarding the services and fabric installed. On completion of works the building owner, agent or user hands it over to the fit-out contractor, who can then complete the relevant sections based on the fit-out strategy.

Building type specific notes

Ref	Building type specific notes
2.0	**Small-scale projects** For small-scale projects, only the requirements for 'Schedule and responsibilities (criteria 1 to 5) and 'Handover' (criteria 11 and 12) are applicable.

Assessment criteria

One credit – Schedule and responsibilities

1 Prepare a schedule of commissioning and testing. The schedule identifies and includes a suitable timescale for commissioning and re-commissioning of all complex and non-complex building services and control systems and for testing and inspecting building fabric.

2 The schedule identifies the appropriate standards for all commissioning activities to be conducted, where applicable, in accordance with:

2.a Current Building Regulations .

2.b BSRIA guidelines[5].

2.c CIBSE guidelines[6].

2.d Other appropriate standards (see CN1 on page 68).

Any process or manufacturing-related equipment specified as part of the project can be excluded from the assessment, except where it forms an integral part of building HVAC services, such as some heat recovery systems.

3 Where a building management system (BMS) is specified:

3.a Carry out commissioning of air and water systems when all control devices are installed, wired and functional.

3.b Include physical measurements of room temperatures, off-coil temperatures and other key parameters, as appropriate, in commissioning results.

3.c The BMS or controls installation should be running in auto with satisfactory internal conditions prior to handover.

3.d All BMS schematics and graphics (if BMS is present) are fully installed and functional to user interface prior to handover.

3.e Fully train the occupier or facilities team in the operation of the system.

4 Appoint an appropriate project team member to monitor and programme pre-commissioning, commissioning and testing. Where necessary include re-commissioning activities on behalf of the client.

5 The principal contractor accounts for the commissioning and testing programme, responsibilities and criteria within their budget and the main programme of works. Allow the required time to complete all commissioning and testing activities prior to handover.

One credit – Commissioning role

6 Achieve the schedule and responsibilities credit (criteria 1 to 5).

7 During the design stage, the client or the principal contractor appoints an appropriate project team member (see criterion 4), provided they are not involved in the general installation works for the building services systems, with responsibility for:

7.a Undertaking design reviews and giving advice on suitability for ease of commissioning.

7.b Providing commissioning management input to construction programming and during installation stages.

7.c Management of commissioning, performance testing and handover or post-handover stages.

For buildings with complex building services and systems, this role needs to be carried out by a specialist commissioning manager.

One credit – Envelope testing

8 Achieve the schedule and responsibilities credit (criteria 1 to 5).

9 Complete post-construction testing and inspection to quality-assure the integrity of the building fabric, including continuity of insulation, avoidance of thermal bridging and air leakage paths (this is through airtightness testing and a thermographic survey) (see Methdology M1). A suitably qualified professional undertakes the survey and testing in accordance with the appropriate standard (see M1.5). For EU taxonomy alignment, please see M1.6.

10 Rectify any defects identified during post-construction testing and inspection prior to building handover and close out. Any remedial work must meet the required performance characteristics for the building or element as defined at the design stage (see M1.4).

One credit – Handover

11 Prior to handover, develop two building user guides (see M2) for the following users:

11.a A non-technical user guide for distribution to the building occupiers.

11.b A technical user guide for the premises facilities managers.

A draft copy is developed and discussed with users first (where the building occupants are known) to ensure the guide is most appropriate and useful to potential users.

12 Prepare two training schedules (see M3) timed appropriately around handover and proposed occupation plans for the following users:

12.a A non-technical training schedule for the building occupiers.

12.b A technical training schedule for the premises facilities managers.

Methodology

M1: Envelope testing

M1.1: Scope of thermographic survey

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. Untreated spaces, which are not subject to compliance with statutory energy performance regulations, can be excluded from the envelope testing criteria.

M1.2: Large complex buildings

In the case of large and complex buildings, it may be impractical for the thermographic survey and airtightness testing to cover 100% of the building. Where a complete thermographic survey or airtightness testing is deemed impractical by a suitably qualified professional (thermographic survey or airtightness testing), the following guidance applies:

- Airtightness testing: Guidance in airtightness standard ISO 9972:2015 (or relevant local standard) should be followed regarding the extent of the survey and testing. This could include, for example, airports, large hospitals, high-rise buildings.
- Thermographic survey: Any building with a floor area less than 2000 m² should have a full survey unless it contains a large number of similar rooms, e.g. a health centre or hotel. Any building with a floor area greater that 2000 m² may be sampled by taking images of a representative sample of spaces on each floor including spaces with different activities and at different locations on the floor plan. Each elevation and each elevational and roof treatment/type need to be sampled. Sampling should be increased if evidence of poor building fabric thermal performance is identified from sampling.

M1.3: Shell only buildings

For shell only assessments with spaces which are intended to be treated post-assessment, imposing the requirement for a thermographic survey on a future user is not acceptable, as it may be difficult and unreasonable to expect them to remediate any defects revealed by the survey. Therefore, the credit is still applicable even if building services have not yet been fitted.

M1.4: Remediation work

Any remediation work undertaken, resulting from a thermographic survey and airtightness test of the building, should be robust and durable, i.e. the remedial work must have the same performance characteristics and life expectancy of the surrounding elements.

M1.5: Appropriate standards

Air tightness testing

- ISO 9972:2015 Thermal performance of buildings — Determination of air permeability of buildings — Fan pressurization method.

Thermographic survey

- ISO 6781-1:2023 Performance of buildings - Detection of heat, air and moisture irregularities in buildings by infrared methods Part 1: General procedures.
- ISO 6781-3:2015 Performance of buildings - Detection of heat, air and moisture irregularities in buildings by infrared methods Part 3: Qualifications of equipment operators, data analysts and report writers.

M1.6: Envelope testing and EU Taxonomy alignment

In order to align with the EU taxonomy, the following requirements apply to buildings larger than 5000 m²:

a. The performance levels for the air-tightness and thermal integrity should be specified at design stage.
b. The results from post-completion testing should be reported to investors and clients, together with any deviation to the levels of performance set at the design stage and defects identified in the building envelope.

M2: Building user guides

The building user guides shall be building-specific or site-specific guidance. The purpose of the guides is to help building users access, understand and operate the building efficiently and in accordance with the original design intent. The content of the guides is specific to the building type and end users, but broadly should include information on the following:

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

Additionally, for the non-technical building user guide for building occupiers:

1. 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.
2. Pre-arrival information for visitors, e.g. access and security procedures or provisions.

Additionally, for the technical building user guide for facilities managers:

1. 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.
2. Refit, refurbishment and maintenance arrangements or considerations
3. Building related training information or links.

The building user guide for building occupiers shall be written in plain English and provide easily accessible and understandable information relevant to the building's staff (or where relevant residents) and to other building users, e.g. visitors or community users.

The building user guide for facilities managers can use more technical language if appropriate and provide understandable information relevant to the professionals managing the building facilities. This guide could be part of the operations and maintenance (O&M) manual.

There is no requirement on the format the building user guide should take.

M3: Training schedule

The training schedules shall include the following as a minimum:

- The building's design intent.

Additionally, for the building occupiers' training schedule:

- Introduction to the non-technical building user guide for building occupiers and other relevant building documentation.

Additionally, for the facilities managers' training schedule:

- The available aftercare provision and aftercare team main contacts, including any scheduled commissioning and post occupancy evaluation.
- Introduction to, and demonstration of, installed systems and key features, particularly building management systems, controls and their interfaces.
- Introduction to the technical building user guide for facilities managers' and other relevant building documentation, e.g. design data, technical guides, maintenance strategy, operations and maintenance (O&M) manual, commissioning records, log book etc.
- Maintenance requirements, including any maintenance contracts and regimes in place.

For speculative developments where the end user is unknown, the training schedules should still be provided; and either a contract to provide future training to end users or evidence that relevant training has been provided to the building owner or a building or facilities manager.

Compliance notes

Ref	Terms	Description
Schedule and responsibilities		
CN1	Other appropriate standards for criterion 2.d on page 64	Appropriate standards for completion of criterion 2.d on page 64 include the following: **Building fabric** 1. BS EN 13187:1999 Thermal performance of buildings. Qualitative detection of thermal irregularities in building envelopes. Infrared method.(7) 2. BS EN ISO 9972:2015 Thermal performance of buildings – Determination of air permeability of buildings – Fan pressurisation method.(8) **Commercial refrigeration** 1. BRA Guide to Good Commercial Refrigeration Practice, Part 5 Commissioning.(9) 2. GPG 347 Installation and Commissioning of refrigeration systems.(10)
Commissioning role		
CN2	Monitor and specialist commissioning manager	The commissioning monitor is typically a project team member who will monitor the systems commissioning and testing programme for the building. The individual may combine that role with that of the specialist commissioning manager to deal with complex systems if they have the necessary knowledge. However, if the building has several specialist systems it is unlikely that the same person would be able to carry out all of the commissioning and more than one specialist would most likely be required.
Envelope testing		
CN3	Thermographic survey – Seasonal constraints	Where seasonal constraints prevent the thermographic survey from being completed prior to certification at the post construction stage, the requirements can be satisfied with: — Evidence that a suitably qualified professional (SQP) has been contractually appointed. — Written confirmation by the SQP that the seasonal constraints prevent the survey at an appropriate time before certification. — The survey is scheduled to take place at the earliest opportunity after the handover. — There is a specific contractual agreement in place to remedy any identified defects before the defects liability period expires. *Thermographic surveys are designed to map the thermal efficiency of buildings and to detect areas where there are breaches in the thermal envelope. Surveys need to be conducted when temperature differences between the external areas of the building and surrounding air can be detected after the envelope is sealed. There may be instances where the survey cannot be done before certification after the envelope is sealed and as such, the survey would take place after certification.*

Evidence

Criteria	Interim design stage	Final post-construction stage
Schedule and responsibilities		
1–4	Relevant section or clauses of the building specification or contract. OR A letter of commitment from the client or developer. AND Commissioning schedule (where available).	Commissioning schedule identifying commissioning standards followed and evidence to verify that commissioning was carried out in line with these. BMS commissioning records or procedures. Confirmation of appointment of appropriate project team member.

Criteria	Interim design stage	Final post-construction stage
5	Copy of the principal contractor's programme and project budget showing commissioning allowances. OR Where contractor not yet appointed: Relevant section or clauses of the building specification or contract. OR A letter of commitment from the client or developer.	Copy of the principal contractor's programme and project budget showing commissioning allowances.
Commissioning role		
7	Letter of appointment for commissioning manager(s). Evidence of design reviews (where available). Where applicable, evidence that the specialist commissioning manager meets the definition for this role.	Copies of design reviews and commissioning records and reports. Where applicable, evidence that the specialist commissioning manager meets the definition for this role.
Envelope testing		
9–10	Relevant section or clauses of the building specification or contract. OR A letter of commitment from the client or developer.	Thermographic survey and air leakage report. Qualifications/certificates for suitably qualified professionals. Verification that remedial works have been completed where required.
Handover		
11–12	Relevant section or clauses of the building specification or contract. OR A letter of commitment from the client or developer which is specific for the project being assessed. OR Draft building user guides and training schedule, where available.	A copy of the building user guides. Written confirmation from the design team or client that the guide has been, or will be, distributed to the building's owner, tenants or fit-out contractor (for completion), as appropriate. Copy of the training schedules, with confirmation that it was issued to the relevant people at the required time and that training was carried out in line with the schedules.
EU Taxonomy		
9–10	For larger buildings over 5000 m²: Confirmation of design fabric performance levels for air-tightness and thermal integrity.	For larger buildings (over 5000 m²): — Confirmation of design fabric performance levels for air-tightness and thermal integrity. — Evidence to show deviations in levels of performance set at design stage have been disclosed to investors and clients.

Definitions

Complex systems

These include, but are not limited to, air-conditioning, comfort cooling, mechanical ventilation, displacement ventilation, complex passive ventilation, BMS, renewable energy sources, microbiological safety cabinets and fume cupboards, cold storage enclosures and refrigeration plant.

Small-scale projects

For the purposes of this issue, small-scale projects are defined as projects up to 500 m² gross internal floor area.

Small-scale projects may follow full requirements where preferred.

Specialist commissioning managers

The specialist commissioning manager is a specialist contractor rather than a general sub- contractor, able to independently verify the work carried out by the project team members installing the systems. The specialist commissioning manager can be appointed by the client or the contractor to perform the tasks described under the relevant criteria for buildings with complex building services and systems and defined in their contract. The specialist commissioning manager shall be a professional who, in the opinion of the assessor, has experience or qualifications that enable them to undertake the responsibilities described in this issue. As an example, membership to the Commissioning Specialists Association (CSA) is a relevant qualification.

In principle, it is possible for the specialist commissioning manager to be from the same organisation as the main contractor provided any conflicts of interest have been declared and records show how they have been managed to provide confidence that commissioning will be carried out appropriately.

The separate roles of the main contractor and specialist commissioning manager are so that the installation and commissioning are carried out independently by different parties.

Suitably qualified professional – thermographic survey and airtightness testing

Thermography surveys and airtightness testing are to be undertaken by suitably qualified professionals in accordance with the appropriate standards, as follows:

1. Airtightness testing: by professionals with membership of Air Tightness Testing and Measurement Association (ATTMA) or Elmhurst Airtightness Scheme (EAS) (previously Independent Air Tightness Testing Scheme (IATS)) attained at organisational level.
2. Thermographic survey: by professionals holding a valid Category 2, e.g. PCN (Personnel Certification in Non-Destructive Testing) or QCF (Ofqual's Qualification and Credit Framework) or RQF (Regulated Qualifications Framework) Level 4, e.g. ABBE (Awarding Body for the Built Environment), certificate in thermography (as defined by the UKTA (UK Thermography Authority) website). Where a Category 2 or Level 4 thermographer is not available, the survey may be undertaken by a Category 1 thermographer and then the images interpreted by a Category 2 or Level 4 thermographer.

Thermal bridge

A thermal bridge (sometimes referred to as thermal bridging, a cold bridge or thermal bypass) describes a situation in a building where there is a direct connection between the inside and outside through one or more elements that are more thermally conductive than the rest of the building envelope.

Additional information

Thermal bridging assessments

It is good practice to carry out thermal bridging assessments at the design stage. This is encouraged through building regulations for energy conservation by allowing the use of actual values in the energy calculation, which could make a significant improvement over using the default values in the National Calculation Methodology. This is reflected in Ene 01 Energy and carbon performance for regulated energy uses, so no additional credit is offered within this issue for thermal bridging assessments. However, good thermal bridging design and assessment will contribute to successful building fabric testing results and the associated credit.

Useful guidance

- Barker, K. Commissioning Air Systems (BG 49/2024), BSRIA; 2024.
- Hawkins G. Commissioning Job Book - A framework for managing the commissioning process (BG 11/2010). BSRIA; 2010.
- Parsloe C. Commissioning Water Systems (BG 2/2010). BSRIA; 2010.
- Ronceray M, Parsloe C. Pre-Commission Cleaning of Pipework Systems Amended 6th edition (BG 29/2021). BSRIA; 2021.
- CIBSE Commissioning Code A: Air distribution systems (2024).
- CIBSE Commissioning Code B: Boilers. CIBSE; 2002.
- CIBSE Commissioning Code C: Automatic Controls. CIBSE; 2001.
- CIBSE Commissioning Code L: Lighting. CIBSE; 2018.
- CIBSE Commissioning Code M: Commissioning Management. CIBSE; 2022.
- CIBSE Commissioning Code R: Refrigerating Systems. CIBSE; 2002.
- CIBSE Commissioning Code W: Water Distribution Systems. CIBSE; 2025.
- Measuring air permeability of building envelopes (non-dwellings), Technical standard Level 2 (TSL2). The Air Tightness Testing and Measurement Association (ATTMA). October 2010.

Man 05 Aftercare

Aim

To provide post-handover aftercare to the building owner or occupants during the first year of occupation to ensure the building operates and adapts, where relevant, in accordance with the design intent and operational demands.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	3 + 1 exemplary	Excellent	All (see 1.0)
Shell and core	0	None	Not applicable
Shell only	0	None	Not applicable

Assessment type specific notes

Ref	Assessment type specific notes
1.0	**Speculative developments** For speculative projects (i.e. where the end occupiers are unknown), this issue – Man 05 Aftercare – will be filtered-out. Any relevant minimum standard will not be applicable in such cases.

Building type specific notes

Ref	Building type specific notes
-	None

Issue specific notes

Ref	Issue specific note
3.0	**Zero carbon transition planning** Where the project is net zero carbon and uses no fossil fuels on-site (see M2.1), this credit will be filtered out.

Assessment criteria

One credit – Aftercare support

1 Provide aftercare support to the building occupiers through having in place operational infrastructure and resources. This includes as a minimum:

1.a A meeting between the aftercare support team or individual, and the building occupier or management team (prior to initial occupation, or as soon as possible thereafter) to:

1.a.i Introduce the aftercare support available, including the content of the building user guide (where it exists) and training schedule.

1.a.ii Present key information about features of the building including the design intent and how to use the building to ensure it operates as efficiently and effectively as possible.

1.b On-site facilities management training including:

1.b.i a walkabout of the building.

AND

1.b.ii introduction to and familiarisation with the building systems, their controls and how to operate them in accordance with the design intent and operational demands.

1.c Provide initial aftercare support for at least the first month of building occupation, e.g. weekly attendance on-site, to support building users and management (the level of frequency will depend on the complexity of the building and building operations).

1.d Provide longer term aftercare support for occupiers for at least the first 12 months from occupation, e.g. a helpline, nominated individual or other appropriate system to support building users and management.

2 Establish operational infrastructure and resources to coordinate the collection and monitoring of energy and water consumption data for a minimum of 12 months, once the building is substantially occupied. This facilitates analysis of discrepancies between actual and predicted performance, with a view to adjusting systems and user behaviours accordingly (see M1).

One credit – In-use commissioning

3 Complete the following commissioning activities over a minimum 12-month period, once the building becomes substantially occupied:

3.a Complex systems: The specialist commissioning manager will:

3.a.i Identify changes made by the owner or operator that might have caused impaired or improved performance.

3.a.ii Test all building services under full and part-load load conditions.

3.a.iii Where applicable, carry out testing during periods of extreme (high or low) occupancy.

3.a.iv Interview building occupants (where they are affected by the complex services) to identify problems or concerns regarding the effectiveness of the systems.

3.a.v Compare sub-metered energy performance to the predicted energy performance.

3.a.vi Identify inefficiencies and areas in need of improvement.

3.a.vii Re-commission systems (following any work needed to serve revised loads) and incorporate any revisions in operating procedures into the operations and maintenance (O&M) manuals.

3.b Simple systems: The external consultant, aftercare team, or facilities manager will:

3.b.i Review thermal comfort, ventilation, and lighting, at three, six and nine month intervals after initial occupation, either by measurement or occupant feedback.

3.b.ii Identify deficiencies and areas in need of improvement.

3.b.iii Re-commission systems and incorporate any relevant revisions in operating procedures into the O&M manuals.

One credit – Post-occupancy evaluation

4 The client or building occupier commits to carry out a post-occupancy evaluation (POE) exercise one year after the building is substantially occupied. This gains comprehensive in-use performance feedback (see criterion 5.b.v on the next page) and identifies gaps between design intent and in-use performance. The aim is to highlight any improvements or interventions that need to be made and to inform operational processes.

5 An independent party carries out the POE covering:

5.a A review of the design intent and construction process (review of design, procurement, construction and handover processes).

5.b Feedback from a wide range of building users including facilities management on the design and environmental conditions of the building covering:

5.b.i Internal environmental conditions (light, noise, temperature, air quality).

5.b.ii Control, operation and maintenance.

5.b.iii Facilities and amenities.

5.b.iv Access and layout.

5.b.v Energy and water consumption (see criterion 2 and M1).

5.b.vi Other relevant issues, where appropriate.

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

7 The client or building occupier commits funds to pay for the POE in advance. This requires an independent party to be appointed to carry out the POE as described in criterion 5.

One exemplary credit – Zero carbon transition planning

8 Where net zero carbon benchmarks are not met for operational performance and/ or fossil fuels are being used on-site, a competent person develops a Zero Carbon Transition Plan demonstrating how the asset will achieve net zero carbon in operation by 2050 at the latest (see M2).

Methodology

M1: Data collection and provision

M1.1: Collection and monitoring of energy and water consumption data

This function can be coordinated or carried out by a dedicated aftercare team or, where the building occupier is known and able to confirm compliance based on their existing or proposed operations for the building, the building owner or occupier's estates or facilities management team.

M1.2: Provision of annual energy and water consumption

One way of demonstrating compliance with this criterion is for the client or end user (see criterion 4) to register and therefore commit the building for assessment under the relevant part of the BREEAM In-Use scheme.

M2: Zero carbon transition plan

Zero carbon transition plans are a relatively new market development. BREEAM Assessment should follow a recognised best practice, or the plan should cover the contents listed below.

Overall ambition

Describe the strategic ambition of the asset’s transition plan by disclosing its objectives, priorities, interim targets and milestones.

Implementation strategy

A description of the future energy and carbon reduction measures that would be implemented to eliminate on-site combustion and reduce energy use intensity to align with a 1.5°C pathway.

This should include:

- A timeline of measures to be implemented and the expected energy and carbon savings from each measure.
- The timeline of measure should be split into short-, medium- and long-term measures and define these terms.
- Any barriers to implementation, such as required grid upgrades etc.

Financial planning

Each measure should include estimated costs and savings.

Metrics and targets

To help assess progress against the Zero Carbon Transition plan, metrics and targets should be set and then progress reviewed on an annual basis. These should align with the Overall Ambition and the Implementation strategy. Targets should:

- Be clearly defined, including any relevant units, metrics and methodologies.
- Have a clear timeframe, defining a baseline and time period over which the target applies.

To ensure the Zero Carbon Transition Plan is implemented and evolves to reflect the latest technologies and costs:

1. Building owners and operators are encouraged to integrate the Transition Plan within the building's capital planning process to ensure alignment of budgets and timing.
2. Project teams are encouraged to pursue BREEAM In-Use certification once in operation to verify the outcomes of implementing the Transition Plan and ensure that the plan is updated every three years.

For further links and guidance, see Additional Information.

M2.1: No fossil fuels onsite

The scope of fossil fuel use on site includes all fossil fuel use by the building except for:

- Industrial scale process loads.
- Emergency and life safety systems such as firefighting, evacuation and back-up power in health care settings.
- Essential back-up systems serving buildings with functions where it is essential to maintain their continuous use, particularly in response to a disaster, for example hospitals, fire stations, police stations and emergency vehicle garages.
- Essential back-up systems serving data centres.

Compliance notes

Ref	Terms	Description
In-use commissioning		
CN1	In-use (seasonal) commissioning of solar photovoltaics (PV)	Solar PVs can be excluded from the requirements for seasonal commissioning. This is because commissioning at a particular time of the year will not affect the original commissioning of the system.

Evidence

Criteria	Interim design stage	Final post-construction stage
Aftercare support		
1–2	Evidence of a commitment or contract to provide compliant aftercare support and training.	Evidence to verify what aftercare has or is due to take place and what procedures are in place for initial and long-term aftercare support. Where 13 months have passed since building occupation, aftercare data collection records should be available for submission.
In-use commissioning		
3	Relevant section or clauses of the building specification or contract. OR A letter of commitment from the client or developer. OR Appointment letters or commissioning responsibilities schedule where available.	In-use commissioning records/reports and records of occupant interviews. Where applicable, evidence that the specialist commissioning manager meets the definition for this role. Where a 15 month period has not passed since occupation of the building, the following should be provided: — Evidence of the appointment of a commissioning manager. — Schedule of commissioning responsibilities. — Confirmation of proposed commissioning dates. — Where some commissioning has taken

Criteria	Interim design stage	Final post-construction stage
		place, but not all, these reports must be submitted.
Post-occupancy evaluation		
4–7	A signed and dated commitment by the client or developer or future building occupier.	Evidence of the appointment of the independent third-party and schedule of responsibilities which fulfils the BREEAM criteria. Where 15 months have passed since building occupation, a copy of the POE report must be provided.
Zero carbon transition planning		
8	Relevant section or clauses of the building specification or contract. OR A letter of commitment from the client or developer.	Copy of compliant zero carbon transition plan.

Definitions

Competent person – Zero carbon transition plan

This would be an organisation that has sufficient knowledge and expertise of scenario analysis, financial planning, carbon risk and opportunity analysis and carbon accounting, specifically in real estate. Please also see the Additional Information section for further links and guidance.

Complex systems

These include, but are not limited to, air-conditioning, comfort cooling, mechanical ventilation, displacement ventilation, complex passive ventilation, BMS, renewable energy sources, microbiological safety cabinets and fume cupboards, cold storage enclosures and refrigeration plant.

Independent party

A third party or a person or body internal to a party involved – parties involved are typically a supplier (1st party) or purchaser (2nd party) – who shall not be involved in the issue in question, and shall not have conflicts of interests resulting from their position. To comply with the criterion relating to the use of an independent party, the client or design team needs to demonstrate either:

1. They have used a party independent of the design process to conduct the necessary consultation exercise; OR
2. If the consultation is to be carried out by an organisation involved with the design of the building, e.g. the project architect, then they must present the assessor with evidence that robustly demonstrates the independence of the consultation process. BREEAM has not attempted to define what form this evidence must take; the onus is on the design team or relevant individual to clearly demonstrate to the BREEAM Assessor a credible level of independence.

Other relevant issues

Other relevant issues include the following:

1. Health, safety and wellbeing
2. Building user information including training for building users and operators
3. Value for money, achievement of business objectives
4. Sector–specific issues, such as impacts on absenteeism in offices, infection rates in healthcare facilities, pupil performance in schools etc.
5. Sustainability performance (performance of any sustainable features or technologies, e.g. materials, renewable energy, rainwater harvesting etc.).

Post-occupancy evaluation (POE)

POE is also known as Building Performance Evaluation (BPE).

The POE is used to improve the building operation, occupants' comfort and other areas based on its outcomes. Therefore, the POE provides suggestions on potential improvements, including, but not limited to the following:

- Re-commissioning activities
- Measures that maintain or improve end users' comfort and productivity
- Health and safety

A POE can also be used as part of the stakeholder consultation at the briefing stage for a new building or the refurbishment of an existing one, in cases where the building occupants are the same. This can be achieved through the use of a questionnaire or workshops to highlight lessons from the old or existing building that could be taken into account in the design of the new project.

POE methodologies

Any POE or BPE methodology that fulfils the criteria can be used. Further guidance on POE can be found in the following resources:

- Post Occupancy Evaluations | WBDG - Whole Building Design Guide
- BCO guide to Post-Occupancy Evaluation, British Council for Offices (BCO), 2007.(11)
- BRE Digest 478, Building performance feedback: getting started, Building Research Establishment, 2003.(12)
- Guide to Post Occupancy Evaluation Report and Toolkit, HEFCE, AUDE & University of Westminster, 2006.(13)
- The Building Use Studies (BUS) methodology (busmethodology.org.uk) is an occupant satisfaction survey that will fulfil part of the POE credit requirement, occupant feedback stage.
- BSRIA Guide to Building Performance Evaluation is a general introduction to BPE. BSRIA; 2015.(14)
- The Design Quality Indicator (DQI) is a method to assess the design quality of buildings. DQI is a process that actively involves a wide group of stakeholders in the design of building. It is delivered though a facilitated workshop that enables representatives from both the demand and supply side to work together to achieve the best outcome. Completion of the DQI Stage 5, In-use stage workshop could fulfil part of the POE credit requirement, the occupant feedback stage. See www.dqi.org.uk.

Specialist commissioning managers

The specialist commissioning manager is a specialist contractor rather than a general sub- contractor, able to independently verify the work carried out by the project team members installing the systems. The specialist commissioning manager can be appointed by the client or the contractor to perform the tasks described under the relevant criteria for buildings with complex building services and systems and defined in their contract. The specialist commissioning manager shall be a professional who, in the opinion of the assessor, has experience or qualifications that enable them to undertake the responsibilities described in this issue. As an example, membership to the Commissioning Specialists Association (CSA) is a relevant qualification.

Substantially occupied

For the purposes of this BREEAM issue, a building is considered as substantially occupied when approximately 80% of each building function area is occupied.

Third party

A person or body that is recognised as being independent of the parties involved. Parties involved are typically a supplier (1st party) or purchaser (2nd party), as concerns the issue in question.

Additional information

Absence of predicted performance data

Where building occupiers do not have predicted performance models, it may be more appropriate to benchmark actual building performance data with other sources of Building Performance Evaluation Data and benchmarks. Sources of benchmarking information can be found in the following documents here:

Building performance benchmarks can be found in CIBSE Guidance including:

- CIBSE Guide F: Energy Efficiency in Buildings.(15)
- CIBSE TM46: Energy Benchmarks.(16)
- CIBSE TM47: Operational Ratings and Display Energy Certificates.(17)

Additional information of building performance and benchmarking can be found at Buildings Performance Institute Europe (BPIE) (www.bpie.eu).

Actual vs predicted performance

In most cases it is not feasible to accurately compare predicted vs actual performance due to variances in the assumptions used in the predicted vs actual models. Figures reported via the Carbon Buzz website show that on average, buildings consume between 1.5 and 2.5 times the predicted values. When comparing predicted with actual, an analysis should be carried out to understand why there may be discrepancies in performance. These discrepancies can be due to reasons including:

- Predicted energy consumption is normally based upon building regulation compliance models which only focus on 'regulated' energy use, therefore additional unregulated energy use may not have been modelled in the design prediction model.
- There may be extended use due to extra occupancy and operating hours, which is not accounted for in predicted models.
- Inefficiencies from poor control, bad commissioning or poor maintenance
- Additional special functions such as cafeteria, server rooms etc. are not accounted for in the predicted model.
- Variances in actual occupant behaviour that vary from the predicted one, such as use of small power and lighting.

CIBSE TM54(18) provides guidance on how to improve the accuracy of the model for operational energy use of buildings at the design stage. The Carbon Trust guidance, Closing the gap: Lessons learned on realising the potential of low carbon building design(19), also provides additional guidance on this issue.

Zero carbon transition plan

For additional guidance on preparing a zero carbon transition plan and organisations who may provide support, please refer to:

- CDP (www.cdp.net), including CDP Technical Note: Reporting on Climate Transition Plans which provides requirements for a credible climate transition plan.
- The Transition Plan Taskforce (TPT) (transitiontaskforce.net)
- Corporate Sustainability Reporting Directive (CSRD) (www.carbontrust.com/news-and-insights/insights/corporate-sustainability-reporting-directive-csrd-explained)
- Science Based Targets Initiative (sciencebasedtargets.org)

Health and wellbeing

Summary

This category encourages the increased health, wellbeing and safety of building users. Issues within this category reward building design and specification decisions that create a healthy, safe and comfortable internal and external environment.

Assessment issues

Hea 01 Natural light	up to 5 credits + 2 exemplary
Hea 02 Artificial light	2 credits + 1 exemplary
Hea 03 Non-visual effects of light	1 credit
Hea 04 Indoor air quality	up to 5 credits + 2 exemplary
Hea 05 Thermal comfort	3 credits
Hea 06 Acoustic performance	up to 4 credits
Hea 07 Safe and accessible design	2 credits
Hea 08 Security	1 credit + 1 exemplary

Hea 01 Natural light

Aim

To ensure daylighting is considered at the design stage and ensure best practice in visual performance, visual comfort, and overall wellbeing for building occupants.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	up to 5 + 2 exemplary (building type dependent)	Outstanding	All
Shell and core	up to 4 + 1 exemplary (building type dependent)	Outstanding	1, 5–9, 12 (see ref 1.0 and 1.1)
Shell only	up to 4 +1 exemplary (building type dependent)	Outstanding	1, 5–9, 12 (see ref 1.0 and 1.1)

Assessment type specific notes

Ref	Assessment type specific note
1.0	**View out** Where it is not possible to confirm which areas of the building will contain workstations or benches or desks, then all areas of the building designed for or likely to be occupied by workstations or benches or desks must comply with the relevant criteria.
1.1	**Daylighting** Where the building is speculative and therefore the final layout is not defined (e.g. only an open plan shell is provided in each tenanted space), the required percentage of each open plan shell should meet the daylighting requirements. However, where it is possible to designate separable ancillary areas that would be required in the space (such as toilets or server rooms), these can be excluded from the calculation.

Building type specific notes

Ref	Building type specific note
2.0	**Residential institution (long-term stay) – Living rooms** **Residential care home – Communal lounges, individual bedrooms** All relevant areas are to be within 5 m of a wall which has a window or permanent opening providing an adequate view out. The window or opening must be ≥ 20% of the surrounding wall area.
2.1	**Residential institutions and Hospitality – Bedrooms** Glare is not considered to be problematic in bedrooms in Residential institutions (long-term stay and short-term stay) and Hospitality assessments where the occupants are assumed to be elsewhere during the daylight hours. The only exception to this is where designated additional office working space is provided within a bedroom. In these circumstances it is the role of the assessor to determine if individual spaces should be determined as 'relevant building areas' in accordance with guidance provided.
2.2	**Commercial kitchens** It is not necessary to provide a view out for commercial kitchens. This is because in such a space it is likely that kitchen staff will move around, doing various tasks. This makes the requirements for the view out to rest the eyes unnecessary.

Ref	Building type specific note
2.3	**Prison buildings – Cells** An adequate view out from a normal standing or sitting position. The distance between each window and nearest external solid object (i.e. buildings, screens, walls or fences) is ≥ 10 m. Where existing features prevent compliance with this criteria in less than 20% of the cells within the building, the credit can still be awarded.
2.4	**Retail** Where there is no 'Other occupied space' within the asset, the additional daylight credit in Table 5.2 can be awarded when the 'Sales area' meets the daylight requirements.

Assessment criteria

Minimum standard – Natural light

1 Achieve one of the following:

1.a At least 95% of all relevant building areas for daylight, have vertical and/or inclined windows with a glazed area ≥ 20% of the surrounding wall area (see Definitions and M1).

OR

1.b At least 80% of relevant building areas for daylight have a glazed area as a percentage of floor area ≥ 7% (see Definitions and M1).

One credit – Glare control

2 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.

3 Where risk has been identified within a relevant building area, a glare control strategy is used to design out the potential for glare (see M2).

4 The glare control strategy does not increase energy consumption used for lighting. This is achieved by:

4.a Maximising daylight levels in all weather (cloudy or sunny).

AND

4.b Ensuring the use or location of shading does not conflict with the operation of lighting control systems.

Up to two credits – Daylighting

5 Daylighting criteria have been met using one of the options outlined in Table 5.2 on page 83 (see M3.2):

5.a The relevant building areas meet good practice average and minimum point daylight illuminance criteria as outlined in Table 5.2 on page 83.

OR

5.b The relevant building areas meet any level of recommendation using the daylight illuminance criteria in EN 17037:2018+A1:2021.[20]

OR

5.c The relevant building areas achieve at least 'nominally accepted' daylight sufficiency as per IES LM-83-23.[21]

One credit – Direct sunlight to windows

(Healthcare, Residential institutions – Long term stay, Prisons)

6 Achieve at least one credit for 'Daylighting' (criterion 5).

7 All relevant units have at least one relevant area that receives at least 3 hours of direct sunlight at windows on equinox day (21 March or 21 September, as the average representation of annual conditions) assuming a cloudless sky (see M4).

One credit – View out

8 At least 95% of the floor area in 95% of spaces for each relevant building area are within the distances of a window or permanent opening that provides an adequate view out (see Definitions and M5), as outlined in Table 5.1 below.

Table 5.1: Window or opening size required as a percentage of surrounding wall area depending on the distance of the desk or work space to the window or opening

Distance from window to workspace or desk, X (in metres)	Window or opening size (as % of surrounding wall area)
X < 8	20%
8 ≤ X ≤ 11	25%
11 < X ≤ 14	30%
X > 14	35%

OR

9 At least 75% of the floor area in 95% of spaces for each relevant building area can meet both of the following criteria:

9.a Horizontal sight angle ≥ 28° AND

9.b The landscape layer and at least one additional layer (sky or ground) are visible through a permanent opening (see M5.4).

One exemplary credit – Evaluating glare from daylight

10 Achieve the credit for 'Glare control' (criteria 2–4).

11 An evaluation has been undertaken to demonstrate compliance with either of the following and M6:

11.a The Daylight Glare Probability (DGP) does not exceed 0.40 over more than 5% of annual operating hours at all workstations in all relevant building areas.

OR

11.b Annual Sunlight Exposure ASE1000, 250 ≤ 10% of an occupied space. This means no more than 10% of the occupied space in all relevant building areas can receive a daylight illuminance of ≥ 1000 lux for ≥ 250 hours per year.

One exemplary credit – Daylighting

12 Daylighting criteria have been met using one of the following options:

12.a Relevant building areas meet exemplary criteria for average and minimum point daylight illuminance as outlined in Table 5.3 on page 85.

OR

12.b Relevant building areas meet the highest rating in EN 17037:2018+A1:2021 OR IES LM-83-23 and the relevant criteria in Table 5.3 on page 85.

Checklists and tables

Table 5.2: Space type and illuminance requirements – in Option 1 both criteria (average illuminance and minimum point illuminance) must be met

Area type	Minimum area to comply		Option 1: Good practice criteria		Option 2: EN 17037	Option 3: IES LM-83
	1 credit	2 credits	Average daylight illuminance (averaged over entire space)	Minimum daylight illuminance at worst lit point		
Education buildings (up to 2 credits available)						
Preschools, schools, crèche – occupied spaces	-	80%	At least 300 lux for 2000 hours per year or more	At least 90 lux for 2000 hours per year or more	Any level of recommendation using the daylight illuminance criteria in EN 17037	At least ‘nominally accepted’ daylight sufficiency as per IES LM-83
Universities, colleges and higher education – occupied spaces	60%					
Residential institutions and Hospitality (1 credit available*)						
Kitchens	100%	-	At least 100 lux for 3450 hours per year or more	At least 30 lux for 3450 hours per year or more	Any level of recommendation using the daylight illuminance criteria in EN 17037	At least ‘nominally accepted’ daylight sufficiency as per IES LM-83
Living rooms, dining rooms, studies (including home offices)		-				
Non-residential or communal occupied spaces	80%	-	At least 200 lux for 2650 hours per year or more	At least 60 lux for 2650 hours per year or more		
Retail buildings (2 credits available**)						
Sales areas	35%	-	At least 200 lux point daylight illuminances for 2650 hours per year or more		Any level of recommendation using the daylight illuminance criteria in EN 17037	At least ‘nominally accepted’ daylight sufficiency as per IES LM-83
Other occupied areas	80%	-	At least 200 lux for 2650 hours per year or more	At least 60 lux for 2650 hours per year or more		
Office buildings (2 credits)						
All occupied spaces, unless indicated in Definitions on page 92	-	80%	At least 300 lux for 2000 hours per year or more	At least 90 lux for 2000 hours per year or more	Any level of recommendation using the daylight illuminance criteria in EN 17037	At least ‘nominally accepted’ daylight sufficiency as per IES LM-83
Healthcare buildings (2 credits available*)						
Staff and public areas	80%	-	At least 300 lux for 2000 hours per year or more	At least 90 lux for 2000 hours per year or more	Any level of recommendation using the daylight illuminance criteria in EN 17037	At least ‘nominally accepted’ daylight sufficiency as

Area type	Minimum area to comply 1 credit	2 credits	Option 1: Good practice criteria Average daylight illuminance (averaged over entire space)	Minimum daylight illuminance at worst lit point	Option 2: EN 17037	Option 3: IES LM-83
Occupied patients' areas (dayrooms, wards) and consulting rooms		-				per IES LM-83
Staff and public areas	-	80%	At least 300 lux for 2650 hours per year or more	At least 90 lux for 2650 hours per year or more		
Occupied patients' areas (dayrooms, wards) and consulting rooms	-					
Prison buildings (2 credits available*)						
Cells and custody cells	-	80%	At least 100 lux for 3150 hours per year or more	N/A	Any level of recommendation using the daylight illuminance criteria in EN 17037	At least 'nominally accepted' daylight sufficiency as per IES LM-83
Internal association or atrium			At least 300 lux for 2650 hours per year or more	At least 210 lux for 2650 hours per year or more		
Patient care spaces						
Teaching, lecture and seminar spaces			At least 300 lux for 2000 hours per year or more	At least 90 lux for 2000 hours per year or more		
Industrial and all Other building types (1 credit available*)						
Internal association or atrium area	80%	-	At least 300 lux for 2650 hours per year or more	At least 210 lux for 2650 hours per year or more	Any level of recommendation using the daylight illuminance criteria in EN 17037	At least 'nominally accepted' daylight sufficiency as per IES LM-83
Teaching, lecture and seminar spaces		-	At least 300 lux for 2000 hours per year or more	At least 90 lux for 2000 hours per year or more		
All occupied spaces, unless indicated in Definitions on page 92		-				
Notes: * All spaces must comply to achieve 1 credit. ** Each space can be awarded credits independently.						

Table 5.3: Exemplary level illuminance value requirements (both criteria – average illuminance and minimum point illuminance – must be met for daylight illuminance method)

Area type	Exemplary credits	Minimum relevant area to comply	Average daylight illuminance (averaged over entire space)	Minimum daylight illuminance at worst lit point	EN 17037 OR IES LM-83-23
All building types (excluding retail – see below)					
Multi-storey buildings Occupied spaces (unless indicated below)	1	80%	At least 300 lux for 2650 hours per year or more	At least 90 lux for 2650 hours per year or more	Highest rating in standard is met.
Single storey buildings Occupied spaces (unless indicated below)		80%	At least 300 lux for 3000 hours per year or more	At least 120 lux for 3000 hours per year or more; or in spaces with glazed roofs (such as atria), at least 210 lux for 3000 hours per year or more	Highest rating in standard is met.
Prisons and courts buildings Cells and custody cells		80%	At least 100 lux for 3450 hours per year or more	N/A	Highest rating in standard is met.
Prison buildings Internal association or atrium areas		80%	At least 300 lux for 3250 hours per year or more	At least 210 lux for 3250 hours per year or more	Highest rating in standard is met.
Retail					
Retail buildings Sales areas	1	50%	At least 300 lux point daylight illuminances for 2000 hours per year or more		Highest rating in standard is met.
Retail buildings Other occupied areas		80%	Select relevant criteria above for occupied spaces dependent on whether you are assessing a multi-storey or single storey building.		Highest rating in standard is met.

Methodology

M1: Natural light – Minimum standard

The minimum standard for natural light is applicable to relevant areas for daylight.

M1.1: Window to wall area

The following steps must be followed in order to assess whether the asset demonstrates compliance with the minimum performance requirements (criterion 1.a on page 81):

1. For each relevant space, calculate the total glazed area of vertical and/or inclined windows. The frames are not included in the calculation, only the area of glass.
2. Calculate the total area of surrounding walls containing the windows within each relevant area.
3. For each relevant space, compare the ratio of total glazed area to the total surrounding wall area. The space is compliant if this ratio is ≥ 20%.

4. Calculate the percentage of all relevant areas within the asset that meets the minimum performance requirements, as follows:

   Percentage of relevant area = (Total net internal area of compliant space / Total net internal area of all relevant space) × 100

Criterion 1.a is not applicable to horizontal daylight openings. Where horizontal daylight openings are used, criterion 1.b applies.

M1.2: Glazing to floor area

The following steps must be followed in order to assess whether the asset demonstrates compliance with the minimum performance requirements (criterion 1.b on page 81):

1. For each relevant space, calculate the total glazed area of all windows and roof lights within the space. The frames are not included in the calculation, only the area of glass.
2. For each relevant space, calculate the percentage of glazed area to floor area as follows:

   Percentage glazed area to floor area = (Total glazed area in relevant space / Net internal area of relevant space) × 100
3. For each relevant space, compare the glazed area to floor area percentage. The space is compliant if the ratio is ≥ 7%.
4. Calculate the percentage of all relevant areas within the asset that meets the minimum performance requirements, as follows:

   Percentage of relevant area = (Total net internal area of compliant space / Total net internal area of all relevant space) × 100

M2: Glare control

M2.1: Glare control assessment

A glare control assessment is used to determine the areas of the building that are at risk of glare, including a demonstration of the building areas not at risk. This can be achieved through a survey of or modelling of the relationship between sunlight and the building. The design must consider the possibility of glare from all sources, including direct sunlight, reflected sunlight and contrast glare. Design studies can be used to demonstrate that glare cannot reach the eyes of building occupants, or the computer screens they are using, during occupied hours.

Where compliant shading measures are specified for all relevant building areas regardless of the risk of glare, a glare control assessment will not be necessary. The glare control strategy must demonstrate building design measures are specified for all relevant building areas, while also complying with criteria 4 to 4.b.

It is acceptable to account for surrounding buildings, structures or other permanent environmental features when using simulation modelling to assess the risk of glare, provided this accounts for both direct sunlight and reflected glare from glazing or reflective surfaces.

Where roof lights are present, they must be considered when demonstrating that the glare control strategy provides adequate control/measures for minimising glare in that space.

M2.2: Assessing compliant forms of glare control

Compliant shading measures for meeting glare control criteria are:

1. Internal, mid-pane, or external shading such as opaque Venetian or close weave fabric blinds where:
   a. The openness factor of blinds is ≤ 1% and the fabric light transmittance value is ≤ 0.1 (10%).

      OR
   b. The openness factor of blinds is ≤ 3% and the fabric light transmittance value is ≤ 0.03 (3%).

      OR
   c. The shading is classified as class 3 or 4 in accordance with Table 7 of EN 14501:2021.
2. The shading can be occupant controlled, or automatically controlled with manual override.

The following measures can be used in addition to the above, but are not compliant on their own:

— Building-integrated measures (e.g. overhangs, brise-soleil, fins, or light shelves).

— Variable transmittance glazing (e.g. electrochromic, photochromic, or thermochromic glass).

— Window films and tinted glazing.

Transmittance values should be based on those quoted for 'visible light' or 'optical transmittance'.

Glare control must provide shading from both high-level summer and low-level winter sun. Design studies can be used to demonstrate the sunlight is prevented from reaching the eyes of building occupants, or the computer screens they are using, during occupied hours.

M2.2.1: Alternative shading measures

Variable transmittance glazing (e.g. electrochromic, photochromic, or thermochromic glass) as well as window films can reduce glare from the bright sky but may have little impact on glare from the sun. Therefore, such shading options should be used in conjunction with other glare control measures in all cases where control of glare from the sun is required.

Solar control or 'tinted' glazing could potentially support the attainment of this requirement. It should be noted that whilst certain types of glazing, such as low emissivity glazing, may be slightly tinted, they may not necessarily be effective in reducing disabling glare. For facades receiving direct sunlight, tinted windows alone are unlikely to be sufficient in most situations. The assessor must provide evidence to demonstrate that the particular glazing type, when used on the assessed building for a given location, meets the overarching aim of preventing disabling glare.

Curtains (where used without other forms of shading) do not meet the criteria for the glare control credit. This is because they do not provide sufficient control to optimise daylight into the space. As such, the use of curtains to control glare is likely to cause occupants to rely more on artificial lighting.

M2.3: Applicability of glare control – Atrium spaces

The 'Glare control' criteria are applicable to all spaces that meet the definition for 'relevant building areas – glare control'. This includes reception and atrium spaces where these spaces meet this definition. Where an atrium space does not meet the definition of 'relevant building areas – glare control' it does not need to comply with the criteria. However, the risk of glare must be considered for any relevant building areas that connect off the atrium space. This is because sunlight could pass through the atrium causing discomfort for users of other relevant building areas that connect to the atrium space. Where this is the case, building design measures or the provision of shading will be required to enable glare to be controlled or eliminated.

M3: Daylight

M3.1: Calculating the percentage of assessed area

The percentage of the total floor area of all relevant areas must comply where the criteria specify that a percentage of floor area must have adequate daylight illuminance. For example, six relevant rooms each have a floor area of 150 m² making a total relevant floor area of 900 m²; 80% of this floor area must meet the criterion, so 720 m² must comply. This is the equivalent to 4.8 rooms. As daylight illuminance is a measure of daylight across the whole room, only whole rooms can be compliant. The number of rooms must always be rounded up so, in this example, five rooms must comply to achieve the credit.

Spaces whose size is substantially larger should meet the daylight criteria on their own. In these cases, the percentage requirement is still applicable to the floor area of the remaining rooms.

For example, where 80% of 'teaching, lecture and seminar spaces' need to comply with the daylight illuminance criteria, if we have a large lecture theatre of 200 m² and 3 seminar spaces of 30 m² each, the requirement for 80% would mean 232 m² of the floor area need to comply. This would require the lecture theatre and two seminar spaces to comply.

Where areas within a building have different daylighting requirements for the same credit, all relevant areas must meet the requirements to award the daylighting credit(s).

M3.2: Calculation model

Daylighting calculations will require assessment via detailed computer modelling to simulate the daylight illuminance at calculation points within the assessed spaces. The calculation model should include all the room surfaces, and any surface outside the room that could affect the direction or quality of light received.

If any of the assessed spaces is expected to contain moveable shading device (such as blinds), then a dynamic modelling of their use should be included in the calculation for option 1. For options 2 and 3, consideration should be made to the shading guidance in EN 17037 or IES LM-83-23, respectively.

Calculations should be carried out using climatic data for the location of the site (via the use of an appropriate weather file within the software) at an at least hourly interval for a typical year and using appropriate simulation parameters as described in Guidance Note 50.

M3.3: Alternative route for school buildings

For school buildings, it is acceptable to use the Department for Education Generic Design Brief (GDB), Technical Annex 2E requirements as an alternative method of compliance with the 'Daylighting' criteria. In this case, evidence would be required to demonstrate that the requirements in the framework have been adhered to. The set daylight performance criteria by each area type (weighted by area) must be met in line with the GDB framework requirements.

M4: Direct sunlight

M4.1: Relevant building areas

Relevant units must each be assessed separately with at least one relevant area meeting the criteria in each unit.

M4.2: Calculation

The criterion applies to rooms of all orientations, although if a room faces north of due east or west it is less likely to be met (as experienced in the northern hemisphere).

A geometrical calculation model should be used and include in detail any surrounding obstructions and surfaces outside the room that could affect the sunlight received. Surface reflectances are not needed for this calculation. This can be determined using either a manual procedure or adequate software. Further reference can also be made to EN 17037, Annex D.(22)

Where window positions are already known, a reference point on the inside face of the window aperture at the centre of the opening width and at least 1.2 m above the floor and 0.3 m above the sill (whichever is the higher) should be used. For a horizontal daylight opening (such as a rooflight), the reference point should be taken at the geometrical centre on the inside face of the opening.

Sunlight blocked by window reveals and balconies or overhangs above the window should not be included, but the effect of window frames and bars can be discounted.

If a room has multiple windows, the amount of sunlight received by each can be added together provided they occur at different times and sunlight hours are not double counted.

M5: View out

M5.1: Relevant building areas

The view out criteria apply to all 'relevant building areas'. The assessment is based on distinct spaces that are considered relevant building areas. These are referred to as 'relevant spaces'.

- A relevant space is compliant where the required percentage of the floor area has an adequate view out.
- Credits are awarded based on the percentage of all relevant spaces that are compliant.

For example, 19 out of 20 relevant spaces have adequate view out for 95% of each separate space's floor area. This results in 95% of the relevant spaces meeting the view out requirements, from which the number of available credits can be determined.

Where rooms contain areas of different functions, only relevant areas should be assessed. In this case a notional line can be drawn on the plans and calculations made based on these relevant areas only. However, spaces such circulation routes or other transient spaces within a relevant area can only be excluded if the route or area is clearly defined by the building layout. If this is arbitrary or based solely on a proposed furniture layout, it cannot be excluded. Features of the building layout which may be considered as dictating a function area would include, for example, the position of doors or fixed furniture such as a reception desk or canteen servery.

M5.2: Calculating the window to wall ratio

This should be calculated based on the glazed area of window or opening, expressed as a percentage of the area of the external wall in which the window or opening sits.

The frames are not included in the calculation, only the area of glass. The external wall area also includes the area of the window or opening itself.

Where the ceiling height of the room is unusually high, relative to the window height, the wall area can be calculated based on a standard ceiling height for the building type.

Where there are windows or openings in different walls within a space, the window or opening nearest to each desk or work space can be considered in the calculation.

M5.3: Horizontal sight angle

This defines the width of the view from a specific reference point in the assessed space.

To assess the horizontal sight angle over a room area, a horizontal grid should be built as illustrated in Figure 3 below. The grid spacing should be no more than 0.3 m in residential applications and no more than 0.5 m in non-residential applications. The horizontal sight angle as formed by the view opening reveals should be determined at each grid point, and then the percentage room area with a horizontal sight angle above a certain threshold can be calculated from the percentage of grid points exceeding that threshold.

Where a space has more than one opening, the horizontal sight angle at a reference point can be taken as the sum of the horizontal single angles determined for each opening as seen from the reference point unless the openings are on opposite walls. Further reference can also be made to EN 17037, Annex C.[23]

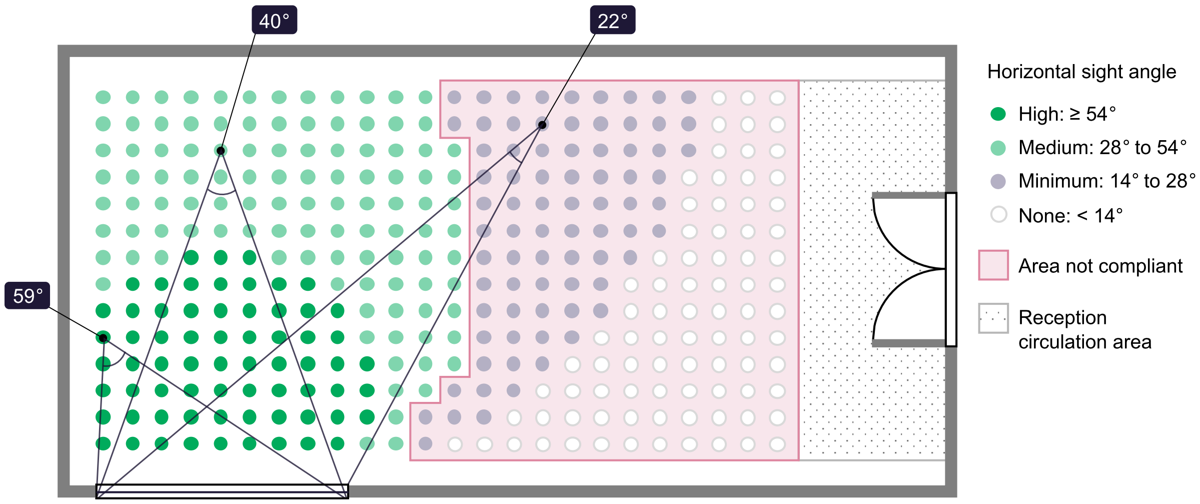

Figure 3: Example of horizontal sight angle assessment in a space with one opening (circles indicate grid points)

M5.4: View layer

A view is considered to comprise three distinct layers: the sky layer; the landscape layer; and the ground layer. The ground layer can include information of activities, whilst the landscape layer can consist of buildings, nature, a combination of these, or only the horizon. The more view layers are visible from a reference point, the higher the view quality for that point.

To assess the number of visible view layers over a room area, a horizontal grid should be built as illustrated in Figure 3 above. The grid spacing should be no more than 0.3 m in residential applications and no more than 0.5 m in non-residential applications. The number of visible view layers should be determined at each grid point, and then the percent room area with the number of visible view layers above a certain threshold can be calculated from the percentage of grid points exceeding that threshold.

Where a space has more than one opening, the number of visible view layers at a reference point can be taken as the number of visible view layers seen from the reference point through all openings that are not on opposite walls.

M6: Evaluating glare from daylight

M6.1: Daylight Glare Probability

Daylight Glare Probability (DGP) is a discomfort glare metric developed for side lit spaces. It factors in vertical daylight illuminances at the eye as well as brightness and position of potential sources of glare in the visual field of an observer.

Guidance Note 50 provides guidance on the methodology and application of the Daylight Glare Probability requirements. EN 17037 uses DGP to assess protection from glare for spaces where the activities are comparable to reading, writing, or using display devices and the occupants are not able to choose position and viewing direction.

Compliance with the BREEAM exemplary level criteria is achieved if for all workstations in all relevant building areas the calculated DGP value does not exceed 0.40 over more than 5% of annual operating hours.

The DGP assessment can be applied to a space with vertical or inclined daylight openings but is not applicable for a space with daylight openings in a horizontal surface (such as rooflights).

Additionally, DGP cannot be applied to cases where vertical illuminance is not expected to be a good indicator for the perception of glare; for example, vending areas of shops, sports halls and deep or dark spaces with very small daylight openings. Furthermore, DGP cannot be applied to positions in a space which are far away from daylight openings or receive low daylight levels.

M6.2: IES LM-83 – Annual Sunlight Exposure

Annual Sunlight Exposure (ASE) is a measure of sunlight to suggest if a space is over-sunlit with the potential for glare or heat gains. Whilst ASE is not a direct measure of glare, it can indicate the potential for glare if sunlight exposure exceeds a certain limit.

Guidance Note 50 provides guidance on the methodology and application of the Annual Sunlight Exposure requirements. Compliance with the BREEAM exemplary level criteria is achieved if in all relevant building areas, ≤ 10% of the regularly occupied space can:

1. Receive a daylight illuminance of ≥ 1000 lux
2. For ≥ 250 hours per year.

In other words, at least 90% of the regularly occupied space in all relevant building areas can receive no more than 1000 lux from daylight over no more than 250 hours per year.

Compliance notes

Ref	Terms	Description
Glare control		
CN1	No relevant areas	If the scope of the assessment does not include any relevant building areas, the criteria for glare control can be considered as met by default.
CN1.1	No windows in relevant areas	Where a relevant area does not include any windows, the glare control criteria can be considered as met for this area. Note that the view out and daylighting criteria would not be achieved in rooms with no windows.
Daylight		
CN2	Daylight for schools	For school buildings, it is acceptable to use the Education and Skills Funding Agency (ESFA) framework requirements as an alternative method of compliance with the ‘Daylighting’ criteria. In this case, evidence would be required to demonstrate that the requirements in the framework have been adhered to. At least 80% of all relevant room types (weighted by area) must meet the relevant criteria in the ESFA framework requirements.
CN2.1	Compliant daylight metrics	As outlined in the criteria, only daylight illuminance methods are accepted. If using EN 17037 or IES LM-83 options, only the daylight illuminance method from these standards is compliant with the criteria, other methods such as daylight factor are not.
CN2.2	Mixed-use buildings	In the case of a mixed-used buildings, the number of daylight credits are adjusted to account for the various asset types present. For full details, see Guidance Note 20 (GN20).

Ref	Terms	Description
View out		
CN3	First aid rooms	The view out criteria do not apply to dedicated first aid or medical rooms in non-healthcare projects.
CN3.1	Security and sensitive rooms	The view out criteria do not apply to rooms containing security, critical systems or sensitive material, such as CCTV monitoring rooms, where the presence of compliant windows would compromise a critical function of the space.
CN3.2	No relevant areas	If the scope of the assessment does not include any relevant building areas, as defined within the manual, the criteria for 'view out' can be considered as met by default.
CN3.3	Percentage area	For the view out credit, compliance must be demonstrated for the percentage of the floor area in each relevant building area, rather than the percentage of the total relevant building area in the building.
CN3.4	Exclusion of non-relevant areas	Only relevant areas within rooms should be assessed. However, spaces such as circulation routes or other transient spaces within a relevant area can only be excluded if the route or area is clearly defined by the building layout, this is further explained within M5.1.

Evidence

Criteria	Interim design stage	Final post-construction stage
Minimum standard		
1	Design drawings and calculations.	Assessor site inspection report and photographic evidence. OR Final construction drawings or equivalent. Updated calculations where required.
Glare control		
2–4	Design drawings and relevant section or clauses of the building specification or contract. Glare control assessment, where required.	Assessor site inspection report and photographic evidence. Final construction drawings or equivalent. Where relevant, manufacturer's data sheets or product literature. Glare control assessment, where required.
Daylighting		
5, 12	Design drawings and daylight calculations. OR Relevant section or clauses of the building specification or contract confirming national best practice daylighting guidelines or BREEAM requirements.	Final construction drawings or equivalent or assessor site inspection report and photographic evidence. Daylight calculations, where not provided at design stage or updated. Confirmation from the design team that daylighting is in accordance with national best practice daylighting guidelines or BREEAM requirements.
Direct sunlight to windows		
6–7	Design drawings and calculations (manual or computer simulated). OR Relevant section or clauses of the building specification or contract confirming BREEAM requirements.	Where not provided at design stage or updated, calculations (manual or computer simulated). Assessor site inspection report and photographic evidence. OR

Criteria	Interim design stage	Final post-construction stage
		Final construction drawings or equivalent.
View out		
8–9	Design drawings, window schedules and calculations.	Assessor site inspection report and photographic evidence. OR Final construction drawings or equivalent. Updated calculations where required.
Evaluating glare from sunlight		
10–11	Design drawings and calculations.	Assessor site inspection report and photographic evidence. OR Final construction drawings or equivalent. Updated calculations where required.

Definitions

Adequate view out

BREEAM defines an adequate view out as a view of a landscape or buildings (rather than just the sky) at seated eye level (1.2 m) 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 10 m (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.

Computer simulation

Software tools that can be used to model more complex room geometries for daylighting.

Illuminance

The amount of light falling on a surface per unit area, measured in lux.

Occupied space

A room or space within the assessed building that is likely to be occupied for 30 minutes or more by a building user.

Reflectance

The ratio of the luminous flux reflected from a surface to the luminous flux incident on it.

Relevant building area – Daylighting

For BREEAM, this is defined as areas within the building where good daylighting is of benefit to the building users if it is an occupied space.

This includes the following, specifically stated because they are often omitted:

1. Sports hall exercise spaces
2. Laboratory areas (unless the type of research that will be carried out requires strictly controlled environmental conditions, such as the exclusion of natural light)
3. Self-contained flats
4. Kitchen and catering areas
5. General communal areas
6. Small offices (including those within residential buildings and residential institutions)
7. Meeting rooms (including those within residential buildings and residential institutions)
8. Leisure areas
9. Any area that may involve close up work.

However, this excludes the following (where present):

1. Media, arts production, SEN sensory spaces, x-ray rooms and other areas requiring strictly controlled acoustic or lighting conditions.
2. Clinical areas with controlled environmental conditions, e.g. operating theatres, delivery rooms or pathology. However, BREEAM strongly advises that the benefits from daylighting and view out are seriously considered when designing areas of critical and intensive care in healthcare buildings.
3. Holding areas and custody cells where security issues conflict with the BREEAM daylighting requirements.
4. Custody cells in courts, where privacy is a functional or operational requirement.

Relevant building area – Direct sunlight

For direct sunlight, only occupied living areas within the unit are required to assess the provision of direct sunlight. For example, within a healthcare building this would include in-patient bedrooms and day care living rooms.

Relevant building area – Glare control

Glare control criteria apply to areas of the building where resultant glare could be problematic for users. This includes, but not exclusively:

— Areas that have been designed to contain or use workstations or projector screens (such as offices, study bedrooms, libraries, facility management offices and reception desks).

— Areas where people must spend time in fixed locations and cannot change their viewing direction (such as classrooms and hospital wards).

— Sports halls.

— Areas where occupants are expected to spend a significant amount of time in the day (such as care home bedrooms).

Building areas described above should not be assessed when they are excluded for the daylight and view out criteria.

Relevant building area – View out

The aim of the view out criteria is to allow occupants to refocus their eyes from close work. Relevant areas are spaces where close work in a fixed position is carried out for sustained periods of time. The view out criteria is therefore not applicable to occupied areas such as meeting rooms, or other spaces where such close work is not being carried out.

BREEAM defines relevant building areas requiring a view out to include spaces where close work in a fixed position is carried out for sustained periods of time:

1. There are or will be workstations or benches or desks for building users.
2. Close work will be undertaken or visual aids will be used.
3. Occupants spend a significant amount of time, and a view out is deemed to be of benefit to the building occupants, this includes:
    a. Bedrooms (Residential care home)
    b. Living rooms (Residential institution – long-term stay, and Residential)

Excluded areas for view out might include:

— Conference rooms, meeting rooms, lecture theatres, sports halls, acute SEN rooms, kitchens.

— Any spaces where the exclusion or limitation of natural light is a functional requirement (such as laboratories or media spaces).

— Individual booths or enclosed workstations that are intended for temporary non-permanent work.

— Bedrooms where occupants mainly use the space for sleeping, such as in hospitality, residential and residential institutions (long- and short-term stay) and bedrooms that are not specified above and in building type specific note 2.1.

Relevant spaces – View out

A distinct space that falls within the definition of 'relevant building area'.

Relevant unit – Direct sunlight

A relevant unit would be a distinct building or space intended for single residential-like occupancy type. Where units are self-contained, such as a house or flat each self-contained unit must be considered separately. Where there are shared communal areas such as in a residential care home, then the whole care home can be considered one relevant unit. In a healthcare scenario, a healthcare ward that overnight patients have direct access to would be considered one unit.

Surrounding wall area

Surrounding wall area refers to the internally measured area (in m^2) of the external wall on which the window or opening is located, including the area of the window or opening itself.

Working plane

The CIBSE SLL Lighting Handbook and the CIBSE SLL Code for Lighting define the working plane or the reference plane as the plane at which work is normally done.

Additional information

None.

Hea 02 Artificial light

Aim

To ensure artificial lighting and occupant controls are considered at the design stage to ensure best practice in visual performance, visual comfort and overall wellbeing for building occupants.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	2 + 1 exemplary	None	All (see ref 1.0)
Shell and core	1	None	1, 4 (see ref 1.0)
Shell only	1	None	1, 4 (see ref 1.0)

Assessment type specific notes

Ref	Assessment type specific notes
1.0	**External lighting** 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. For fully fitted buildings, the credit can be awarded based on compliance with criteria 1–3. For non-fully fitted buildings, the credit is not applicable, and the issue is filtered out.

Building type specific notes

Ref	Building type specific notes
2.0	**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.
2.1	**Hospitality – lighting levels in hotel bedrooms** Internal lighting levels in hotel bedrooms will not usually need to conform to national best practice levels for offices as these spaces are not generally used as a workspace. However, if hotel bedrooms, or rooms within a hotel suite, are intended to be used as workspaces, similar to a small office, the lighting levels should conform to national best practice levels for this type of space.

Assessment criteria

Prerequisite – Flicker

1 All lighting types should be designed to avoid flicker and stroboscopic effects (see M1), including across their full dimming and colour tuning range if applicable. This is applicable to all internal and external lighting.

One credit – Internal and external lighting levels

Internal lighting

2 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 2022[24] and any other relevant industry standard. Internal lighting

should be appropriate to the tasks undertaken, accounting for building user concentration and comfort levels. Compliance criteria should include, as applicable for each type of application:

2.a Illuminance levels and uniformity

2.b Glare limits

2.c Colour appearance (where standard recommendations exist)

2.d Colour rendering

3 For areas where computer screens are regularly used, the lighting design complies with CIBSE Lighting Guide 7 – Sections 2.5, 2.15 to 2.17, 2.22, and 6.10 to 6.20.[25] This gives recommendations highlighting:

3.a Limits to the luminance of the luminaires to avoid screen reflections. (Manufacturers' data for the luminaires should be sought to confirm this.)

3.b Any area where a surface is used to reflect light in to a space, such as uplighting, the recommendations refer to the luminance of the lit ceiling rather than the luminaire; a design team calculation is usually required to demonstrate this.

3.c Recommendations for direct lighting, ceiling illuminance, and average wall illuminance.

External lighting

4 All external lighting located within the construction zone is specified in accordance with BS 5489-1:2020[26] and BS EN 12464-2:2024[27]. External lighting should provide illuminance levels that enable users to perform outdoor visual tasks efficiently and accurately, especially during the night. Compliance criteria should include, as applicable for each type of application:

4.a Illuminance / luminance levels and uniformity

4.b Glare limits

4.c Colour rendering

One credit – Zoning and occupant control

5 Internal lighting is zoned to allow for occupant control in accordance with the criteria below for relevant areas present within the building, as applicable:

5.a Workstations adjacent to windows or atria and other building areas are separately zoned and controlled

5.b In office areas where furniture layout is known, zones of no more than four workplaces

5.c Seminar and lecture rooms: zoned for presentation and audience areas

5.d Library spaces: separate zoning of stacks, reading and counter areas

5.e Teaching space or demonstration area

5.f Whiteboard or display screen

5.g Auditoria: zoning of seating areas, circulation space and lectern area

5.h Dining, restaurant, café areas: separate zoning of servery and seating or dining areas

5.i Retail: separate zoning of display and counter areas

5.j Bar areas: separate zoning of bar and seating areas

5.k Wards or bedded areas: zoned lighting control for individual bed spaces and control for staff over groups of bed spaces

5.l Treatment areas, dayrooms, waiting areas: zoning of seating and activity areas and circulation space with controls accessible to staff.

6 Areas used for teaching, seminar or lecture purposes have lighting controls provided in accordance with CIBSE Lighting Guide 5.[28]

7 Where automatic lighting controls are used for energy efficiency reasons, manual override must be provided.

8 In addition, the building type criteria in Table 5.4 below (where relevant).

Table 5.4: Building-specific zoning and control requirements

Building type	Internal and external lighting requirements
Education 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.
Law 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).
Lighting zoning and control – 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).

One exemplary credit – Lighting control

9 Lighting in each control zone with an occupied space can be manually dimmed by occupants down to no more than 20% of the maximum light output using lighting control interfaces positioned in accessible locations.

10 Lighting in each control zone within an occupied space can be colour tuned over a correlated colour temperature range from 2700K or less to 4000K or more, with automatic controls set to limit the correlated colour temperature in the afternoon and evening to 2700K or less.

Methodology

M1: Flicker and stroboscopic effects

All lighting (except for emergency lighting), including light sources and separate control gear, must demonstrate compliance against one of the below:

— Ecodesign EU Directive 2009/125/EC (see Methodology M1.3)

— UK Statutory Instrument 2010 No. 2617 (see Methodology M1.3)

— IEEE 1789-2015 *IEEE Recommended Practices for Modulating Current in High-Brightness LEDs for Mitigating Health Risks to Viewers*

— California Title 24, 2016, Joint Appendix JA10, Test Method for Measuring Flicker of Lighting Systems

M1.1: Dimmable lights

In the case of dimmable lighting where it complies with the flicker standard above at full load (such as the Ecodesign directive) and the manufacturer has not tested at dimmed states. Then the dimmed lights can still comply with criterion 1 where the lighting designers confirm flicker has been considered through appropriate driver, switch and circuit design to minimise flicker across the entire dimming range.

M1.2: Colour tuning range

Colour tuneable lights must be assessed for flicker across the entire colour tuning range. If colour tuneable lights are not assessed across the entire range, then they can still comply with criterion 1 where the lighting designers confirm flicker has been considered through appropriate driver, switch and circuit design to minimise flicker across the entire colour range.

M1.3: United Kingdom – compliance

The UK SI 2010 No.2617 Ecodesign for Energy-Related Products Regulations implements the Ecodesign EU Directive 2009/125/EC in the UK. This mandates that lighting products must meet the flicker specification below at full load (not dimmed) before they can be legally sold on the UK market:

- Short-term flicker indicator Pst LM ≤ 1.0 and
- Stroboscopic visibility measure SVM ≤ 0.4

No evidence is required for non-dimmed lights in countries where this directive has been adopted.

M2: Internal and external lighting levels, zoning and control

M2.1: Occupancy or workstation layout

The limit of four workspaces is indicative of the required standard but is not a fixed requirement. Where there is justification for this to be increased to fit with the adopted lighting strategy, this may be accepted provided that the assessor is satisfied that the aim of this criterion is upheld, i.e. that there is suitable zoning or control of lighting to enable a reasonable degree of occupant control over lighting in their personal work area. The relevant design team member, e.g. lighting consultant, should set out how this is to be achieved in such an instance.

Where occupancy or workstation layout is not known, lighting control can be zoned on the basis of 40 m² grids, i.e. an assumption of 1 person or workspace per 10 m².

Compliance notes

Ref	Terms	Description
Internal and external lighting levels		
CN1	Lighting levels for areas where computer screens are regularly used	Projects can specify 300 lux instead of what is prescribed in EN 12464-1. This is as per CIBSE Lighting Guide 7.
CN1.1	External lighting – architectural façade/decorative lighting	Architectural façade or other decorative lighting, which does not provide users with lighting to perform tasks outdoors, does not need to be included in the assessment of external lighting.
Zoning and control		
CN2	Small spaces	Buildings consisting entirely of small rooms or spaces (less than 40 m²) which do not require any subdivision of lighting zones or control will meet the zoning criteria by default.
CN2.1	Zoning rooms not listed	For zoning rooms or spaces not listed within criteria 5 and 6 the assessor can exercise an element of judgment when determining whether what is specified is appropriate for the space, given its end use and the aim and criteria of this BREEAM issue.
CN2.2	Task lighting	Lighting zoning criteria are applicable to both general lighting and task lighting (where present). Task lighting is only considered in fully fitted projects, where they are integrated into

Ref	Terms	Description
		the workstations. Are able to be controlled individually by occupants and can be centrally controlled by building management, enabling automatic switch off. Portable task lights are not accepted. Task lighting must connect to the building systems in a way that prevents removal by general users.
CN2.3	Dimming control	Localised dimming controls installed in line with the criteria, along with a master on/off switch, can be considered as meeting the aim of the requirement for 'controls' in open plan offices.
CN2.4	Hand held remote controls	Remote control light switches can be considered as compliant, on the basis that these are provided in sufficient numbers/locations to meet the aim of the criteria.
CN2.5	Exemplary zoning and control	The exemplary level criteria applies only to lighting zones in the asset where: — Zones will benefit from dimming control. — Dimming does not interfere with the function of the space. Where lighting zones do not have dimming controls fitted, these must be clearly evidenced and justified.

Evidence

Criteria	Interim design stage	Final post-construction stage
Flicker and stroboscopic effects		
1	For dimmable / colour tuneable lights (see M1.1): Design drawings/lighting schedules. OR Relevant section or clauses of the building specification or contract. OR A letter of formal confirmation of compliance from the building services engineer or lighting designer. Where luminaire specifications are known, manufacturer's product data sheets.	For dimmable / colour tuneable lights (see M1.1): Assessor site inspection report and photographic evidence. Final construction or equivalent lighting schedules and lighting layout plans. Manufacturer's product data sheets.
Internal and external lighting, Zoning and occupant control, Lighting control		
2–10	Design drawings, lighting schedules and lighting control strategy. OR Relevant section or clauses of the building specification or contract. OR A letter of formal confirmation of compliance from the building services engineer or lighting designer.	Assessor site inspection report and photographic evidence. Documentary evidence to confirm compliance such as final construction or equivalent lighting schedules, lighting layout plans, lighting control strategy, lighting calculations or light testing results. A letter of formal confirmation of compliance from the building services engineer or lighting designer.

Definitions

Computer simulation

Software tools that can be used to model more complex room geometries for daylighting.

Construction zone

For the purpose of this BREEAM issue, the construction zone is defined as the site which is being developed for the BREEAM-assessed building. This includes the external site areas that fall within the scope of the new works.

Illuminance

The amount of light falling on a surface per unit area, measured in lux.

Occupied space

A room or space within the assessed building that is likely to be occupied for 30 minutes or more by a building user. Please note there is a specific, unrelated, definition of 'unoccupied' with reference to acoustic testing and measurement and this should not be confused with the definition used here.

Reflectance

The ratio of the luminous flux reflected from a surface to the luminous flux incident on it.

Relevant building area – Internal and external lighting

Relevant areas are for internal lighting should cover all the relevant areas listed within the standard used, i.e. BS EN 12464-1:2021 (Table 9 – 61).

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. The credit can be awarded on the basis of compliance with the internal lighting criteria.

Separate zoning – Occupant control

Light switches or controls for a particular area or zone of the building that can be accessed and operated by the individuals occupying that area or zone. Such controls will be located within, or within the vicinity of, the zone or area they control.

The relevant areas for the criteria apply only to areas where users are expected to have control. For instance, this means that areas intended for the general public, or a shop floor, would not be expected to have lighting controls.

Staff areas

Areas of the building used mainly by staff (e.g. offices, meeting rooms, staff rooms) and medical areas where patients are admitted but that do not require restricted environmental conditions (e.g. consulting rooms, physiotherapy etc.).

Uniformity

The uniformity is the ratio between the minimum illuminance on the working plane within a room and the average illuminance on the same working plane.

Working plane

CIBSE LG10 defines the working plane as the horizontal, vertical or inclined plane in which a visual task lies.(29) The working plane is normally taken as 0.7 m above the floor for offices and 0.85 m for industry.

Additional information

Flicker and stroboscopic effects

Further information on flicker and stroboscopic effects can be found in SLL Factfile 17: Temporal lighting artefacts (2021).

Internal and external lighting levels, zoning and control

Relevant industry standards for lighting design

For preschools, schools and sixth form colleges, the following can be considered a relevant industry standard for lighting design:

- Building Bulletin 90: Lighting Design for Schools(30)

For care homes housing people with dementia the following standard can be used instead of the SLL Code for Lighting:

- Design Lighting for People with Dementia, University of Stirling, Stirling, 2013.

For residential institution (long-term stay), CIBSE SLL LG9[31] can be considered as a relevant standard in addition to, or instead of, SLL Code for Lighting 2022.

Illuminance levels specified in the SLL Code for Lighting 2022 align with BS EN 12464-1.[32]

BREEAM has not attempted to list all appropriate industry standards. Any recognised collaborative industry or sector best practice standard or guidance that sets levels appropriate to the tasks undertaken, accounting for building user concentration and comfort levels, can be considered an appropriate industry standard for the purposes of this BREEAM issue.

Hea 03 Non-visual effects of light

Aim

To ensure the non-visual effects of light are considered to promote positive impacts on psychology and physiology of the building occupants through a healthy circadian rhythm.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	1	None	All (see ref 1.0)
Shell and core	0	None	Not applicable
Shell only	0	None	Not applicable

Assessment type specific notes

Ref	Assessment type specific note
1.0	Where the fully fitted building is speculative and therefore the final layout is not defined (e.g. only open plan is provided in each tenanted space), the required areas of each open plan space should meet the criteria. Criterion 2.a is not applicable to speculative assessments. When using criterion 2.b and fixed positions are unknown, both seated and standing eye heights must be assessed (see CN1.4). Where it is possible to designate separable ancillary areas that would be required in the space (such as toilets or server rooms), these can be excluded from the calculation (see CN1.5).

Building type specific notes

Ref	Building type specific note
-	None

Assessment criteria

One credit – Non-visual effects of light

1 Achieve at least one credit for 'Daylighting' in Hea 01 Natural light.

2 All relevant areas achieve one of the below, as applicable:

2.a Where occupant positions are known and fixed (see M1.1): All positions in all relevant building areas receive a vertical illuminance of at least 250 lux melanopic EDI at occupant eyes for at least four hours during the daytime (beginning by noon at the latest).

2.b Where occupant positions are unknown or variable (see M1.2): Cylindrical illuminance at eye height across each relevant building area corresponds to at least 250 lux melanopic EDI for at least four hours during the daytime (beginning by noon at the latest).

3 Electric lighting systems and controls are in place to adjust the flux and spectral output of the emitted light over time (colour tuning) so that melanopic EDI at occupant eye level can be reduced in the afternoon and evening, as relevant for each type of application.

Residential areas (Healthcare, Residential institutions, Prisons, and Hospitality)

4 For residential areas within a building, systems and controls are in place to ensure that no more than 10 lux melanopic EDI for a period of three hours before bedtime and no more than 1 lux melanopic EDI during sleep time are achieved at occupant eye level in all relevant building areas where residential occupancy type is expected (see Definitions).

Methodology

M1: Non-visual effects of light

Non-visual effects of light can be quantified through melanopic Equivalent Daylight Illuminance (EDI), expressed in lux. This is the illuminance from daylight that produces a melanopic irradiance, or a circadian stimulation, equivalent to that of the light source considered. It can be calculated or measured based on illuminance and spectral power density using the CIE S 026 Toolbox (cie.co.at/publications/cie-system-metrology-optical-radiation-iprgc-influenced-responses-light-0).

For each seated or standing occupant location in all relevant building areas, daylight should be the preferred light source for achieving the 250 lux melanopic EDI criterion during the daytime (criterion 2). To calculate the daylight contribution, see M1.3. In addition to daylight, electric lighting may also be used to achieve the criterion. For appropriate methodology on electrical lighting contribution, see M1.4.

M1.1: Known and fixed occupant positions

Where fixed seated or standing positions are known, and criterion 2.a is used, only those positions and viewing directions need to be assessed for compliance against the daylight and electrical light contribution (M1.3 and M1.4) using vertical illuminance at the eye.

M1.2: Variable or not known positions

Where positions are variable or not known, and criterion 2.b is used, cylindrical illuminance at eye height, seated and/or standing (see CN1.4), should be determined in each relevant building area. A calculation grid as defined in Guidance Note 50 must be used for each relevant area. The daylight and electric lighting contributions should be determined at all calculation grid points in the relevant areas. To comply with criterion 2.b, cylindrical illuminance should meet the target at each calculation grid point.

Examples of spaces with variable occupant positions include areas where occupants are not confined to static locations during activities. These can be healthcare facilities where staff move around patients, retail spaces where shopping assistants move about, industrial buildings where staff shift between different positions, and other similar environments.

M1.3: Daylight contribution

Following the procedures described in Guidance Note 50, daylight contribution should first be determined through computer-based calculations of daylight illuminance (expressed in lux) at occupant eye level (see CN1.4). This can be vertical illuminance at the eye for each occupant position where occupant positions are fixed and known, or cylindrical illuminance at eye height across a calculation grid covering each relevant area where occupant positions are unknown or variable.

Calculations should be carried out for each occupied day in a typical year, and at hourly steps over four hours during the daytime beginning by noon at the latest. For each calculation point, the lowest hourly daylight illuminance value calculated (expressed in lux) should be retained and deducted from the target value of 250 lux melanopic EDI. If the result is a positive value, it should be taken as the daytime melanopic EDI target for the electric lighting system.

> For example, the lowest hourly daylight illuminance calculated at occupant eye level for a known and fixed seating location is 50 lux. In order to achieve the 250 lux melanopic EDI target, 200 lux melanopic EDI must be provided by electric lighting at occupant eye level for this location.

Note: Daylight illuminance (lux) is directly equivalent to melanopic EDI.[33]

M1.4: Electric lighting contribution

The contribution from electric lighting can be determined through in situ measurements or computer-based calculations of vertical melanopic EDI at eye level for each seating location where occupant positions are fixed and known, or cylindrical melanopic EDI at eye height across a grid covering each relevant area where occupant positions are unknown or variable.

Measurements should prioritise melanopic EDI via spectral power density (using a spectrometer) although illuminance (using an illuminance meter) would also be acceptable see M1.4.1 and M1.4.2 respectively. Computer-based calculations will typically include illuminance.

Daylight should be completely excluded from measurements and calculations of electric lighting (spectral power density and/or illuminance).

M1.4.1: Measurement of melanopic EDI

Vertical melanopic EDI can be measured in situ using a spectrometer that records spectral power density and converts the readings into melanopic EDI. Alternatively, if the spectrometer only records spectral power density without converting it into melanopic EDI, the spectral power density measurement results will need to be entered into the CIE S 026 Toolbox to determine the corresponding melanopic EDI values. The International Commission on Illumination (CIE) provides user guides and introduction videos in this respect (available from: cie.co.at/publications/cie-system-metrology-optical-radiation-iprgc-influenced-responses-light-0).

Where in situ measurements of cylindrical melanopic EDI are taken, a simplified methodology may be used. For each grid point, vertical melanopic EDI can be measured as above in all four cardinal directions corresponding to the main axes of the space, and the mean average of the four measurement results can be taken to represent cylindrical melanopic EDI.

M1.4.2: Measurement of illuminance

Where melanopic EDI or spectral power density measurements are not possible, illuminance can be measured or calculated via computer modelling. The illuminance measurement results will need to be multiplied by the melanopic Daylight Efficacy Ratio (DER) corresponding to the type of electric lighting used in each relevant building area. In this situation, the calculation cannot use the CIE S 026 Toolbox but instead should apply the melanopic DER given in Table 5.5 below for the corresponding type of electric lighting. The multiplication results will constitute the melanopic EDI values for electric lighting.

Table 5.5: Typical melanopic DER for common types of electric lighting

Type of electric lighting	Typical melanopic DER
LED, warm white, CCT 2700K	0.42
LED, warm white, CCT 3000K	0.47
LED, neutral white, CCT 4100K	0.63
LED, cool white, CCT 5700K	0.72
Fluorescent lighting, warm white, CCT 3000K	0.40
Fluorescent lighting, neutral white, CCT 4000K	0.56
Fluorescent lighting, cool white, CCT 5000K	0.68
Incandescent lighting	0.50

Notes:

1. The correlated colour temperature (CCT) should be as per product datasheets or measured in situ using a spectrometer.
2. Where the measured CCT differs from the values listed above, the melanopic DER corresponding to the nearest CCT listed may be used. Alternatively, for higher accuracy, the melanopic DER may be determined through interpolation or extrapolation.
3. If there are other types of electric lighting not listed above, the CCT value should be determined and the corresponding values for fluorescent lighting should be used.

Following on the example, where the lowest hourly daylight contribution at occupant eye level for a known and fixed seating location is 50 lux, 200 lux melanopic EDI of electric lighting is needed to meet criterion 2.a. The room assessed uses 'LED, neutral white, CCT 4100K' which has a melanopic DER of 0.63 (see Table 5.5 above). The measured illuminance at occupant eye level from electric lighting at the seating location is 500 lux. Therefore, the following can be confirmed:

The melanopic EDI from the electric lighting system = 500 × 0.63 = 315 (lux melanopic EDI)

The overall melanopic EDI for the seating location at occupant eye level = 50 + 315 = 365 (lux melanopic EDI)

This is greater than the 250 lux melanopic EDI and therefore this seating location meets criterion 2.a.

This process will need to be repeated for all other known and fixed seating locations in the relevant building area.

The same lighting system must also be able to meet criterion 3 and 4. In the case of a residential institution asset type, the electric lighting system must not exceed the melanopic EDI benchmarks provided for three hours before bedtime and during sleep, respectively. The contribution from all forms of electric lighting present in each relevant building area should be accounted for.

> For example, the lighting is dimmed and colour tuned to a 'LED, warm white, CCT 2700K' which has a melanopic DER of 0.42 (see Table 5.5 on the previous page) three hours before bedtime in a residential care home. The measured illuminance at occupant eye level is 50 lux.
>
> The melanopic EDI from the electric lighting system = 50 × 0.42 = 21 (lux melanopic EDI)
>
> This is higher than the 10 lux melanopic EDI. To meet the criteria, the lighting system would have to reduce the CCT or dimmed further to reduce the illuminance at occupant eye level.

Compliance notes

Ref	Terms	Description
CN1	Relevant building areas – occupation hours	Criterion 2 should only be considered for occupation during daylight hours. Where the relevant building areas are occupied during nighttime hours only this criterion is not applicable. The remaining criteria are still applicable.
CN1.1	Occupant age	Criteria 1–4 are designed for a typical healthy adult. Currently, there is not enough evidence to justify changing the melanopic EDI criteria to suit other age groups. Where young children will occupy relevant building areas, the daytime level of 250 lux melanopic EDI should be achieved from daylight alone.
CN1.2	Bedtime and sleep time – timeframes	Assessor and design team judgement can be used when defining the bed and sleep time frames. Where needed a bedtime of 23:00 and a sleep time of 7 hours can be assumed.
CN1.3	Areas exempt	Following the principles outlined in Section 5.3.5 of ISO/CIE 8995-1:2025, a band near the wall may be excluded unless occupants are expected to be in this zone for a significant amount of time (i.e. > 2 hours a day).(34)
CN1.4	Eye height	Eye height is considered to be 1.2 m above floor level for seated positions and 1.6 m when standing. Where fixed positions are unknown, both seated and standing eye heights must be assessed.
CN1.5	Exclusion of non-relevant areas	Only relevant areas within rooms should be assessed. However, spaces such as circulation routes or other transient spaces within a relevant area can only be excluded if the route or area is clearly defined by the building layout. Features of the building layout which may be considered as dictating a function area would include, for example, the position of doors or fixed furniture such as a reception desk or canteen servery.

Evidence

Criteria	Interim design stage	Final post-construction stage
Non-visual effects of light		
All	A letter of formal confirmation of compliance from the building services engineer or lighting designer. Lighting product datasheets and schedules or specification. Documentary evidence to confirm the measured or calculated inputs of illuminance or spectral power density. AND	Assessor site inspection report and photographic evidence. Final construction drawings or equivalent, lighting product data sheets and schedules. Updated calculation or measurement inputs and results, where required. Formal confirmation of compliance from the building services engineer or lighting designer.

Criteria	Interim design stage	Final post-construction stage
	The calculated lux melanopic EDI confirming criteria has been achieved.	

Definitions

Computer simulation

Software tools that can be used to model more complex room geometries for daylighting and electric lighting.

Cylindrical illuminance

Average illuminance on the curved surface of a small imaginary cylinder with a vertical axis, unless stated otherwise. It does not include light falling onto the ends of the cylinder. It can be calculated using specialist software.

Illuminance

The amount of light falling on a surface per unit area, measured in lux.

Melanopic Daylight Efficacy Ratio (DER)

Metric used to quantify the effectiveness of a light source in stimulating the melanopic photoreceptors in the human eye, relative to its ability to provide visible light for general vision. It is defined as the ratio of melanopic irradiances for this light source to that for the CIE standard daylight illuminant D65 at the same visual illuminance.[(35)]

Melanopic Equivalent Daylight Illuminance (EDI)

The illuminance from the CIE standard daylight illuminant D65 that produces an equal melanopic irradiance as the light source considered. Measured in lux.

Non-visual effects

Non-visual effects of light, also referred to as non-image-forming (NIF) or non-visual (NV) responses to light, are the physiological effects of light that are distinct from visual perception. These effects can include light-induced melatonin suppression; pupillary light reflex; circadian rhythm regulation; influence on heart rate and alertness; or impacts on mood and attention.

Occupied space

A room or space within the assessed building that is likely to be occupied for 30 minutes or more by a building user.

Relevant areas – Non-visual effects

BREEAM defines relevant areas for non-visual effects to include areas of the building where:

1. There are or will be workstations, benches or desks for building users.
2. Close work will be undertaken.
3. Where occupants are expected to be for over 2 hours of the day and move about a space. Such as healthcare facilities where staff move around patients, retail spaces where shopping assistants move about, industrial buildings where staff shift between different positions, and other similar environments.

Exclusions apply to the following:

- Only the relevant areas listed above within a room need to comply, un-occupied areas in the same room such as corridors or storage areas are excluded (see CN1.5).
- See CN1.3
- The following areas exempt from the daylight criteria can be excluded (where present):
  - Media, arts production, SEN sensory spaces, x-ray rooms and other areas requiring strictly controlled acoustic or lighting conditions.

Residential areas

Residential areas within a building include any room intended for long term residential use, including sleep and long-term occupation.

Spectral power density

A measure of the power per unit area emitted by a light source per unit wavelength. It describes how the light emitted by a light source is distributed across different wavelengths of the visible spectrum. Typically measured in watts per square metre per nanometre ($W/m^2/nm$).

Additional information

CIE S 026 Toolbox

The International Commission on Illumination provides user guides and introduction videos to support the use of the recommended CIE S 026 Toolbox (cie.co.at/publications/cie-system-metrology-optical-radiation-iprgc-influenced-responses-light-0).

Circadian lighting effects on health and wellbeing

Report on circadian lighting effects on health and wellbeing RI01: Circadian lighting (www.cibse.org/knowledge-research/knowledge-portal/research-insight-01-circadian-lighting).

Hea 04 Indoor air quality

Aim

To recognise and encourage a healthy internal environment with excellent indoor air quality.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	up to 5 + 2 exemplary	Very Good	All
Shell and core	2	Very Good	1–3 (see ref 1.0)
Shell only	0	None	Not applicable
EU Taxonomy	-	-	7–8, 16–17

Assessment type specific notes

Ref	Assessment type specific note
1.0	**Shell and core – Ventilation** Where ventilation systems are not within the remit of the shell and core developer, compliance can be demonstrated through the building servicing strategy where this is predetermined by the built form or core services provision as appropriate to the shell and core option being followed.

Building type specific notes

Ref	Building type specific note
2.0	**Industrial buildings** If the building will not contain any office or other occupied space, only the prerequisite within this issue applies. While the requirements apply to permanently or semi-permanently occupied offices, small administration areas, which are only used occasionally can be excluded.
2.1	**Industrial buildings** The aim of this issue is to encourage a healthy internal environment. For the operational areas of industrial buildings, the internal environment is dictated by health and safety requirements. This means that the BREEAM requirements should not be made applicable to them, and so the operational areas can be excluded in the assessment of Hea 04.

Assessment criteria

One credit – Indoor air quality plan

1 A site-specific indoor air quality plan has been produced in accordance with Guidance Note 6 (GN06). This plan informs the design, specification, and installation to maximise improvement of indoor air quality during occupation. The plan must consider the following:

- 1.a Removal of highly contaminating sources
- 1.b Dilution and control of other contaminant sources, including:
  - 1.b.i Air quality requirements of specialist areas such as laboratories, where present
- 1.c Procedures for pre-occupancy flush out and purge ventilation
- 1.d Third party testing and analysis
- 1.e Maintaining indoor air quality in-use

1.f Any relevant local or national authority plans or policies (for example, Air Quality Management Areas or Local Air Quality Action Plans)

One credit – Ventilation

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

2 Provide fresh air into the building in accordance with one of the best practice standards for ventilation (see M1.1).

3 Ventilation pathways are designed to minimise the ingress and build-up of air pollutants inside the building (see M1.2).

4 Where present, HVAC systems must incorporate suitable filtration to minimise external air pollution, as defined in BS EN 16798-3:2025 Section B.4.2.(36) The specified filters should achieve supply air classification of at least SUP 2. The level of filtration required is dependent on the quality of the outdoor air.

5 Occupied spaces have calibrated carbon dioxide (CO_2) or calibrated air quality sensors specified in accordance with Building Regulations ADF2(37) and:

5.a In mechanically ventilated buildings or spaces: sensors are linked to the mechanical ventilation system and provide demand-controlled ventilation to the space.

5.b 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.

5.c The total number of sensors, and the net internal area of relevant areas covered by the sensors, is reported via the BREEAM Platform.

6 The ventilation strategy provides adequate ventilation rates throughout the year, including sufficient airflow rates in summer to prevent overheating and maintain required thermal comfort conditions, in accordance with:

6.a CIBSE AM10(38) (for naturally ventilated buildings)

6.b CIBSE AM13(39) (for mixed-mode buildings)

Up to two credits – Emissions from construction products

One credit

7 Three of the five product types meet the emission limits, testing requirements and any additional requirements listed in Table 5.6 and M2. Where wood-based products are not one of three selected product types, all wood-based products used for internal fixtures and fittings must be tested and classified as formaldehyde E1 class as a minimum (see CN2.2).

> Note: Even if low emitting products are used, the air quality may still exceed the indoor air quality limits, depending on the amount of material used, the volume of the space, and the ventilation rate.

Two credits

8 All the product types meet the emission limits, testing requirements and any additional requirements listed in Table 5.6 and M2.

One credit – Post-construction indoor air quality measurement

9 Criterion 1 has been achieved.

10 The formaldehyde concentration in indoor air is measured post-construction (but pre-occupancy) and does not exceed 100 μg/m³, averaged over 30 minutes.(40)

11 The formaldehyde sampling and analysis is performed in accordance with ISO 16000-2(41) and ISO 16000-3(42) and Methodology M3.

12 The total volatile organic compound (TVOC) concentration in indoor air is measured post-construction (but pre-occupancy) and does not exceed an 8-hour time-weighted average of 300 μg/m³.(43)

13 The TVOC sampling and analysis is performed in accordance with ISO 16000-5(44) and ISO 16000-6(45) or ISO 16017-1 (46) and Methodology M3.

14 Where levels are found to exceed these limits, the project team confirms the measures that have, or will be undertaken in accordance with the recommendations of the IAQ plan, to reduce the TVOC and formaldehyde levels to within the above limits.

15 The measured concentration levels of formaldehyde (μg/m³) and TVOC (μg/m³) are reported via the BREEAM Platform.

Up to two exemplary credits – Emissions from construction products

One exemplary credit

16 At least four of the five product types listed in Table 5.7 on the next page meet the emission limits, testing requirements and any additional requirements listed in Table 5.7 and M2.

Two exemplary credits

17 All product types meet the emission limits, testing requirements and any additional requirements listed in Table 5.7 and M2.

Checklists and tables

Table 5.6: Emission criteria by product type

Emission limit [1, 2]			Testing requirement
Formaldehyde	Total volatile organic compounds (TVOC) [3]	Category 1A and 1B carcinogens	
Interior paints and coatings			
≤ 0.06 mg/m³	≤ 1.0 mg/m³	≤ 0.001 mg/m³	EN 16402 (47) or ISO 16000-9 (48) or CEN/TS 16516 (49) or CDPH Standard Method v1.2 (50) or ISO 16000-10 (51) (see CN2.5)
Additional requirements for interior paints and coatings (see M2.3)			
Meet VOC content limits (Table 5.8 on page 115). Paints used in wet areas (e.g. bathrooms, kitchens, utility rooms) should protect against mould growth (see M2.3).			
Wood-based products (including wood flooring)			
≤ 0.06 mg/m³ (Non-MDF) ≤ 0.08 mg/m³ (MDF)	≤ 1.0 mg/m³	≤ 0.001 mg/m³	ISO 16000-9 or CEN/TS 16516 or

Emission limit [1, 2]			Testing requirement
Formaldehyde	Total volatile organic compounds (TVOC) [3]	Category 1A and 1B carcinogens	
			CDPH Standard Method v1.2 or EN 717-1 (formaldehyde emissions only) (52) or ISO 16000-10 (see CN2.5)
Flooring materials (including floor levelling compounds and resin flooring)			
≤ 0.06 mg/m³	≤ 1.0 mg/m³	≤ 0.001 mg/m³	ISO 10580 (53) or ISO 16000-9 or CEN/TS 16516 or CDPH Standard Method v1.2 or ISO 16000-10 (see CN2.5)
Ceiling materials, wall materials, acoustic insulation and thermal insulation materials			
≤ 0.06 mg/m³	≤ 1.0 mg/m³	≤ 0.001 mg/m³	ISO 16000-9 or CEN/TS 16516 or CDPH Standard Method v1.2 or ISO 16000-10 (see CN2.5)
Interior adhesives and sealants (including flooring adhesives)			
≤ 0.06 mg/m³	≤ 1.0 mg/m³	≤ 0.001 mg/m³	EN 13999 (Parts 1-4) (54), (55), (56), (57) or ISO 16000-9 or CEN/TS 16516 or CDPH Standard Method v1.2 or ISO 16000-10 (see CN2.5)

Notes

1. 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.
2. The emission limits in this table apply to the finished product, i.e. after any coating or other treatment process has been applied.
3. Where test results for a product exceed the TVOC emission limit, compliance with the above requirements can still be achieved where the test results demonstrate an R-value ≤ 1 after 28 days.

Table 5.7: Exemplary level emission criteria by product type

Emission limit [1, 2]				Testing requirement
Formaldehyde	Total volatile organic compounds (TVOC) [3]	Total semi-volatile organic compounds (TSVOC)	Category 1A and 1B carcinogens	
Interior paints and coatings				
≤ 0.01 mg/m³	≤ 0.3 mg/m³	≤ 0.1 mg/m³	≤ 0.001 mg/m³	EN 16402 or ISO 16000-9

Emission limit [1, 2] Formaldehyde	Total volatile organic compounds (TVOC) [3]	Total semi-volatile organic compounds (TSVOC)	Category 1A and 1B carcinogens	Testing requirement
				or CEN/TS 16516 or CDPH Standard Method v1.2 or ISO 16000-10 (see CN2.5)
Additional requirements for interior paints and coatings (see M2.3)				
Meet VOC content limits (Table 5.8 on page 115). Paints used in wet areas (e.g. bathrooms, kitchens, utility rooms) should protect against mould growth (see M2.3).				
Wood-based products (including wood flooring)				
≤ 0.01 mg/m³	≤ 0.3 mg/m³	≤ 0.1 mg/m³	≤ 0.001 mg/m³	ISO 16000-9 or CEN/TS 16516 or CDPH Standard Method v1.2 or EN 717-1 (formaldehyde emissions only) or ISO 16000-10 (see CN2.5)
Flooring materials (including floor levelling compounds and resin flooring)				
≤ 0.01 mg/m³	≤ 0.3 mg/m³	≤ 0.1 mg/m³	≤ 0.001 mg/m³	ISO 10580 or ISO 16000-9 or CEN/TS 16516 or CDPH Standard Method v1.2 or ISO 16000-10 (see CN2.5)
Ceiling materials, wall materials, acoustic insulation and thermal insulation materials				
≤ 0.01 mg/m³	≤ 0.3 mg/m³	≤ 0.1 mg/m³	≤ 0.001 mg/m³	ISO 16000-9 or CEN/TS 16516 or CDPH Standard Method v1.2 or ISO 16000-10 (see CN2.5)
Interior adhesives and sealants (including flooring adhesives)				
≤ 0.01 mg/m³	≤ 0.3 mg/m³	≤ 0.1 mg/m³	≤ 0.001 mg/m³	EN 13999 (Parts 1-4) or ISO 16000-9 or CEN/TS 16516 or CDPH Standard Method v1.2 or ISO 16000-10 (see CN2.5)
Notes				

Emission limit [1, 2]				Testing requirement
Formaldehyde	Total volatile organic compounds (TVOC) [3]	Total semi-volatile organic compounds (TSVOC)	Category 1A and 1B carcinogens	

1. 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.
2. The emission limits in this table apply to the finished product, i.e. after any coating or other treatment process has been applied.
3. Where test results for a product exceed the TVOC emission limit, compliance with the above requirements can still be achieved where the test results demonstrate an R-value ≤ 1 after 28 days.

Methodology

M1: Ventilation

M1.1: Provision of fresh air for ventilation

It is the design team's responsibility to determine and apply the most appropriate method or option(s) for the project undergoing assessment.

Education buildings

— Building Bulletin 101 or BS ISO 17772-1:2017 (excluding naturally ventilated buildings), whichever requires the higher performance.

Clinical areas with controlled environmental conditions

— HTM03-01 Specialised ventilation for healthcare premises (England, Wales and Northern Ireland), SHTM03-01 Ventilation for healthcare premises Part A: Design and Validation (Scotland), or

— BS ISO 17772-1:2017 (excluding naturally ventilated buildings), whichever requires the higher performance.

All other buildings (mixed mode or mechanical ventilation)

— BS ISO 17772-1:2017 Annex I.

All other buildings (naturally ventilated)

— CIBSE AM10.

M1.2: Ventilation pathways

Location of ventilation intakes and airflows should be designed in accordance with the below methodologies. There are different methodologies for either mechanically ventilated and mixed mode buildings or naturally ventilated buildings.

Mechanically ventilated and mixed mode buildings

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

1. 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:
    a. PD CEN/TR 16798-4:2017 Sections 8.8.1 to 8.8.4
    b. BRE FB 30 Ventilation for healthy buildings: Reducing the impact of urban air pollution (2011)
    c. BRE IP 9/14 Locating ventilation inlets to reduce ingress of external pollutants into buildings, as appropriate
    d. CIBSE TM21
2. 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 (see Definitions on page 119).

3. Positioning the building's air intakes and exhausts at least 10 m of horizontal distance apart. Positioning intakes at least 10 m horizontal distance from sources of external pollution (including the location of air exhausts from other buildings). There is no minimum vertical distance set in this approach. 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.

Naturally ventilated buildings

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:

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

Or 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.

M1.3: Sensors

Sensors must be calibrated, mounted, and installed in line with the manufacturer's recommendations and in line with national guidance. The number of sensors should be decided based on the coverage of each sensor, according to the manufacturer.

For CO_2 monitoring used to gain ventilation credit, the sensors must be wall mounted. The CO_2 sensors should be placed at head height and away from windows, doors or air supply openings.

M2: Emissions from construction products

M2.1: Scope of assessment of emissions from construction products

Only products that are installed or applied in parts of the building where their emissions are likely to affect indoor air quality need to be assessed. For the purposes of this issue, this means any product installed or applied:

— Inside of the inner surface of the building's infiltration
— Inside of the vapour or waterproof membrane or
— Inside of the inner surface of the building envelope's interior facing thermal insulation layer, where present.

The scope of the VOC credit issues does not extend to furnishings, e.g. desks or shelving, it focuses on the key internal finishes and fittings integral to the building.

The scope of the VOC credit issues does cover products such as:

— Where a paint or coating falls within a category in Annex II of the EU Directive 2004/42/CE or, a category in the relevant product emission table of the technical manual, then the paint or coating must be assessed. This is likely to include paints and coatings applied to walls, ceilings, floors, doors, etc.

— A finish applied to a product in the factory. Any finished product as a whole must meet the performance requirements / emission limits set in the manual. For instance, a wood panel has a finish applied in the factory. The whole panel, including all the elements that make up that panel, would need to comply with the requirements set for wood panel products in this issue.

— Internal finishes to installations manufactured off-site such as elevators. The specification of internal finishes (regardless of whether they are installed on site or in the factory) will impact on VOC emissions.

M2.1.1: Non-VOC emitting products

Inherently non-VOC emitting products do not need to be assessed and can be deemed fully compliant with the criteria. Examples of non-VOC emitting products include:

— Brick
— Natural stone
— Concrete
— Ceramic tile
— Glass
— Metal surfaces etc.

This is unless potentially VOC emitting products (either organic- or inorganic-based) are used as coatings, binders, or sealants in their production or finishes.

M2.2: Guidance Note 22

Guidance Note 22 (GN22) provides a list of approved alternative schemes recognised by BREEAM and that can be used to demonstrate compliance for the VOC emission levels. If assessors, clients or scheme operators wish to seek recognition of other schemes not currently listed, please contact the BREEAM office (breeam@bregroup.com) for details of the application process.

M2.3: Additional requirements for interior paints and coatings

Evidence must be provided to show that paints used in wet areas protect against mould growth. Evidence could include appropriate test results (e.g. fungal or algal resistance testing) or manufacturer's product information or declaration. There are European standard tests which could be used: EN 15457 and EN 15458.[58], [59]

In addition to the emission criteria by product type in Table 5.6 on page 110 and Table 5.7 on page 111, interior paints and coatings must also comply with requirements shown in Table 5.8 below.

Table 5.8: Maximum VOC content for paints and coatings

Product category	Free VOC content of ready-to-use product (g/l)	Testing requirements
Interior matt walls and ceilings (Gloss <25@60°)	10	ISO 11890-2 or ISO 17895 or Calculation based on the ingredients and raw materials
Interior glossy walls and ceilings (Gloss >25@60°)	40	
Interior trim and cladding paints for wood and metal	90	
Interior trim varnishes and wood stains, including opaque wood stains	65	
Interior minimal build wood stains	50	
Primers	15	
Binding primers	15	
One-pack performance coatings	100	
Two-pack reactive performance coatings for specific end use such as floors	80	
Multi-coloured coatings	80	
Decorative effect coatings	80	

M2.4: Self-declaration of emission levels from construction products

Manufacturers' self-declaration of emission levels from construction products is acceptable in the form of technical specification sheets or manufacturers' literature provided the testing has been performed by an accredited laboratory in accordance with the above. OR, where the manufacturer declares that the product contains no formaldehyde or VOCs.

For paints and varnishes, manufacturers' calculations of VOC content, based on the constituent ingredients, can be used to demonstrate compliance with the testing requirement.

M2.5: Testing requirements for emission limits

The testing requirements for emission limits are based on the use of standardised emission test chamber methods. Perforator, flask, desiccator and other extraction based test methods are specifically excluded. Compliance with these requirements may be met using alternative standards, where these stipulate emission test chamber methods similar to those in the standards listed in Table 5.6 and Table 5.7. BREEAM Assessors must submit details of any alternative standards to BRE Global for approval prior to awarding any credits for this issue.

M2.6: M&E construction products

For M&E purposes, only paints, coatings, adhesives and sealants that are applied on site during construction and finishing works need to be included in the assessment. Prefabricated M&E components that arrive on-site as complete, factory-finished products are excluded from emission assessment requirements. HVAC insulation can be excluded from the emission assessment.

M3: Post-construction indoor air quality measurement

The measurement of formaldehyde and TVOC must be made in accordance with the relevant standards (as listed in the criteria). ISO 16000-2 and ISO 16000-5 provide guidance on sampling strategies for formaldehyde and VOCs, respectively. Sampling should be performed in rooms that could be occupied for periods of time greater than 30 minutes i.e. occupied spaces such as bedrooms, living rooms, classrooms, offices, etc. A representative number of rooms should be sampled, rather than every room in the building. For example, in an office building, sampling of one cellular or single occupancy office should suffice to assess the indoor air quality for that type of habitable space in the building (assuming the other cellular offices have the same construction and fit-out materials specification and ventilation strategy). In larger rooms, such as open-plan office areas, additional sampling locations may be required in order to understand the homogeneity of the indoor environment.

Uncertainties in sampling and analysis are inevitable and unavoidable, therefore it is recommended that replicate samples are taken at each sampling location (ideally a minimum of three samples for each measurement parameter, as set out in the referenced guidance). Before sampling, naturally ventilated rooms should be intensively ventilated for 15 minutes and then outer doors and windows closed for at least 8 hours (e.g. overnight) before sampling begins with the room still closed off. For mechanically ventilated rooms, the ventilation system should be running under standard operating conditions for at least for 3 hours before sampling begins. Sampling locations should be at least 1 m to 2 m from a wall and at a height of between 1 m to 1.5 m.

This information is provided to assist project teams and BREEAM Assessors on the appropriate scope of post-construction indoor air quality measurement, and, as such, is intended as guidance only and not a compliance requirement. The sampling strategy should be determined based on the advice of the appropriate person appointed to conduct the testing.

Compliance notes

Ref	Terms	Description
Ventilation		
CN1	Ventilation with window opening restrictors	Opening restrictors to windows may sometimes need to be installed to meet: — Health and safety requirements — Building regulations — Legal obligations Where such external requirements are in force, these requirements cannot be used as a mitigating factor for meeting the BREEAM ventilation criteria. Even with window restrictors, adequate ventilation must still be demonstrated in accordance with the requirements.
CN1.1	Ventilation filter classification	Filters of class F7 and ePM_1 50% can be considered equivalent to those of class MERV 13.
CN1.2	Ventilation – School office area	Office areas in schools should comply with listed office ventilation rates set in 'BB 101: Guidelines on ventilation, thermal comfort, and indoor air quality in schools'.
Emissions from construction products		
CN2	Products used in small quantities for ad hoc	All products specified for a project that fall within one of the product types listed in Table 5.6 and Table 5.7 on page 111 must be assessed under this issue. However, it is

Ref	Terms	Description
	purposes	accepted that it may be difficult to control the specification of some products (e.g. sealants) that are used in small quantities for ad hoc purposes such as 'making good'. As such, any products used in this way do not need to be assessed for this issue. The BREEAM Assessor should use their judgment to determine whether products being used or intended to be used for ad hoc purposes will be used in significant quantities and therefore need to be assessed for this issue.
CN2.1	Specialist products	Products specified for specialist applications or providing a specific function may be exempted from meeting the emission limits in Table 5.6 on page 110 and Table 5.7 on page 111 where it can be demonstrated that there are no alternative products available that can perform the function and meet the emission limits.
CN2.2	Formaldehyde E1 class	The formaldehyde E1 class is set by the European union commission in Regulation (EC) No 1907/2006. The minimum emission limit set for furniture and wood-based articles is ≤ 0.124 mg/m³. This is the current requirement. Note that new Regulation 2023/1464, published on 14 July 2023 comes into effect after 6 August 2026. The minimum emission limit set for furniture and wood-based articles is ≤ 0.062 mg/m³. All relevant products after the adoption date must comply with the new limit.
CN2.3	Number of products to comply when less than five product types are specified in the building – Non exemplary credits	For compliance with the first credit for emissions from constructions products, where four product types are specified within the building, the requirements remain the same and three out of the four must comply with the criteria for emissions from construction products. Where three or fewer product types are specified within the building, the number of product types that need to be assessed for the emissions criteria reduces proportionally as follows: — Where three product types are present, two must comply. — Where two or fewer product types are present, one must comply. For the second credit, all of the products that are specified need to comply. For example, if only four product types were specified then all of these would need to comply to achieve the second credit.
CN2.4	Number of products to comply when less than five product types are specified in the building – Exemplary credits	For compliance with the first exemplary credit for emissions from constructions products, where four product types are specified within the building, the requirements remain the same and three out of the four must comply with the criteria for emissions from construction products. Where three or fewer product types are specified within the building, the number of product types that need to be assessed for the emissions criteria reduces proportionally as follows: — Where three product types are present, all must comply. Two exemplary credits are awarded if three out of three meet the requirement. — No exemplary credits are awarded if two out of three product types meet the requirement.
CN2.5	Testing to ISO 16000-10	Results of testing to ISO 16000-10 can be considered compliant with the relevant testing requirements of the emissions from construction products credit where the product manufacturer can demonstrate the results generated by testing to ISO 16000-10 correlate to results that would be achieved using EN 16516 or ISO 16000-9.
CN2.6	Ceiling materials, wall materials, acoustic insulation and thermal insulation materials	This product category refers to all building materials specifically designed for use in ceilings, walls, or as insulation systems, which are not covered under other categories in Table 5.6. This includes, but is not limited to, materials such as acoustic ceiling tiles, gypsum boards, wall insulation panels, mineral wool, rigid foam insulation, cement-bonded particle boards, acoustic boards, and wall coverings of any type.
Emissions from construction products / post-construction indoor air quality measurement		
CN3	Accreditation of organisations performing analysis	All organisations conducting indoor air analysis or emissions testing of building products must be accredited to ISO/IEC 17025[60], with specific accreditation covering all applicable chemical analysis and emission testing methods relevant to their scope.

Ref	Terms	Description
		The accreditation must be carried out by either: — A national accreditation body. — An accreditation body that is a signatory to the ILAC Mutual Recognition Arrangement (ILAC MRA).
CN3.1	Accreditation of organisations performing sampling	If sampling and analysis is carried out by two separate organisations, then the sampling organisation does not need to be accredited to the above (CN3). However, they must provide a brief report justifying: — The sampling methodology used. — Appropriate environmental conditions during the sampling. — The number and location of samples taken. This report is provided to the BREEAM assessor and submitted as supporting evidence for this issue.

Evidence

Criteria	Interim design stage	Final post-construction stage
Indoor air quality plan		
1	A copy of the indoor air quality plan.	Written confirmation including examples and any documentary supporting evidence to demonstrate how the indoor air quality plan was used to influence the design, specification and installation (measures relating to credits not targeted do not need to be implemented).
Ventilation		
2–6	Design drawings, relevant sections of the building specification or contract clauses.	Final construction drawings or equivalent and assessor site inspection report and photographic evidence. Confirmation sensors are calibrated and mounted in line with guidance. For a naturally ventilated building, a letter from the building services engineer confirming the building has been built in accordance with a design compliant with the BREEAM criteria. For a mechanically ventilated building, the commissioning manager's performance testing report confirming the required fresh air rates are achieved.
Emissions from construction products and exemplary level		
7–8, 16–17	Relevant sections of the building specification, contract clauses, schedule or letter of commitment confirming specification of compliant materials. Where product specification is known, letters from or copies of the manufacturer's literature confirming testing standards and emissions achieved.	Confirmation from the project team of the materials installed for each relevant product type. Letter from or copies of the manufacturer's literature confirming testing standards and emissions achieved. Where applicable for paints and varnishes, evidence of protection against mould growth.
Post-construction indoor air quality		
9–15	Commitment to carry out necessary testing post-construction.	Results of indoor air quality testing for formaldehyde and TVOCs.

Criteria	Interim design stage	Final post-construction stage
		Where representative sampling is undertaken, details of the sampling strategy employed on the site. Where relevant, written confirmation from the project team of the remedial measures that have been undertaken.

Definitions

Category 1A and 1B carcinogens

Carcinogenic compounds detectable by the VOC emission testing requirements in Table 5.6 and Table 5.7 and that are classified as category 1A or 1B carcinogens in Annex VI to Regulation (EC) No. 1272/2008 on classification, labelling and packaging of substances and mixtures, which are listed as *Carcinogenic VOCs* in Annex H of EN 16516.[61], [62]

Competent individual – Wind tunnel modelling

An individual with one or more of the following qualifications and experience can be considered to be a 'competent individual' for the purpose of carrying out wind tunnel modelling:

1. Holds a degree or equivalent qualification in a relevant engineering field (mechanical, chemical), physics, mathematics, or meteorology, AND holds a membership to an appropriate professional body.
2. Has a minimum of three years relevant experience. Such experience must clearly demonstrate a practical understanding and experience of wind tunnel modelling and factors affecting outdoor pollutant dispersion in relation to ventilation and the built environment.

Competent individual – Numerical modelling

An individual with one or more of the following qualifications and experience can be considered to be a 'competent individual' for the purpose of carrying out numerical modelling:

1. Holds a degree or equivalent qualification in a relevant engineering field (mechanical, chemical), physics, mathematics, meteorology, environmental sciences, environmental engineering or a related environmental discipline, AND holds a membership to an appropriate professional body,
2. Demonstrated ability to interpret environmental guidelines, policies, plans and legislative requirements.

Fresh air

Fresh air is air used to supply air for buildings that ensures proper indoor air quality is achieved. This includes filtered outdoor air or air from a fresh supply.

Habitable or occupied room

A room used for dwelling purposes or a room in a non-dwelling occupied by people (e.g. office, hotel bedroom, classroom) but which is not used solely as a kitchen, bathroom, cellar, utility room or for storing plant or equipment.[63]

Occupied space – Ventilation

A room or space within the assessed building that is likely to be occupied for 30 minutes or more by a building user.

The definition includes areas with a large and unpredictable or variable occupancy pattern, for example:

- Auditoria
- Gyms
- Retail stores, malls, or shopping centres
- Cinemas
- Waiting rooms.

For the purpose of the ventilation credit, the definition excludes:

1. Small spaces up to 125 m^3 volume, or up to 50 m^2 floor area.

Openable window area

The openable window area is defined as the geometric free ventilation area created when a ventilation opening, e.g. window, is open to its normal operational fully designed extent for ventilation purposes (i.e. this excludes open areas created when reversible windows are opened for cleaning etc.). It is not the glazed area of a façade or the glazed area of the part of the window that is openable (unless it opens fully).

Purge ventilation

Manually controlled ventilation of rooms or spaces at a relatively high rate to rapidly dilute pollutants and/or disperse water vapour. Purge ventilation may be provided by natural means (e.g. an openable window) or mechanical means (e.g. a fan).

R-value

Sum of all Ri values. Ri is the ratio Ci or LCIi, where Ci is the mass concentration of the individual VOC i. in the air of the reference room, and LCIi is the LCI value of VOC i. The LCI value is the 'Lowest Concentration of Interest', which is the substance-specific value for health-related evaluation of the emission from construction products as agreed by the EU-LCI Working Group (ec.europa.eu/growth/sectors/construction/eu-lci_en).

Smoking

Smoking includes tobacco as well as the use of e-cigarettes and vaporizers. A compliant smoking ban must include all listed forms of smoking.

Sources of external pollution

This includes, but is not limited to the following:

1. Highways and the main access roads on the assessed site.
2. Car parks, delivery areas and vehicle waiting bays.
3. Other building exhausts, including from building services plant, industrial or agricultural processes.

Service and access roads with restricted and infrequent access (for example roads used only for waste collection) are unlikely to represent a significant source of external pollution. These roads can therefore be excluded from the criteria of this issue. This does not include vehicle pick-up or drop-off or waiting bays.

Total semi-volatile organic compound (TSVOC)

Sum of the concentrations of identified and unidentified volatile organic compounds eluting between n-hexadecane (excluded) and n-docosane (included) on a gas chromatographic column.

Total volatile organic compound (TVOC)

Sum of the concentrations of identified and unidentified volatile organic compounds eluting between and including n-hexane and n-hexadecane on a gas chromatographic column.

Additional information

None.

Hea 05 Thermal comfort

Aim

To ensure the building is capable of providing an appropriate level of thermal comfort.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	3	None	All
Shell and core	2	None	1–8 (see ref 1.0)
Shell only	0	None	Not applicable

Assessment type specific notes

Ref	Assessment type specific notes
1.0	**Shell and core – Thermal modelling** Thermal modelling assumptions must be reasonable and represent typical use patterns and loads given the parameters and function of the building. Thermal modelling may need to be completed on the basis of a typical notional layout.

Building type specific notes

Ref	Building type specific notes
2.0	**Industrial (without offices)** Where an industrial unit contains no office space and only an operational or storage area, this BREEAM issue does not apply.
2.1	**Industrial (with offices)** The thermal comfort criteria (criteria 1–8) do not apply to the operational or storage areas typically found in industrial assets or other similar asset types. The criteria still apply to the other parts of the asset as appropriate.
2.2	**Education** In this issue, occupant controls (criterion 11) are for staff use only.
2.3	**Buildings with less complex heating or cooling systems** Thermal modelling – An alternative, less complex analysis may be appropriate, compared to full dynamic building simulation (criterion 2). Thermal zoning and controls – The strategy need only comply with criteria 11.a and 11.b (see M2.2).

Assessment criteria

One credit – Thermal modelling – Current climate

1 Thermal modelling has been carried out using software in accordance with CIBSE AM11[64] Building Energy and Performance Modelling (see M1.2).

2 The software used to carry out the simulation at the detailed design stage provides full dynamic thermal analysis.

3 The modelling demonstrates that:

3.a 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[65], Table 1.5; or other appropriate industry standard (where this sets a higher or more appropriate requirement or level for the building type); or the thermal environment in occupied spaces meet the Category B requirements for PPD, PMV and local discomfort set out in Table A.1 of Annex A of ISO 7730:2005.

3.b For naturally ventilated buildings and mechanically ventilated buildings with limited comfort cooling:

3.b.i Winter operative temperature ranges in occupied spaces are in accordance with the criteria set out in CIBSE Guide A Environmental design, Table 1.5. Or other appropriate industry standard (where this sets a higher or more appropriate requirement or level for the building type).

3.b.ii The building is designed to limit the risk of overheating, in accordance with the adaptive comfort methodology outlined in either of the following standards as appropriate; CIBSE TM52: The limits of thermal comfort: avoiding overheating in European buildings[66] or CIBSE TM59: Design methodology for the assessment of overheating risk in homes[67].

4 For air-conditioned buildings, when generated, report the PMV and PPD indices based on the above modelling via the BREEAM Platform (see CN1.3 and CN1.4).

One credit – Thermal modelling – Future climate

5 Criteria 1 to 4 are achieved.

6 The thermal modelling demonstrates that the relevant requirements set out in criterion 3 on the previous page are achieved for a projected climate change environment (see M1.3).

7 Where criterion 6 above is not met, the project team demonstrates how the building has been adapted, or designed to be easily adapted in future using passive design solutions to meet the requirements under criterion 6 above.

8 For air-conditioned buildings, when generated, report the PMV and PPD indices based on the above modelling via the BREEAM Platform (see CN1.3 and CN1.4).

One credit – Thermal zoning and controls

9 Criteria 1 to 4 are achieved.

10 The thermal modelling analysis (criteria 1 to 4) has informed the temperature control strategy for the building and its users.

11 The strategy for proposed heating or cooling shows that it has addressed:

11.a Thermal zoning in the building and how the building services will efficiently and appropriately heat or cool these areas.

11.b The degree of user control required for these zones appropriate for the end users (see M2.1). The strategy considers:

11.b.i User knowledge of building services.

11.b.ii The level of control required based on occupancy type, patterns and room functions (see M2.2).

11.b.iii How the user is likely to operate or interact with the heating or cooling systems.

11.b.iv The user expectations across seasons and degree of individual control.

11.c Where there is more than one system, how the proposed systems will interact and interlock with each other and how this may affect the thermal comfort of the building occupants.

11.d The need or otherwise, for an accessible user actuated manual override for any automatic systems.

Methodology

M1: Thermal comfort strategies

M1.1: Thermal comfort strategy – occupancy patterns

If it is not possible to confirm the number of building occupants using the building, e.g. speculative developments, then the default occupancy rates given in Table 7.11 in Tra 02 Sustainable transport measures can be used to determine a default number of users. Where the typical use patterns are also unknown, Table 7.2 in Tra 01 Transport assessment and travel plan can be used to determine the typical opening hours of different building types. The design team need to justify or validate the occupancy number and use patterns applied in the thermal model.

M1.2: Thermal modelling – current climate

The software used to carry out the thermal modelling simulation at the detailed design stage needs to provide full dynamic analysis. For smaller and more basic building designs with less complex heating/cooling systems, an alternative less complex means of analysis may be appropriate. Further guidance on thermal modelling can be found in CIBSE AM11 Building performance modelling.

Where the weather file for the nearest location isn't representative of the actual climatic conditions on site, it is acceptable to use the weather file from another, nearby location, which more closely matches the climate at the actual location.

Doing this can take into account additional factors such as altitude, prevailing wind direction, urban heat island effect and also proximity to climate moderating features such as the sea, mountains, woodland, and lakes.

M1.3: Thermal modelling – future climate

Dynamic thermal simulation software packages provide the facility for building designs to be assessed under external climatic conditions specific to geographic location. Industry standard weather data for the UK is available in the form of Test Reference Years (TRYs) and Design Summer Years (DSYs) provided by CIBSE (2016 or more recent) (www.cibse.org/weatherdata). 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: 50 years after construction is complete
- Emission scenario: Medium
- 50th percentile DSY 2 and DSY 3

Mechanically ventilated or mixed mode buildings

- Time period: 15 years after construction is complete
- Emission scenario: High
- 50th percentile DSY 2 and DSY 3

The current CIBSE future weather data covers three time periods: 2020s (2011–2040), 2050s (2041–2070) and 2080s (2071–2100). The above weather files represent the minimum requirements to perform thermal modelling under a climate change scenario and subsequently demonstrate compliance. Where design teams feel that added consideration of building occupant risk or sensitivity to overheating is necessary, weather files can be used that exceed the minimum requirements outlined above.

The time periods indicated above have been selected to represent the building services life cycle likely to be present in each building services strategy type. A shorter time period is chosen for mechanically ventilated or mixed mode building types due to consideration of mechanical servicing equipment life span (before major upgrade or replacement is required), and to avoid over-specification of plant which could lead to inefficient operation.

M1.4: Mixed mode ventilation

Where a building has some occupied spaces that are naturally ventilated and some occupied spaces that are air-conditioned, the thermal modelling must demonstrate that the naturally ventilated spaces meet the criteria for naturally ventilated buildings (criterion 3.b) and that the air-conditioned spaces meet the criteria for air-conditioned buildings (criterion 3.a).

M2: Thermal zoning and controls

M2.1: End user controls

Where the end users are known, the thermal controls are based on discussions with the end user.

Where the end users are unknown, the thermal controls are based on building or use-specific design guidance, case studies, and feedback.

M2.2: Spaces requiring user controls

Types of spaces for which user controls are required or would be considered beneficial are listed below.

User controls required

Spaces where users are expected to have independent control over their environment.

- Owned spaces: small rooms for a few people.

  For instance, cellular offices, owned spaces in residential assets.

- Temporarily owned spaces: where occupants expect to operate the environmental controls while they are there.

  For instance, meeting rooms and hotel bedrooms.

- Shared spaces.

  For instance, multi-occupied areas such as open-plan offices or workshops.

User controls not required

Spaces where users are not expected to have independent control over their environment.

- Managed spaces: where environmental control is expected to be centrally managed.

  For instance, atria, circulation areas, concourses, entrance halls, function halls, restaurants, libraries, and shops.

- Occasionally visited spaces.

  For instance, storerooms, bookstacks in libraries, aisles of warehouses, toilets.

M2.3: Thermal comfort strategy for less complex heating or cooling systems

For buildings with less complex heating or cooling systems the thermal comfort strategy need only comply with criterion 11.a and criterion 11.b.

Compliance can be demonstrated where zoning allows separate occupant control (within the occupied space) of each perimeter area (i.e. within 7m of each external wall) and the central zone (i.e. over 7m from the external walls). For example, adequate TRVs placed in zones around the building perimeter, and the provision of local occupant controls to internal areas, such as fan coil units.

The distance requirement for smaller buildings is approximate; however, the assessor must use sound judgement considering the aims of this issue, before accepting solutions that do not strictly meet the above criteria.

Examples of potentially compliant heating control measures can be found in Technology Guide CTG065 Heating control.[68]

Compliance notes

Ref	Terms	Description
Thermal modelling – current and future climates		
CN1	Alternative to criterion 3	In some cases it may be more straightforward to demonstrate compliance with the Category B design criteria in Table A.5 in Annex A of ISO 7730:2005. BREEAM considers this an appropriate equivalent to Table A.1; however, the example design criteria included in Table A.5 must be applicable to the building or space type and activity levels for the project.
CN1.1	Approach to thermal model when using BMS	Where there are smart systems such as BMS in place, modelling must consider normal operating conditions, with the heating and cooling system in operation regardless of the control strategy. To correctly size the heating/cooling plant, the design team must carry out modelling to calculate the heat gains and losses throughout the year. Results of these calculations must be submitted, with the heating/cooling plant specification which would demonstrate that the building has been designed to ensure internal winter/summer temperatures will not drop below an acceptable level.
CN1.2	Air-conditioned spaces – future climate	Air-conditioned spaces are assessed to ensure appropriate thermal comfort levels are achieved. Cooling capacity should be sufficient to comply with the requirements of ISO 7730:2005 or CIBSE Guide A, however providing sufficient space to install additional capacity to meet the requirements later in line with projected future climate scenarios

Ref	Terms	Description
		is also acceptable.
CN1.3	Acceptable thermal environment – Air-conditioned buildings	PPD < 10% and PMV range of (-0.5 < PMV < +0.5).
CN1.4	Reporting PPD and PMV figures	The PMV (Predicted Mean Vote) and PPD (Predicted Percentage Dissatisfied) values need to be entered into the BREEAM Platform. The thermal modelling specialist should be able to provide values for both the PMV and PPD for the asset. The values to report are the observed range of values for PMV and PPD: — Across all occupied areas and, — Across all expected occupied hours. If the software or calculation method used does not generate these PMV / PPD metrics, they do not have to be provided.
CN1.5	Mechanically ventilated buildings with no air conditioning	Where the building services include mechanical ventilation with no heating or cooling element this is considered “free-running”. These buildings do not need to follow the air-conditioned building criteria and should be assessed as naturally ventilated following criteria 3.b.
CN1.6	Naturally ventilated buildings with heating for the winter months	Where naturally ventilated occupied spaces are heated in the winter/heating season, such spaces can demonstrate compliance with the criteria for air-conditioned buildings (criterion 3.a) as an alternative to demonstrating compliance with criterion 3.b.i. When these naturally ventilated occupied spaces are in ‘free-running mode’ (i.e. outside of the winter/heating season), the spaces must meet the requirements for naturally ventilated buildings (criterion 3.b.ii).
CN1.7	Future climate – Alternative weather files	Different or newer weather files can be used instead of those referenced. Weather files based on climate projections with higher temperatures than those specified in the relevant criteria, set a more robust standard for overheating and so they are acceptable. The alternative weather files need to include same variables as the specified weather files (e.g. dry bulb & wet bulb temperature, wind speed & direction, solar altitude & azimuth, cloud cover etc.) for each hour of the year.
CN1.8	Future climate – Winter conditions	Where future climate change scenario projections in winter indicates a higher temperature and, therefore, more thermally comfortable climate compared to the current winter temperatures, it can be assumed that the winter conditions within the climate change scenario are met based on the thermal modelling of current winter conditions. Justification must be provided for each project confirming that the future winter conditions will be met with the current heating system.
Thermal zoning and control		
CN2	Occupant control – BMS and degree of control	A building management system controlled set point with local override controls limited to a set range would satisfy the occupant control requirement so long as the temperature range available to building users is confirmed as appropriate for the building type and user profile.

Evidence

Criteria	Interim design stage	Final post-construction stage
Thermal modelling – current and future climate		
1–8	Compliant thermal modelling report, measurements and evaluation results with confirmation that these are within the required limits.	Thermal modelling, measurement and evaluation results reflecting any changes to the design and resultant PMV/PPD data (where relevant) with confirmation that these are within the required limits.

Criteria	Interim design stage	Final post-construction stage
	Confirmation that the modelling software is BREEAM compliant. Where applicable, PMV/PPD data from the design team.	OR Written confirmation from the building physics engineer that there have been no changes required to the thermal modelling provided at design stage.
7	Where the requirements are not met for the projected climate change environment provide evidence such as drawings or specifications to demonstrate how the building has been adapted or designed to be easily adapted using passive design solutions in order to comply.	Final construction drawings or equivalent, relevant sections of the building specification or assessor site inspection report and photographic evidence to confirm that any required design adaptations or passive measures have been implemented.
Thermal zoning and controls		
9–11	Thermal comfort strategy highlighting the points that have been considered and decisions taken accordingly. Design drawings and relevant sections of the building specification which show the proposed HVAC systems, zoning and controls that have been specified.	Final construction drawings or equivalent to confirm the thermal comfort strategy has been implemented and confirming zoning and controls provided. Assessor site inspection report and photographic evidence to verify specified systems and controls are installed.

Definitions

Clinical areas

Areas of the building in which medical functions are carried out that require specific restricted environmental conditions such as humidity, daylighting, temperature etc. (e.g. X-ray, operating department, delivery room etc.).

Heating and cooling systems

Heating and cooling system examples include openable windows, thermostatic radiator valves (TRVs), room thermostats, ceiling fans and fan coil units with user control.

Mechanically ventilated buildings with limited comfort cooling

Mechanically ventilated buildings with limited comfort cooling is a broad term used to outline a building service system that does not have full air conditioning and interlock between systems. In this situation using the adaptive comfort approach can be more appropriate to avoid over specifying the plant. It is up to the assessor and design team members to choose the most appropriate thermal comfort strategy.

Occupied space

A room or space within the assessed building that is likely to be occupied for 30 minutes or more by a building user. Please note there is a specific, unrelated, definition of 'unoccupied' with reference to acoustic testing and measurement and this should not be confused with the definition used here.

However for the purpose of this issue, the definition excludes the following:

1. Atria or concourses
2. Entrance halls or reception areas
3. Ancillary space, e.g. circulation areas, storerooms and plant rooms.

Patient areas

Areas of the building used mainly by inpatients (e.g. wards, dayrooms etc.).

Passive design

Passive design uses layout, fabric and form to reduce or remove mechanical cooling, heating, ventilation and lighting demand.

Examples of passive design include:

- Optimising spatial planning and orientation to control solar gains and maximise daylighting.
- Manipulating the building form and fabric to facilitate natural ventilation strategies.
- Making effective use of thermal mass to help reduce peak internal temperatures.

Predicted mean vote (PMV)

The PMV is an index that predicts the mean votes of a large group of persons on the seven-point thermal sensation scale based on the heat balance of the human body. Thermal balance is obtained when the internal heat production in the body is equal to the loss of heat to the environment.

Predicted percentage dissatisfied (PPD)

The PPD is an index that establishes a quantitative prediction of the percentage of thermally dissatisfied people who feel too cool or too warm. For the purposes of ISO 7730(69), thermally dissatisfied people are those who will feel hot, warm, cool or cold.

Separate occupant control

Responsive heating or cooling controls for a particular area or zone of the building that can be accessed and operated by the individuals occupying that area or zone. Such controls will be located within, or within the vicinity of, the zone or area they control.

Thermal comfort

In BS EN ISO 7730:2005 *Ergonomics of the thermal environment –Analytical determination and interpretation of thermal comfort*, thermal comfort is defined using the calculation of PMV and PPD indices and local thermal comfort criteria. It is also defined as 'that condition of mind which expresses satisfaction with the thermal environment.' The term 'thermal comfort' describes a person's psychological state of mind and is usually referred to in terms of whether someone is feeling too hot or too cold. Thermal comfort is difficult to define because it needs to account for a range of environmental and personal factors in order to establish what makes people feel comfortable. HSE considers 80% of occupants as a reasonable limit for the minimum number of people who should be thermally comfortable in an environment. The purpose of this issue is to encourage appropriate and robust consideration of thermal comfort issues, and specification of appropriate occupant controls to ensure both maximum flexibility of the space and thermal comfort for the majority of building occupants.

Thermal dynamic analysis

Thermal comfort analysis tools can be subdivided into a number of methods of increasing complexity. The most complex of these and the one that provides greatest confidence in results is the full dynamic model. This type of model enables annual heating or cooling loads, overheating risks and control strategies to be assessed.

Additional information

Healthcare building types

The appropriate industry standard for healthcare is Health Technical Memorandum 03-01 Specialised ventilation for healthcare premises.(70) Thermal comfort levels in patient and clinical areas must be in accordance with the temperature ranges set out in HTM 03-01, Appendix 2. Furthermore, internal summer temperatures must not exceed 28ºC dry bulb for more than 50 hours per year (as defined in HTM 03-01, paragraph 2.15). Other occupied spaces not covered in HTM 03-01 Appendix 2 should be in accordance with CIBSE Guide A Environmental Design.

Education building types (schools only)

As an alternative to CIBSE TM52, an appropriate industry standard for schools is Building Bulletin 101, Ventilation of school buildings (April 2018).(71)

Appropriate industry standards

BREEAM has not attempted to list all appropriate industry standards. Any recognised collaborative industry or sector best practice standard or guidance that sets thermal performance levels, in terms of thermal comfort and design temperature, can be considered an appropriate industry standard for the purposes of this BREEAM issue. CIBSE Guide A (Table 1.5) includes recommended summer and winter comfort.

Hea 06 Acoustic performance

Aim

To ensure the building provides an appropriate acoustic environment to enhance the comfort of building users.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	up to 4	None	All
Shell and core	1	None	1.b, or 2, or 3.b only (see ref 1.0, 1.1, and 2.0)
Shell only	1	None	1.b, or 2, or 3.b only (see ref 1.0, 1.1, and 2.0)

Assessment type specific notes

Ref	Assessment type specific notes
1.0	**Alternative means of compliance** The basic built form has a large impact on the acoustic performance of the building and would be outside the control of the tenant. A suitably qualified acoustician (SQA) must carry out a quantifiable assessment of the specification of the built form, construction, and any external factors likely to affect the indoor ambient noise levels. The SQA must then confirm the developer's works will enable a future tenant utilising a typical fit-out and specification to meet the levels required to demonstrate compliance. Where the majority of a building's floor plan will require high performance acoustic environments (e.g. classroom/seminar buildings), then the BREEAM requirements must be achieved for the entire shell where specific layouts are not determined by the built form. One credit can be awarded where this has been achieved. Post-construction testing is not required subject to confirmation from the project team that the built form, construction, and any external factors have not changed from those used in the SQA's assessment.
1.1	**Bespoke performance requirements** When assessing criteria 2 for a shell and core or shell only building, only Indoor ambient noise level should be assessed.

Building type specific notes

Ref	Building type specific notes
2.0	**Residential institutions (short term and long term stay) and hospitality** When assessing a shell and core or shell only, only Indoor ambient noise level should be assessed.
2.1	**Prisons and law court buildings** For custodial spaces where anti-barricade cell doors are required, refer to Ministry of Justice standards for cell doors or equivalent doors approved by Ministry of Justice for use in cells.
2.2	**Building types without areas 'used for speech'** Where a building type does not have areas 'used for speech', it does not need to comply with the relevant 'room acoustics' criteria. In these instances, the credit available for room acoustics can be awarded by default where the building complies with the indoor ambient noise level and sound insulation criteria.

Assessment criteria

Up to three credits – Acoustic performance

For all building types, except residential institutions (short term and long term stay) and hospitality, which have four credits available below.

1 The building meets the appropriate acoustic performance standards and testing requirements defined in the relevant table below. These tables define criteria for the acoustic principles of:

1.a Sound insulation

1.b Indoor ambient noise level

1.c Room acoustics.

OR

2 A suitably qualified acoustician (SQA) is appointed to define a bespoke set of performance requirements for all function areas in the building. The bespoke performance requirements use the three acoustic principles defined in criterion 1, setting out the performance requirements for each and the testing regime required.

Table 5.9: BREEAM acoustic criteria for education buildings

Education buildings (three credits)	
First credit – Sound insulation	
Criteria	Achieve the performance standards set out in Section 1 of Building Bulletin 93: Acoustic design of schools: performance standards, February 2015 (BB93) relating to airborne sound insulation between spaces and impact sound insulation of floors.(72)
Testing requirement	A programme of pre-completion acoustic testing is carried out by a compliant test body in accordance with the BB93 requirements and the Association of Noise Consultants (ANC) Good Practice Guide, Acoustic testing of Schools.(73)
Second credit – Indoor ambient noise levels	
Criteria	Achieve the indoor ambient noise level standards set out within Section 1 of BB93 for all room types.
Testing requirement	A programme of pre-completion acoustic testing is carried out by a compliant test body in accordance with the ANC Good Practice Guide, Acoustic testing of schools.
Third credit – Room acoustics	
Criteria	Room acoustics (Control of reverberation, sound absorption and speech transmission index (STI)): **Teaching and study spaces** achieve the requirements relating to reverberation time for teaching and study spaces set out within Section 1 of BB93. **Open plan teaching spaces** achieve the performance requirements relating to reverberation time and STI set out within Section 1 of BB93. **Corridor and stairwells**, for those that give direct access to teaching and study spaces, achieve the performance requirements relating to sound absorption.
Testing requirement	**Teaching and study spaces:** A programme of pre-completion acoustic testing is carried out by a compliant test body in accordance with the requirements of BB93 and ANC Good Practice Guide, Acoustic testing of schools. **Open plan teaching spaces:** A programme of pre-completion acoustic testing of reverberation time is carried out within open plan teaching spaces. The measurement is carried out by a compliant test body in accordance with the requirements of BB93 and ANC Good Practice Guide, Acoustic testing of schools. STI testing is not required. To demonstrate compliance the SQA shall undertake measurements of reverberation times to compare against the STI model. The SQA should provide a report confirming that the surface finishes and distribution of sound absorption within the completed space is in line with the design intent implemented within the STI model. Where significant changes or differences are observed, the SQA shall re-model the space accordingly to demonstrate that the STI measurement is met by the completed spaces. **Corridors and stairwells:** Installation of a specification compliant with the BB93 criteria demonstrates compliance. A site inspection by the developer or SQA is required to confirm that a compliant specification has been installed.

Table 5.10: BREEAM acoustic criteria for healthcare buildings

Healthcare buildings (three credits)
First credit – Sound insulation

Healthcare buildings (three credits)	
Criteria	Achieve the airborne sound insulation performance standards set out in Section 2 of HTM 08-01: Acoustic design requirements, 2013 determined according to the privacy requirements using both Table 3 and Table 4 from HTM 08-01.(74) The weighted standardised impact sound pressure level (L'nT,w) must not exceed 65 dB for floors over noise-sensitive rooms, following the guidance in HTM 08-01. For assessments in Scotland, see also Country-specific guidance on page 136.
Testing requirement	A programme of pre-completion acoustic testing is carried out by a compliant test body in accordance with the requirements of Section 7 of HTM 08-01. For assessments in Scotland, see also Country-specific guidance on page 136
Second credit – Indoor ambient noise levels	
Criteria	The indoor ambient noise requirements for noise intrusion from external sources in Table 1 of HTM 08-01 are not exceeded. The values for internal noise from mechanical and electrical services in Table 2 of HTM 08-01 are not exceeded. For assessments in Scotland, see also Country-specific guidance on page 136.
Testing requirement	A programme of pre-completion acoustic testing is carried out by a compliant test body in accordance with the Section 7 of HTM 08-01: Acoustics. For assessments in Scotland, see also Country-specific guidance on page 136.
Third credit – Room acoustics	
Criteria	Acoustic environment (Control of reverberation and sound absorption): Achieve the requirements relating to sound absorption set out in Section 2 of HTM 08-01. For assessments in Scotland, see also Country-specific guidance on page 136.
Testing requirement	Installation of a specification compliant with the HTM 08-01 criteria demonstrates compliance. A site inspection by the developer or SQA is required to confirm that a compliant specification has been installed.

Table 5.11: BREEAM acoustic criteria for office buildings

Office buildings (three credits)	
First credit – Sound insulation	
Criteria	The sound insulation between rooms and other occupied areas complies with the performance criteria given in Section 7 of BS 8233:2014.(75) This should be based on the layout and function of the different spaces within the building.
Testing requirement	A programme of pre-completion acoustic testing is carried out by a compliant test body in accordance with the acoustic testing and measurement procedures outlined in the Methodology on page 132.
Notes	If testing is to be carried out where the office is not yet furnished, then section 7.5 of BS 8233:2014 should be referred to when determining the performance criteria. Where the office is to be furnished at the time testing is carried out, then refer to section 7.7.6 of BS 8233:2014 for the relevant performance criteria.
Second credit – Indoor ambient noise levels	
Criteria	Achieve indoor ambient noise levels that comply with the design ranges given in Section 7 of BS 8233:2014.
Testing requirement	A programme of pre-completion acoustic testing is carried out by a compliant test body in accordance with the acoustic testing and measurement procedures outlined in the Methodology on page 132.
Third credit – Room acoustics	
Criteria	Acoustic environment (control of reverberation and sound absorption): Achieve the requirements relating to sound absorption and reverberation times, where applicable, set out in Section 7 of BS 8233:2014.
Testing requirement	A programme of pre-completion acoustic testing is carried out by a compliant test body in accordance with the acoustic testing and measurement procedures outlined in the Methodology on page 132. For spaces where the acoustic environment is controlled through the use of defined amounts of sound absorption, installation of a specification compliant with the BS 8233:2014 criteria demonstrates compliance. A site inspection by the developer or SQA is required to confirm that a compliant specification has been installed.

Table 5.12: BREEAM acoustic criteria for law court buildings

Law court buildings (three credits)	
First credit – Sound insulation	
Criteria	The sound insulation between acoustically sensitive rooms and other occupied areas complies with the performance targets given in BS 8233:2014 and the section on 'Acoustics' in Chapter 5 of the Court and Tribunal Design Guide (CTDG).[76]
Testing requirement	A programme of pre-completion acoustic testing is carried out by a compliant test body in accordance with the requirements of BS 8233:2014, the Court and Tribunal Design Guide (CTDG), and the methodology section below on 'Testing, measurement and calculation procedures' (where applicable).
Second credit – Indoor ambient noise levels	
Criteria	Achieve indoor ambient noise levels that comply with the requirements of BS 8233:2014 and the section on 'Acoustics' in Chapter 5 of the Court and Tribunal Design Guide (CTDG).
Testing requirement	A programme of pre-completion acoustic testing is carried out by a compliant test body in accordance with BS 8233:2014 and the Court and Tribunal Design Guide (CTDG).
Third credit – Room acoustics	
Criteria	Acoustic environment (Control of reverberation and sound absorption): Achieve the requirements relating to sound absorption and reverberation times, where applicable, set out in Chapter 5 of the Court and Tribunal Design Guide (CTDG).
Testing requirement	A programme of pre-completion acoustic testing is carried out by a compliant test body in accordance with Chapter 5 of the Court and Tribunal Design Guide (CTDG) and the methodology section below on 'Testing, measurement and calculation procedures' (where applicable).

Table 5.13: BREEAM acoustic criteria for all building types (excluding education, healthcare, office, and law courts)

All other building types (three credits)	
First credit – Sound insulation	
All room functions	
Criteria	The sound insulation between rooms and other occupied areas complies with the performance criteria given in Section 7 of BS 8233:2014. Alternatively, propose performance standard based on demonstrably best practice.
Testing requirement	A programme of pre-completion acoustic testing is carried out by a compliant test body in accordance with the acoustic testing and measurement procedures outlined in the Methodology on the next page.
Rooms with specific functions	Educational space (teaching and lecture spaces) refer to Table 5.9 on page 129. Medical treatment rooms refer to Table 5.10 on page 129
Second credit – Indoor ambient noise levels	
Criteria	Achieve indoor ambient noise levels that comply with the design ranges given in Section 7 of BS 8233:2014.
Testing requirement	A programme of pre-completion acoustic testing is carried out by a compliant test body in accordance with the acoustic testing and measurement procedures outlined in the Methodology on the next page.
Rooms with specific functions	Education space (teaching and learning spaces) refer to Table 5.9 on page 129. Medical treatment rooms refer to Table 5.10 on page 129.
Third credit – Room acoustics	
Criteria	Achieve the requirements relating to sound absorption and reverberation times, where applicable, set out in Section 7 of BS 8233:2014.
Testing requirement	A programme of pre-completion acoustic testing is carried out by a compliant test body in accordance with the acoustic testing and measurement procedures outlined in the Methodology on the next page. For spaces where the acoustic environment is controlled through the use of defined amounts of sound absorption, installation of a specification compliant with the BS 8233:2014 criteria demonstrates compliance. A site inspection by the developer or SQA is required to confirm that a compliant specification has been installed.
Rooms with specific functions	Educational space (teaching and learning spaces) refer to Table 5.9 on page 129. Medical treatment rooms refer to Table 5.10 on page 129.

Up to four credits – Acoustic performance for residential institutions (short term and long term stay) and hospitality

3 The building meets the appropriate acoustic performance standards and testing requirements defined in the relevant table below. These tables define criteria for the acoustic principles of:

3.a Sound insulation

3.b Indoor ambient noise level

3.c Room acoustics.

Table 5.14: BREEAM acoustic criteria for residential institutions (short term and long term stay) and hospitality

Residential institutions (short term and long terms stay) and hospitality – up to four credits	
First and second credit – Sound insulation	
Criteria	**One credit** Airborne sound insulation values are at least 3 dB higher and impact sound insulation values are at least 3 dB lower than the performance standards in the relevant building regulations or standards. **Two credits** Airborne sound insulation values are at least 5 dB higher and impact sound insulation values are at least 5 dB lower than the performance standards in the relevant building regulations or standards.
Testing requirement	A programme of pre-completion testing is carried out by a compliant test body based on the normal programme of testing described in the relevant building regulations or standards for every group or sub-group of dwellings (houses, flats or rooms for residential purposes) and this must demonstrate that the performance standards detailed within this table are achieved.
Third credit – Indoor ambient noise levels	
Criteria	Achieve indoor ambient noise levels that comply with the design ranges given in Section 7 of BS 8233:2014.
Testing requirement	A programme of pre-completion acoustic testing is carried out by a compliant test body in accordance with the acoustic testing and measurement procedures outlined in the Methodology below.
Fourth credit – Room acoustics	
Criteria	Achieve the requirements relating to sound absorption within residential spaces and within the common spaces of the building described in the relevant building regulations or building standards national guidance.
Testing requirement	Installation of a specification compliant with the relevant building described in the relevant building regulations or building standards national guidance demonstrates compliance. A site inspection by the developer or SQA is required to confirm that a compliant specification has been installed.

Methodology

M1: Testing, measurement and calculation procedures

Where specific guidance on number of testing locations, measurement methods and calculation is not stated in the criteria tables above for the relevant building type, or within the relevant standard or guidance referenced, the following procedures can be followed by the acoustician when measuring or calculating the levels required to demonstrate compliance with this BREEAM issue.

Measurements of sound insulation (airborne and impact) should be made in accordance with the relevant part of BS EN ISO 16283(77) series, or the successor to these standards. Measurements should be conducted between one in four pairs of adjacent rooms (or teaching spaces) of each room type or performance requirements category and construction type. Measurements of reverberation time should be made in accordance with the engineering grade (or better) requirements of BS EN ISO 3382-2:2008(78) and conducted within one in four rooms (or teaching spaces) of each room type of performance requirement category and construction type.

For measurements of ambient noise, when no specific guidance is available, the following procedures should be used:

1. Noise from both internal sources (e.g. mechanical ventilation systems, plant noise, noise-making systems) and external sources (e.g. traffic noise transmitted via the building façade) should be included. Also, where windows are openable as part of the ventilation strategy, these should be assumed to be open for the purposes of calculations and measurements. If openable windows are present but do not form part of the background or permanent ventilation strategy, then these should be assumed to be closed for the purposes of calculations and measurements.
2. Noise from occupants and office equipment (e.g. computers) should not be included in the measurements.
3. Unless otherwise stated in the referenced document, a rate of testing of at least one in ten rooms or spaces of each performance level shall be subject to on-site performance testing.
4. Measurements should be made in at least four rooms in which noise levels can be expected to be greatest either because they are on the noisiest façade or because they are on a naturally ventilated façade.
5. Where different ventilation strategies are used, measurements should be conducted in rooms utilising each strategy. Otherwise, measurements should be made in rooms on the noisiest façade.
6. T in $L_{Aeq,T}$ is taken as the duration of the normal working day (typically 8 hours between 09.00 and 17.00).
7. Measurements need not be made over a period of 8 hours if a shorter measurement period would be suitably representative. In this case, measurements should be made when external noise levels are representative of normal conditions throughout the day.
8. Measurement periods less than 30 minutes may give representative values for indoor ambient noise levels and may be utilised where this is the case. However measurement periods shorter than 5 minutes should not be used.
9. Measurements should be taken in a minimum of three locations in rooms at a height of 1.2m above the floor level and at least 1m away from any surface.
10. The measured level of ambient noise should be used to determine compliance with the criteria for acoustically sensitive rooms. If at the time of acoustic commissioning it is not possible to measure ambient noise levels in the absence of construction or other extraneous noise sources that will not be present when the building is complete, then, for mechanical services the lower level of 35 dB, L_{Aeq} or the lowest design limit for the acoustically sensitive space should be used.

The above is intended as guidance for undertaking acoustic testing or measurement to demonstrate compliance with the performance requirements in BREEAM. If the acoustician has felt it necessary to deviate from the above procedures, they should provide a reason for doing so and confirm that the alternative procedures are adequate for demonstrating that the building meets the acoustic performance requirements.

M2: Residential institutions (short term and long term stay) and hospitality

Residential institution – long term stay and other residential institutions often contain a mixture of non-residential areas such as offices, small retail outlets, meeting rooms etc. and residential areas, e.g. self-contained dwellings or rooms for residential purposes. Where less than 5% of the assessed building's floor area is 'non-residential', these areas do not need to be assessed, only residential spaces are assessed against the residential criteria in Table 5.14 on the previous page. Where more than 5% of the assessed building's floor area includes areas other than for residential purposes, the 'non-residential' areas must meet the relevant criteria for their function for sound insulation, indoor ambient noise levels and room acoustics, as set out in the criteria for Table 5.13 on page 131 for 'other buildings' as well as the self-contained dwellings or rooms for residential purposes. Only include occupied spaces covered by the Other buildings criteria in the calculation for the percentage of 'non-residential' floor area.

Compliance notes

Ref	Terms	Description
CN1	Reverberation times	Where the reverberation time required by the relevant standard is not appropriate for the type of space or building being assessed, the SQA must confirm why this is the case. In addition the SQA must set alternative appropriate reverberation times at the design stage and provide these to demonstrate compliance.
CN1.1	Remedial works	Where a programme of pre-completion testing identifies that spaces do not meet the standards, remedial works must be carried out. The remedial works should occur prior to handover and occupation and the spaces re-tested to ensure compliance. Remedial works must be carried out to all affected and potentially affected areas, including rooms or spaces of a similar construction and performance requirement that were previously untested. The test report, or covering correspondence, should include a clear statement that the testing is in accordance with the required standard (where specified) or the BREEAM criteria and include the relevant pass or fail criteria.

Ref	Terms	Description
CN1.2	Speech Privacy Potential	Where privacy is required or the ambient targets include a minimum as well as maximum limit, the Speech Privacy Potential (SPP) may be considered. The SPP is the sum of the weighted level difference of the partition (D_W) and the measured ambient background noise level in the receive room (L_A or NR (dBA)). To ensure the desired minimum background sound level necessary to achieve speech privacy, productivity and/or comfort goals, a sound masking system may be required. The sound masking system should be installed and in operation at the time of the acoustic testing to demonstrate compliance.
CN1.3	Programme of testing	It is not acceptable to undertake a shorter test programme due to site readiness on the day of testing. If this issue arises additional testing should be scheduled. It may be that testing at less than the typical regime identified would be acceptable in some instances. Where this is the case, clear reasoning must be provided by the compliant test body prior to awarding the credits.
CN1.4	Internal partition sound insulation criteria to internal doors	Where sound insulation criteria apply to internal partitions the calculations do need to include any doors which are part of the wall in question. While sound insulation performance of a typical door will be lower than for a typical wall, with careful design, specification and detailing, this can be overcome.
CN1.5	Mixed-use buildings	In the case of a mixed-use buildings, the 'Acoustic performance' credits are adjusted to account for the credits available when this differs for the asset types present. For full details, see Guidance Note 20 (GN20).

Evidence

Criteria	Interim design stage	Final post-construction stage
1 and 3	The relevant section of the building specification, clauses of the contract or a letter of commitment to meet the relevant acoustic performance standards, carry out all pre-completion testing using a compliant test body and complete remedial work where necessary. Where available, a report from a suitably qualified acoustician (SQA) may be used to confirm required performance standards will be achieved.	Copy of acoustic field test results to show acoustic performance standards have been achieved and evidence to support they were completed by a compliant test body.
2	Professional report or study from the acoustician confirming the bespoke acoustic performance standards and testing regime. Evidence to verify that the acoustician meets the definition of a suitably qualified acoustician. The relevant section of the building specification, clauses of the contract or a letter of commitment to carry out all required pre-completion testing using a compliant test body and remedial works where necessary.	Copy of acoustic field test results to show acoustic performance standards have been achieved and evidence to support they were completed by a compliant test body.

Definitions

Acoustically sensitive rooms

Where the term 'acoustically sensitive rooms' is referenced in this BREEAM issue, it refers to any room or space the design team or client deems to be acoustically sensitive for the purposes of privacy, which may include the following types of space or rooms (where specified):

1. Single and multiple occupancy offices.
2. Meeting, interview, consulting or treatment rooms.

In addition:

1. Educational buildings or spaces: rooms for teaching and learning, i.e. classrooms, lecture theatres.
2. Rooms used for public speaking or seminars.
3. Any other room or space the design team or client deems to be acoustically sensitive for the purposes of privacy.

Café, canteen, catering kitchen, restaurants, bars

For the purposes of the acoustic performance credit:

- Informal cafés, canteen areas, or catering kitchens are generally services provided by an organisation such as a college, factory, or company for its students or staff.
- Restaurants are places where food are served to the public on the premises. Compared to the above, restaurants can be independent and not ancillary, as per the BREEAM definition and scope.
- Bars are an establishment where soft drinks or alcoholic drinks and sometimes other refreshments are served. They might be on their own or auxiliary to other functions, e.g. hotels.

Compliant test body

A compliant test body is defined as:

1. Organisations having United Kingdom Accreditation Scheme (UKAS) accreditation to the appropriate scope (for, e.g. to BS EN ISO/IEC 17025(79)), or who are accredited by a member of the International Accreditation Forum (IAF) (www.iaf.nu) to the appropriate scope OR
2. Organisations or individuals registered with the Association of Noise Consultants (ANC) Registration Scheme OR
3. Companies or individuals that have been declared competent by an organisation who can provide evidence that they follow the relevant principles of BS EN ISO/IEC 17024 (Conformity assessment - General requirements for bodies operating certification of persons)(80) in relation to BREEAM requirements.

Groups and sub-groups

As defined in the Building Regulations for England and Wales Approved Document E: Resistance to the passage of sound, section 1 (paragraphs 1.11–1.17). For example, flats and study bedrooms are usually considered as two separate groups, and if there are significant differences in construction type then the groups will need to be broken down into sub-groups. In addition to this, where there are steps or staggers greater than 300 mm between dwellings, dwellings without steps or staggers should be treated as a different sub-group to those with steps or staggers. This is because the presence of steps or staggers is likely to improve performance.

Habitable rooms

For the purpose of this issue, habitable rooms include any room where individuals will sit or lie down and require a reasonably quiet environment in which to concentrate or rest. Such rooms are bedrooms, living rooms, dining rooms, studies as well as kitchen-dining and kitchen-living rooms.

Multiple occupancy offices

Office space that is not cellular in nature, i.e. it is open plan, and designed to accommodate more than two desk spaces or workstations.

Occupied spaces

A room or space within the assessed building that is likely to be occupied for 30 minutes or more by a building user.

Room acoustics

This describes how sound behaves in an enclosed space in terms of the reverberation time (or degree of echo), overall noise levels and speech intelligibility. Room acoustics are influenced by room geometry and distribution of acoustic absorption either through the general room finishes or through the introduction of sound absorbing products.

Suitably qualified acoustician (SQA)

An individual achieving all the following items can be considered to be 'suitably qualified' for the purposes of a BREEAM assessment:

1. 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.
2. Holds a recognised qualification in acoustics and membership of an appropriate professional body. The primary professional body for acoustics in the UK is the Institute of Acoustics.

Where an SQA is verifying the acoustic measurements or 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:

1. Represent good industry practice.
2. Be appropriate given the building being assessed and scope of works proposed.
3. Avoid invalid, biased and exaggerated recommendations.

Additionally, written confirmation from the third-party verifier that they comply with the definition of an SQA is required.

Users with special hearing and communication needs

Users with special hearing or communication needs includes, but are not limited to, people with permanent hearing impairment or with severe or complex needs, including:

- speech, language and communication difficulties
- visual impairments
- fluctuating hearing impairments caused by conductive hearing loss
- attention deficit hyperactivity disorder (ADHD)
- an auditory processing disorder or difficulty
- being on the autistic spectrum

Such users should be considered by the suitably qualified acoustician when giving early design advice regarding room layout, sound insulation and reverberation times etc. The above is a typical list of users and is not intended to be a list of mandatory requirements.

Additional information

Law court buildings

The latest guidance for law court buildings is the Court and Tribunal Design Guide (CTDG), which is available from: www.gov.uk/government/publications/court-and-tribunal-design-guide

You need to make sure you follow the key metrics for Optimum Reverberation with the correct units (seconds). See the 'Acoustics' section in Chapter 5 of the Court and Tribunal Design Guide (CTDG).

Country-specific guidance

The following standards or building regulations are relevant for the assessment of this issue.

England

For residential institution - long term stay assessments, where the criteria refer to the performance standards in building regulations, in England, this is referring to Approved Document E 2003 edition, with amendments 2004, 2013 and 2015 – Resistance to the passage of sound.(81)

Northern Ireland
For residential institution - long term stay assessments, where the criteria refer to the performance standards in building regulations, in Northern Ireland, this is referring to - DOE Technical Booklet G - Sound 2012.

Scotland
For healthcare buildings, where the criteria refer to the use of HTM 08-01, assessments in Scotland should use SHTM 08-01.(82)

For residential institution - long term stay assessments, where the criteria refer to the performance standards in building regulations, in Scotland, this is referring to Domestic Technical Handbook 2023 – Section 5, Noise.(83)

Wales
For residential institution - long term stay assessments, where the criteria refer to the performance standards in building regulations, in Wales, this is referring to Approved Document E 2003 edition, with amendments 2004 and 2010 – Resistance to the passage of sound.

Noise rating (NR) curves

Noise assessments based on NR curves are often used by building services consultants to predict internal noise levels due to mechanical ventilation systems. However, the BREEAM requirement uses the indoor ambient noise level, $L_{Aeq,T}$ which includes external noise transmitted via the façade as well as internal noise such as that from mechanical ventilation systems. In the absence of strong low frequency noise, $L_{Aeq,T}$ can be estimated from the NR value using the following formula: $L_{Aeq,T} \approx NR + 6$ dB. Therefore, if the NR value is known, but not the sound pressure levels in the individual frequency bands, an estimate for the indoor ambient noise level $L_{Aeq,T}$ can still be determined from the NR value for the building services noise. The $L_{Aeq,T}$ for the external noise transmitted via the façade must then be combined with the $L_{Aeq,T}$ for the building services.

Scotland
The Scottish regulations do not account for Ctr acoustic metric and therefore the BREEAM uplift for Scotland does not need to account for Ctr either.

Hea 07 Safe and accessible design

Aim

To encourage the provision of safe access around the site and outdoor space that enhances the wellbeing of building users.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	2	None	All
Shell and core	2	None	All
Shell only	2	None	All

Assessment type specific notes

Ref	Assessment type specific notes
1.0	For fully-fitted assessments, where the end-user is known, a compliant outside space must have suitable outdoor furniture installed. However, where justified by the design team, for shell only, shell and core and all speculative assessments, it is sufficient to provide evidence that an appropriate 'seating area' is provided including any associated hard landscaping, along with design drawings showing a suggested arrangement and type of furniture.

Building type specific notes

Ref	Building type specific notes
2.0	**Prisons** In the case of an assessment of a prison building or development, the criteria apply only to publicly accessible areas outside of the secure perimeter zone (but still on the wider prison site). This could include visitor reception or waiting buildings, facilities or estates offices, storage buildings and visitor or staff parking.

Issue specific notes

Ref	Issue specific note
3.0	Where the development does not have any external site area that is relevant (as outlined in M1.1), then the 'Safe access' credit is filtered out.
3.1	Where the development does not have any external site area that is relevant (as outlined in M2.1), then the 'Outside space' credit is filtered out.

Assessment criteria

One credit – Safe access

Where external site areas form part of the assessed development (see M1.1) the following apply:

1 Dedicated and safe cycle paths are provided from the site entrance to any cycle storage, and connect to off-site cycle paths where applicable.

2 Dedicated and safe footpaths are provided on and around the site providing suitable links for the following:

2.a The site entrance to the building entrance

2.b Car parks (where present) to the building entrance

2.c The building to outdoor space

2.d Connecting to off-site paths where applicable.

3 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:

4 Delivery areas are not accessed through general parking areas and do not cross or share the following:

4.a Pedestrian and cyclist paths

4.b Outside amenity areas accessible to building users and general public.

5 There is a dedicated parking or waiting area for goods vehicles with appropriate separation from the manoeuvring area and staff and visitor car parking.

6 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.

One credit – Outside space

7 There is an outside space providing building users with an external amenity area.

Methodology

M1: Safe access

M1.1: Applicability of issue

The safe access criteria apply only to developments that have areas external to the assessed building and within the boundary of the assessed development (regardless or not of whether that external area is or will be the responsibility of the future building occupant). This includes external parking areas. If the assessed building does not have any external areas and access to the building is direct from the public highway or footpath, then the criteria concerning safe access are not applicable and the credit is filtered out.

Where the assessed building has no external areas but does have a covered parking facility, and cyclists, pedestrians or delivery vehicles access the building via this area, then the relevant safe access criteria apply and this area must be assessed against those criteria.

M1.2: Dedicated footpaths

Where it is not practical to provide dedicated footpaths from each parking space within a car park, it is expected that design teams take every practical measure to ensure the safety of pedestrians. In general terms, as a minimum, a safe pedestrian route should be provided from the pedestrian exit of the car park to the building entrance. For larger car parks it would be beneficial to provide footpaths at regular intervals across it, to aid safe access from the car to the building entrance and the design team should demonstrate that they have achieved this as far as is practical.

M1.3: Vehicle delivery access and drop-off

Criteria 4 and 5 (delivery access through general parking areas) can be relaxed for smaller sites if it can be confirmed that the building is of an operational type and size which is likely to mean all deliveries to the building will be made by small vans and not heavy goods vehicles. Where dedicated delivery access and drop-off areas do not form part of the assessed development, these criteria – and criterion 6 – are not applicable.

M2: Outside space

M2.1: Applicability of issue

The outdoor space criteria apply to all assessments. Where it is not possible to provide outdoor space, due to statutory requirements, or other issues outside of the control of the developer, then these criteria will be filtered out.

Where both the safe access and outside space criteria are deemed not applicable to the project (in accordance with the above), the issue will be filtered out.

M2.2: Appropriate size of outside space

When determining the appropriate size of the outside space, the building type, function, shift patterns and occupancy numbers should be considered.

Compliance notes

Ref	Terms	Description
Safe access		
CN1	Cyclist safe access	Safe access for cyclists must be via a compliant cycle path, unless it is demonstrated that it would be impractical to cycle for a short distance between the site entrance and cycle storage. For example, where a gate, door or barrier forces the cyclist to dismount and walk for a short distance to access the cycle storage and it would be impractical for cyclists to re-mount. The intent is that this be a short distance, over which cyclists would typically not choose to re-mount and is anticipated to be no greater than 10 m. In order to be considered compliant for greater distances, evidence must be provided of effective additional physical measures to deter cyclists from re-mounting. Where it is not practical to provide a compliant cycle path from the entrance to the cycle storage, the safety of cyclists and pedestrians must be maintained.
CN1.1	Existing facilities	Where existing facilities are present on site that comply with the shared facilities assessment criteria (including the involvement of users and the community in the consultation stage), the credits can be awarded. These facilities could be within an existing building that does not form part of the assessment, provided the building is accessible to all relevant building users.
CN1.2	Dedicated cycle paths in the absence of cycle facilities	Safe cycle access needs to be provided even if there are no dedicated cycle facilities. The dedicated cycle paths will generally need to be provided to the main entrance(s) of the building along routes likely to be used by cyclists through the site. The design team are required to determine what is required to satisfy the intent of the criteria. Cycle access and cyclists' facilities are assessed independently of each other. Building users may cycle even if the building does not have cycle storage facilities and so safe and secure access to and from the building must be provided.
CN1.3	Vehicle delivery routes – safe access	Vehicle delivery routes which cross cycle or pedestrian routes may be acceptable provided there are adequate physical control measures in place to ensure safe access and thus minimise the possibility of delivery vehicles coming into conflict with cyclists and pedestrians. Examples of such measures could be vehicle barriers or retractable vehicle bollards, which only allow access to delivery vehicles when required and whose operation and controls account for cycle and pedestrian movements.
CN1.4	Restricted movement within a secure perimeter	Where the movement of pedestrians, cyclists and vehicles is tightly controlled within a secure perimeter due to security considerations, these areas do not need to strictly meet the safe access criteria. However, justification and evidence provided by an appropriate member of the project team must demonstrate how the layout, measures and secure nature of the site result in a safe environment for cyclists, pedestrians, and vehicle access, in line with intent of each criterion. Where a criterion is not applicable due to the secure nature of the site, this should be noted and justified in the assessment report.
CN1.5	Shared pedestrian and cycle paths	Where footpaths are shared with cyclists, guidance on suitable widths are available in Table H.8 and H.9 of *Sustrans Design Manual – Handbook for cycle-friendly design* (Sustrans, 2014).[84]
Outside space		
CN2	Public realm	As per the definition, compliant outside space must be non-smoking. This requirement precludes compliance for areas within the public realm, where a non-smoking policy would be unenforceable.
CN2.1	Outside space shared with other buildings	Where a building has existing external space, or will be developing new external space, that is or will be shared with other buildings, this can be deemed acceptable if the space meets the definition of 'Outside space' and is of a size able to cater for the building users of all the associated buildings.

Evidence

Criteria	Interim design stage	Final post-construction stage
Safe access		
1–6	Design drawings (including a scaled site layout plan) highlighting safe pedestrian and cycle routes and other compliant features and dimensions. Where required, relevant sections of the building specification.	Final construction site layout plan or equivalent and assessor site inspection report and photographic evidence to confirm provision of compliant safe cycle and pedestrian access.
Outside space		
7	Design drawings (including a scaled site layout plan) showing provision of an adequate external space. Where required, relevant sections of the building specification or letter of commitment confirming the outside space will be in line with the definition for outside space.	Final construction site layout plan or equivalent and assessor site inspection report and photographic evidence to confirm provision of a compliant outside space. For projects not fully-fitted or speculative, the drawings should show indicative seating arrangements to demonstrate that the space provided is sufficient for future installation of furniture by the tenant.

Definitions

Dedicated and safe cycle paths

Marked out and clearly signed routes to accommodate building users arriving on and travelling through the assessed site on a bicycle. They must also have the following features:

1. Adequate external lighting in accordance with BS 5489-1:2020 *Lighting of roads and public amenity areas*.(85)
2. Appropriately sized, designed and constructed. The following publications offer guidance on how to demonstrate this:
    a. Local Transport Note 1/20 Cycle Infrastructure Design (Department of Transport, 2020).(86)
    b. Sustrans design guidance (www.sustrans.org.uk), specifically the *Sustrans Design Manual – Handbook for cycle-friendly design* (Sustrans, 2014).(87)

The term 'dedicated' is not intended to preclude cycle routes which are shared with pedestrians or vehicles. The assessor may deem such arrangements compliant, provided that they meet the requirements of the approved external guidance referred to in the criteria.

Dedicated and safe footpaths

Marked out and clearly signed routes to accommodate building users arriving on and travelling through the assessed site on foot. They must also have the following features:

1. Dedicated pedestrian crossing points are provided where needed to allow pedestrians to cross vehicle access routes
2. Appropriate traffic calming measures are in place to slow traffic at any crossing points
3. Developments with high numbers of visitors provide signposting to other local amenities and public transport nodes off site (where existing)
4. Adequate external lighting in accordance with BS 5489-1:2020 *Lighting of roads and public amenity areas*.

Dedicated pedestrian crossing

Dedicated infrastructure or road markings and signage or instructions that enables a pedestrian to safely cross a vehicle carriageway on the assessed site and continue their journey to or from the building. Such a crossing must be fit for purpose, in that it will be appropriate for the width of the road, level of traffic and pedestrian use specific to the site. It will also act to alert drivers of vehicles using the carriageway to the potential presence of pedestrians in the carriageway, by ensuring they can be clearly seen and requiring the driver of the vehicle to give way to the pedestrian.

External site areas

Areas external to the assessed building, but within the development's site boundary, which contain vehicle or pedestrian access roads and pathways to the building, parking, unloading and drop-off areas.

Outside space

The space is of an appropriate size to provide enough amenity for the predicted number of building users during coffee or lunch breaks to gather, socialise, relax and connect with the natural environment. The space is predominantly intended for building staff, but can be used by other building users where relevant and beneficial to the building users. The outside space must:

1. Be an outdoor landscaped area, for example a garden, balcony or terrace; the majority of the space should be open to the sky.
2. Have appropriate seating areas.
3. Be non-smoking and controlled by building management (see CN2).
4. Be located to ensure it is accessible to all intended building users and avoids areas that will have disturbances from sources of noise (e.g. building services, car parks, busy roads, delivery areas etc.).
5. Be permanent and be away from roads or be visually screened.
6. Be on-site or in close proximity to the site (within 500m from the building entrance point).

Additional information

Delivery vehicles

The Metric Handbook contains details of typical delivery or freight vehicle sizes and turning circles.(88)

Hea 08 Security

Aim

To encourage the planning and implementation of effective measures that provide an appropriate level of security to the building and site.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	1 + 1 exemplary	None	All
Shell and core	1 + 1 exemplary	None	All (see ref 1.0)
Shell only	1 + 1 exemplary	None	All (see ref 1.0)

Assessment type specific notes

Ref	Assessment type specific notes
1.0	**Speculative project** If the SQSS cannot make complete recommendations due to the speculative nature of the assessment, then the credit may still be available. The SQSS must confirm that they have addressed all parts of the project where feasible based on the information available to them at the time of assessment. Regarding the occupiers' influence on security, the SQSS shall document their assumptions in the SNA.

Building type specific notes

Ref	Building type specific notes
2.0	**Prison buildings** In the case of an assessment of a prison building or development, the security criteria apply only to publicly accessible buildings and car parking areas outside of the secure perimeter zone (but still on the wider prison site). This could include visitor reception or waiting buildings, facilities or estates offices, storage buildings and visitor or staff parking. Security relating to secure prison buildings and their related site layout falls outside the scope of BREEAM.

Assessment criteria

One credit – Security of site and building

1 A suitably qualified security specialist (SQSS) must conduct an evidence-based security needs assessment (SNA) during or before Concept Design (RIBA Stage 2). The purpose of the SNA is to identify any security-relevant attributes of the proposed development, site context, and surrounding environment that may influence the security strategy.

2 Based on the SNA findings, the SQSS must devlop a set of security controls and design recommendations. These must directly address the specific threats and assets identified in the SNA.

3 The agreed security 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.

One exemplary credit – Security rating scheme

4 A compliant risk-based security rating scheme has been used. The performance against the scheme has been confirmed by independent assessment and verification.

The ‘Security of site and building’ credit must first be achieved for the exemplary credit to be awarded.

Methodology

M1: Security of site and building

M1.1: Suitably qualified security specialist (SQSS)

An individual achieving 1–3 or 4 of the following can be considered to be suitably qualified for the purposes of compliance with BREEAM:

1. Minimum of three years' experience in a relevant security profession (in 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.
2. Holds a degree or equivalent qualification (e.g. N/SVQ level 5) relevant to security.
3. Maintains a full membership to a relevant professional body, institute or certification scheme that has a professional code of conduct, to which members adhere.*
4. A specialist registered with a BREEAM recognised third-party licensing or registration scheme for security specialists.**

An SQSS may be any practising security professional, however they must demonstrate that they hold the experience, qualifications and memberships required by the SQSS criteria.

When appointing the SQSS, consideration should be given to the appropriateness of the individual to carry out the task assigned. The SQSS should be able to demonstrate that they have experience dealing with similar projects with equal security levels and similar risks.

*Designing Out Crime Officers (DOCO) and Secured By Design (SBD) Licensed Consultants listed on the websites provided below currently meet the membership requirement of point 3 above. All listed staff have attended either a Home Office or College of Policing Designing Out Crime course or will hold the new Level 5 or Level 6 qualifications in Designing Out Crime. Links to the listings are as follows:

1. Designing Out Crime Officers can be found at: www.securedbydesign.com/contact-us/national-network-of-designing-out-crime-officers?view=article&id=308
2. SBD Licensed Consultants can be found at: www.securedbydesign.com/contact-us/sbd-licensed-consultants (please note ONLY those carrying a ‘Full Secured by Design License’ are qualified to deliver SBD)

**The following licensing/registration schemes are recognised as meeting the requirements of criterion 4 of the suitably qualified security specialist (SQSS) criteria. As such, individuals listed are also eligible to perform the role of SQSS:

1. Chartered Security Professionals (CSyP)
2. Register of Security Engineers and Specialists (RSES) ‘General Security Advisor’ (GSA)

Any licensing or registration scheme for security specialists that wishes to apply to be recognised by BREEAM should contact BRE Global.

M1.2: Security needs assessment (SNA)

To demonstrate compliance with the 'Security of site and building' credit the project site-specific SNA must include

1. A visual audit of the site and surroundings, identifying environmental cues and features that may influence the security approach.
    a. This audit is expected to be conducted in person, on-site.
    b. Where a physical site visit is not feasible, or unlikely to add meaningful insight, a desktop review using up-to-date site information, plans, and drawings may be acceptable.

c. The SQSS must confirm that the chosen method is adequate to inform the SNA. The approach must be proportionate and justified in relation to the site's scale, complexity, location, and context.

2. Stakeholder consultation to understand local crime patterns, security concerns, and disorder risks relevant to the development.
3. Identification of key risks, including:
   a. Risks associated with the proposed or potential use(s) of the buildings.
   b. Risks specific to the building's intended or likely user groups.
   c. Potential negative impacts of the development on the surrounding community.

The outcome of the SNA must directly inform the development of security controls and recommendations, which must:

— Be clearly linked to the threats and assets identified in the assessment.
— Be incorporated into the design proposals.
— Be implemented in the as-built development.

Any deviation from the recommended security measures must be justified and agreed with the SQSS, with supporting evidence retained.

M1.3: Timing of consultation

Where an SQSS was consulted at a later stage than Concept Design (RIBA Stage 2), this credit may still be achievable. Provided all other compliance requirements are met, the credit can still be awarded where the SQSS confirms that the implementation of security measures has not been restricted or impaired or are not possible as a result of their later involvement (i.e. everything that would or could have been recommended can still be implemented).

M1.4: Scope of security controls and recommendations

The scope of the recommended security controls may consider the following:

— Design and layout (e.g. crime prevention through environmental design)
— Physical security (e.g. tested and certified security products)
— Technological security (e.g. Tested and certified alarms, automatic access control systems, CCTV). It may also be necessary to consider building and security systems' ability to resist cyber-related attacks. This will depend on the types of systems to be incorporated into the project.

M2: Security rating scheme

Performance against a security rating scheme must be independently verified before the BREEAM certification.

The security rating scheme should provide a structured method for grading security performance against a defined standard at key project stages, including design, shell, core, and post-construction.

Through verification, the system shall recognise and reward:

— Adoption of industry best practices, tools and standards.
— A systematic and risk-based approach to security.
— An appropriate and proportionate response to security needs.
— Innovation.
— Engagement of competent persons for the process of identifying security needs, security planning and design, and the implementation of security controls.

M2.1: Order of certification

To achieve the BREEAM exemplary credit, the certification of a compliant risk-based security rating scheme must be completed before BREEAM certification.

M2.2: Evidence output

The most appropriate evidence output for this exemplary credit is a certificate (or equivalent) corresponding to the stage of the BREEAM assessment (i.e. 'design stage' or 'post-construction stage'). The certificate (or equivalent) shall demonstrate that the requirements of the risk-based security scheme have been validated.

M2.3: Timing of assessment

Unlike the 'Security of site and building' credit, there is no strict cut-off point by which the risk-based security assessment process must commence, however RIBA Stage 2 is recommended unless it can be evidenced that the implementation of security measures has not been restricted or impaired, or are not possible as a result of later commencement.

Compliance notes

Ref	Terms	Description
CN1	Appointment of the SQSS	Security professionals often possess knowledge and skills in relation to specific aspects of the discipline, whilst others may possess more holistic knowledge. Therefore, when appointing an SQSS, consideration should also be given to their experience and background, as well as the appropriateness of the individual to carry out the task assigned. The SQSS should be able to demonstrate independence and that they have experience dealing with similar projects with comparable security levels and risks.
CN2	Security needs assessment (SNA) – Formal consultation with relevant stakeholders	If a relevant stakeholder does not respond when consulted, the SQSS must provide evidence of reasonable attempts to obtain feedback from relevant stakeholders. If a stakeholder doesn't respond, the SQSS should consider alternative sources of information. For example, check out crime data on the Police UK website and include a summary or analysis in their Security Needs Assessment.
CN3	Compliant SNA	Irrespective of who performs the role of SQSS, the one credit available for 'Security of site and building' may only be awarded if the assessment criteria are satisfied i.e. where a compliant, documented security needs assessment (SNA) has been produced and subsequent risk-commensurate security recommendations have been implemented.
CN4	Security – Change of SQSS and recommendations	If the SQSS working on the project changes during the assessment, the recommendations of the original SQSS can be modified if the new SQSS can provide justification for this.

Evidence

Criteria	Interim design stage	Final post-construction stage
Security of site and building		
1–2	Copy of a compliant security needs assessment and recommendations from a SQSS. Evidence to demonstrate the SQSS meets the definition of a suitably qualified security specialist.	No further actions required post-construction, no additional evidence is required other than that listed for the design stage.
3	Design drawings, relevant section of the building specification, contract clauses or letter of commitment to confirm the recommendations from the SQSS will be implemented within the final design.	Final construction drawings or equivalent to confirm the recommended measures have been implemented. Assessor site inspection report and photographic evidence. AND/OR SQSS inspection report and photographic evidence. Where recommendations are not followed, justification and agreement from the SQSS must be provided.
Security rating scheme		
4	Copy of the security rating scheme certificate from the design stage.	Copy of the security rating scheme certificate from the post-construction stage.

Definitions

Chartered Security Professional (CSyP)

The Register of Chartered Security Professionals (CSyP) was established under a Royal Charter granted to the Worshipful Company of Security Professionals in the UK and launched in 2011. Registrants use CSyP as a post nominal. Being admitted to the Register and becoming a CSyP is a means of being recognised and continuing to represent the highest standards and ongoing proficiency. It is the gold standard of competence in security practice. CSyPs must comply with a Code of Conduct, a Professional Disciplinary Code, and also complete Continuous Professional Development each year. The Register is recognised across the UK, including by the Association of Security Consultants (ASC), the International Professional Security Association (IPSA), The Security Industry Authority (SIA) and NPSA (National Protective Security Authority).

Counter Terrorism Security Advisor (CTSA)

CTSA's receive specialist training allowing them to identify and assess sites within their police force area that are deemed critical and may be vulnerable to terrorist or extremist attack. They then devise appropriate security plans to minimise impact on that site and the surrounding community. They also have responsibility for the protection afforded to crowded places (areas which by virtue of their crowd density may be liable to terrorist attack).

Designing Out Crime Officer (DOCO)

A DOCO is a police officer or staff member who works with developers, architects, planners, and local authorities to reduce opportunities for crime through the design and layout of the built environment.

This role used to be known as a Crime Prevention Design Advisor (CPDA) in some regions.

National Protective Security Authority (NPSA)

The National Protective Security Authority (NPSA) is the UK government's national technical authority for physical and personnel security, providing trusted guidance to help organisations design out risks from threats such as terrorism, espionage, and hostile activity. For those working in the built environment, the NPSA offers detailed, practical advice on how to embed proportionate security into the design and development of buildings, public spaces, and infrastructure.

For more information, visit: www.npsa.gov.uk

Register of Security Engineers and Specialists (RSES)

The Register of Security Engineers and Specialists (RSES) was established to promote excellence in security engineering by providing a benchmark of professional quality against which its members have been independently assessed. Registration is open to engineers, applied scientists and specialists who apply their knowledge to securing the built environment and infrastructure. RSES is sponsored by the National Protective Security Authority (NPSA) and administered by the Institution of Civil Engineers' (ICE) Membership Division.

Secured by Design (SBD)

SBD is a crime prevention initiative operated by the police services of the United Kingdom, which aims to utilise design principles and products in the built environment that reduce the risk of crime by combining minimum standards of physical security and proven principles of natural surveillance and defensible space. SBD is administered by Police Crime Prevention Initiatives (PCPI) which is owned by the London Mayor's Office for Policing Crime Prevention Initiatives (MOPAC) on behalf of the UK police service, and has the support of the National Police Chiefs Council and Police Scotland.

Additional information

Useful references

The NPSA Security Overlay to the RIBA Plan of Work helps designers and developers embed security by aligning protective security tasks with each stage of the RIBA Plan of Work. It encourages early consideration of security risks and promotes collaboration with qualified security professionals during design development. By mapping proportionate, risk-based security activities to key project milestones, the overlay ensures that protective measures are integrated seamlessly into the design, rather than added as reactive features later. This approach supports safer, more resilient developments from the outset and contains signposting to other relevant design guidance.

You can find the overlay on the NPSA website: www.npsa.gov.uk/security-best-practices/build-it-secure

Energy

Summary

This category encourages the specification and design of energy efficient building solutions, systems and equipment that support the sustainable use and management of energy during the building's operation. Issues in this section assess measures to improve the inherent energy efficiency of the building, encourage the reduction of carbon emissions and support efficient management throughout the operational phase of the building's life.

Assessment issues

Ene 01 Energy and carbon performance for regulated energy uses	9 credits + 3 exemplary
Ene 02 Prediction of operational energy and carbon	12 credits + 4 exemplary
Ene 03 Energy monitoring	up to 2 credits
Ene 04 Low carbon design	5 credits
Ene 05 Energy efficient equipment	up to 5 credits
Ene 06 Energy efficient systems	up to 9 credits
Ene 07 Flexible demand response	2 credits
Ene 08 Installed controls	2 credits

Ene 01 Energy and carbon performance for regulated energy uses

Aim

To minimise the energy consumption and carbon emissions from regulated energy uses and to maximise the use of low carbon energy sources.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	9 + 3 exemplary	Excellent, Outstanding	All
Shell and core	9 + 3 exemplary	Excellent, Outstanding	All (see ref 1.0)
Shell only	9	Excellent	1 (see ref 1.0)
EU Taxonomy	-	-	1 (see M4)

Assessment type specific notes

Ref	Assessment type specific note
1.0	**Shell only** See M2.1.
	Shell and core See M2.2.

Building type specific notes

Ref	Building type specific note
-	None

Issue specific notes

Ref	Issue specific note
3.0	**Shell only – glazing not within scope** Where a retail building envelope is not complete, and glazing will be provided by the future tenant(s) the assessment assumes either: The same glazing as for the notional building. OR Where a robust green lease agreement is in place, the efficiencies stated in the agreement.

Assessment criteria

Up to nine credits – Calculated energy performance

1 Calculate the overall Energy Performance Ratio (EPR_{NC}). The number of BREEAM credits awarded is given in Table 6.1 on the next page. See M1.

Table 6.1: Ene 01 EPR_{NC} performance scale

BREEAM credits	EPR_{NC}	Minimum standard – Fully fitted and Shell and core	Minimum standard – Shell only
1	≥ 0.1	-	-
2	≥ 0.2	-	-
3	≥ 0.3	-	-
4	≥ 0.4	Excellent*	Excellent***
5	≥ 0.5		
6	≥ 0.6	Outstanding**	
7	≥ 0.7		
8	≥ 0.8		
9	≥ 0.9		

*Alternatively, shell and core and fully fitted buildings may meet the minimum OEP_{NC} scores specified in Ene 02.

**Alternatively, shell and core and fully fitted buildings may meet the minimum OEP_{NC} scores specified in Ene 02.

***Shell only buildings may adopt the fabric performance optimisation approach specified in Ene 04.

Up to three exemplary credits – Beyond zero net regulated carbon

2 The building regulation modelling results demonstrate that at least 100% of the building's service energy requirements are met by eligible low and zero carbon (LZC) technologies (see M3).

3 The number of BREEAM credits awarded is based on the percentage of operational energy use that is met by LZC sources (see Table 6.2 below).

Table 6.2: Exemplary credits for beyond net zero regulated carbon

BREEAM credits	Percentage of operational energy use that is met by LZC sources
1 exemplary	≥ 100% regulated energy use
2 exemplary	≥ 100% regulated energy use AND ≥ 50% unregulated energy use
3 exemplary	≥ 100% regulated energy use AND ≥ 100% unregulated energy use

Methodology

Overview

This issue measures the energy performance of regulated energy uses compared to that of the baseline building specification determined by UK building regulations.

M1: Energy Performance Ratio for New Construction (EPR_{NC})

BREEAM uses the following three metrics to determine the overall energy performance improvement:

- Demand – the building's demand for heating and cooling per unit floor area (kWh/m² per year)
- Primary energy – energy consumption measured in primary energy per unit floor area (kWh/m² per year)
- Carbon emissions – carbon emissions arising from energy use per unit floor area ($kgCO_2e/m^2$ per year)

The percentage improvement in energy performance, compared to the baseline building, is used to determine the EPR (Energy Performance Ratio) for each metric using a translator curve defined by the following formula:

$$EPR = 1 - (A/R)^n$$

where:

A = actual building metric

R = reference building metric

n = metric scaling factor

This generates an EPR value of between 0 to 1, where 0 = no improvement and 1= maximum improvement.

The EPR for each of the three metrics is calculated in the BREEAM Platform. These are then combined to give an overall EPR_{NC} as follows:

$$EPR_{NC} = (EPR_{dem} \times A) + (EPR_{PE} \times B) + (EPR_{CO2} \times C)$$

where A, B, and C are weighting factors and A + B + C = 1.

For shell only projects the EPR_{NC} is based only on the demand metric:

$$EPR_{NC} = EPR_{dem}$$

Further details of the EPR_{NC} calculation are provided in Guidance Note 52 (GN52).

M1.2: Calculating (EPR_{NC})

The EPR_{NC} for a building is determined based performance data contained in the NCM output document, specifically the BRUKL.inp file.

At the design stage the energy modelling to generate the BRUKL.inp file may be generated by a suitably qualified member of the design team, but at post-construction the as-built BRUKL.inp should be undertaken by an accredited energy assessor (see Additional information). In both instances the BRUKL.inp file must be generated using approved building energy calculation software, and be the last version that has been submitted to Building Control.

The energy modelling and the BRUKL.inp file must be carried out for the following version of the building regulations:

— For England: Approved Document Part L2 2021 Conservation of fuel and power in new buildings other than dwellings - for use in England.

— For Scotland: Non-domestic Technical Handbook 2023 - Section 6, Energy.

— For Wales: Approved Document Part L2 2022 Conservation of fuel and power in new buildings other than dwellings - for use in Wales.

— For Northern Ireland: Technical Booklet F2 2022 Conservation of fuel and power in buildings other than dwellings.

The baseline metrics, EPRs, and credit scores are calculated automatically by uploading the BRUKL.inp file to the BREEAM Platform.

M1.3: Calculating EPR with multiple BRUKL outputs

Where more than one calculation is produced for a development that is registered as a single BREEAM assessment, an area-weighted average of the metrics for the actual and baseline building should be used to calculate the EPR.

This does not apply where the 'similar buildings' approach is used.

If the BREEAM assessment includes shared common areas where the energy performance has been determined separately, the energy performance for the building the energy and floor area should be allocated to the building based on the floor area of the building compared to that of all units sharing the common areas.

When applying these approaches, the area-weighted calculations and modelling outputs must be provided as supporting evidence.

M1.4: Calculating EPR for residential institutions

Residential institution buildings can be assessed under BREEAM UK New Construction under either the non-dwelling version of the relevant building regulations or a combination of the non-dwelling and dwelling versions of the building regulations.

The portion of a residential institution building that needs to be assessed using dwelling versions of the building regulations follows the definitions provided within the Building Regulations. For England, Wales, and Northern Ireland, both 'self-contained dwellings' and 'rooms for residential purposes' must be assessed using SAP. For Scotland, the definition of domestic and non-domestic building should be used to determine which parts of the building should be assessed using SAP as follows:

1. Obtain the SAP worksheet for all dwellings, from approved SAP software via an accredited energy assessor.
2. Enter the SAP data into the BREEAM Platform, or if there are multiple SAP data files these must be entered into the 'Ene 01 Supplementary Calculator'. This calculator converts the data into the outputs required in the BREEAM Platform.
3. The SAP data and the relevant output from SBEM will then calculate the Energy Performance Ratio (EPR_{NC}) and the number of BREEAM credits achieved.

Where both SBEM and SAP outputs are used, the total credits achieved are determined by area weighting the HEPR (Home Energy Performance Ratio) for the domestic parts and the EPR_{NC} for the non-domestic parts of the building. The HEPR is generated using the same methodology as in BREEAM UK New Construction Residential V6.1.

M2: Energy modelling

M2.1: Modelling assumptions for shell only assessments

For shell only assessments, the efficiency of all installed buildings services for the actual building should be the same as for the notional building. This means that only the effect of fabric improvement is considered for the demand metric.

M2.2: Modelling assumptions for shell and core assessments

For any building services where the specification is unknown, a system of notional efficiency should be assumed. For heating systems, the assumed system type should be a natural gas boiler of notional efficiency.

In instances where there is a green lease agreement that includes specific clauses about the system types, minimum efficiencies of buildings services that will be installed in the building may be used in place of the notional values.

Any speculative areas not covered by the agreement must assume systems of notional efficiency.

M3: Beyond zero net regulated carbon

The percentage of the building's total energy consumption that will be met by eligible local low and zero carbon technologies must be calculated on a net annual basis.

Regulated energy consumption is taken from the energy modelling carried out in criterion 1 and unregulated building energy consumption is based on the energy modelling or calculations used for Ene 03 (see Ene 03 Energy monitoring – M1: Estimating expected annual energy consumption on page 169).

Alternatively, where predictive energy modelling has been carried out for Ene 02 these modelling results may be used for regulated and unregulated energy.

The calculation must be carried out by, or checked by, a suitably qualified energy modelling engineer, accredited professional, or an LZC specialist.

M3.1 Eligible local low and zero carbon technologies

Only local LZC technologies that use the following energy sources can be used for this issue:

- Wind
- Solar radiation (solar thermal and solar photovoltaic)
- Geothermal and hydrothermal energy sources
- Hydropower
- Waste heat from operational processes

Waste heat from operational processes includes manufacturing processes, high temperature oven or kiln, compressors serving process plant, microbrewery, crematorium, testing and commissioning boilers for training or manufacture, and data centres.

It does not include waste heat from IT or server rooms, which could be used as part of conventional heat recovery measures.

The following energy sources may be eligible provided additional requirements are met:

- Biomass from second generation biomass feedstock or waste sources

(For more details, see Ene 04 Low carbon design – M3.1: Eligible LZC energy generation technologies on page 177.)

To be recognised as a local LZC technology the system must be located on-site or near-site and must either:

— Have a direct (private wire) connection to the assessed building.

OR

— Where it is impractical to physically connect the assessed building, the LZC system(s) must be located on the same site and be owned and managed by the same organisation as the assessed building.

M3.2: LZC systems that serve more than one building

Where an LZC system serves or will serve more than one building, the proportion of annual energy that is attributed to the assessed building should be based on the predicted annual energy consumption of that building compared to the measured or estimated annual energy consumption for all buildings connected to the LZC, minus net annual renewable energy exports to the grid.

M4: EU Taxonomy reporting

The EU taxonomy report generated will automatically calculate whether the building meets the primary energy consumption improvement over regulation required to meet the Annex I Climate Mitigation requirements for new buildings for both the “do no significant harm” and “substantial improvement” criteria.

Where an as-built EPC rating is been provided, the EU taxonomy report will indicate whether the EPC rating meets the Annex I Climate Mitigation requirements for new buildings for both the “do no significant harm” and “substantial improvement” criteria.

Compliance notes

Ref	Terms	Description
CN1	Extensions to existing buildings	For an extension using existing building services, the modelled performance is based on the extension fabric and building services it connects to, both existing and new. The modelling does not consider: — The existing building fabric where it will be out of assessment scope or, — Existing systems that do not supply the extension.
CN2	Building contains untreated areas	Where the assessment contains a mix of treated and untreated spaces, untreated spaces may be excluded, and the performance may be based on the treated spaces only.
CN3	LZC technologies – Energy centre or LZC technologies connected at a later stage	If a project specifies LZCs that have been proposed in the feasibility report and reduce emissions, and/or will be connected to a site-wide energy centre operational at a later stage of the phased development (after the post-construction review has been submitted), this issue can be assessed as follows: — In a phased development where the primary heating system will be upgraded at a later stage than the building being assessed, a commitment to install the new heating source must be made in the General Contract Specification. BREEAM does not specify a particular time for phasing as it is difficult to set parameters, however, as a rule building users should have to wait the least time possible before they can use the upgraded heating source. — For the quality audit, two energy model outputs/EPCs must be produced at the final stage – one with the actual interim system installed for building control, and one for the BREEAM assessment which can include the predicted energy from the proposed energy centre. — Additionally, the legally binding general contract specification for the new heating source must be submitted with details of the timescales proposed for the completion of the second phase of work. Where this approach is to be followed BREEAM must be consulted in each case to ensure that the arrangements are sufficiently robust to award the credits.
CN4	Building type not required to show compliance with Building Regulations	It is still necessary to undertake energy modelling to generate the required performance data to demonstrate compliance with BREEAM.

Ref	Terms	Description
CN5	Assessing the energy performance for part of a building	If the assessment is only covering part of a whole building, the energy performance assessment must be representative of the part of the building being assessed. Simply taking the energy performance assessment of the whole building would not therefore comply, especially if the non-assessed parts of the building were of a different use. A separate energy assessment of the part of the building is required that is representative of the parts of the building being assessed.

Evidence

Criteria	Interim design stage	Final post-construction stage
Calculated energy performance		
1	A copy of the building regulations output document from the approved software. Confirmation that the energy modelling is based on the design stage of analysis and is the final version that has been submitted to building control, where relevant. SAP calculations (where relevant for multi-residential buildings). Additional calculations where the EPR has been calculated based on averaging. Confirmation of the expertise and experience of the individual carrying out the modelling in compliance with the requirements of the local building regulations.	A copy of the building regulations output document from the approved software. Confirmation that the energy modelling is based on the as-built stage of analysis and is the final version that has been submitted to building control, where relevant. SAP calculations (where relevant for multi-residential buildings). Additional calculations where the EPR has been calculated based on averaging. Confirmation that the individual carrying out the modelling is an accredited energy assessor. OR Where it is not possible to produce an as-built BRUKL for the post-construction assessment, justification must be provided clarifying why an as-designed BRUKL was submitted, along with confirmation from the relevant specialist that the model is an accurate representation of the final, as-built specification of the building. AND Final construction drawings or equivalent or other evidence that demonstrates that the specification used and modelled matches the specification of the completed building.
Beyond zero net regulated carbon		
2	A copy of documents and calculations that demonstrate the proportion of the building's regulated energy consumption that is generated by low and zero carbon generation technologies. These should confirm: 1. The total energy generation from recognised LZC sources (kWh/year). 2. The sources of the LZC energy. 3. The annual regulated energy use for the building (kWh/year). 4. Estimates of the unregulated energy consumption from equipment and systems (kWh/year).	A copy of the updated calculations which reflect the as-built specification confirming: 1. The total energy generation from recognised LZC sources (kWh/year). 2. The sources of the LZC energy. 3. The annual regulated energy use for the building (kWh/year). 4. Estimates of the unregulated energy consumption from equipment and systems (kWh/year). 5. That the calculations have been provided or checked by a suitably qualified energy modelling engineer or

Criteria	Interim design stage	Final post-construction stage
	5. That the calculations have been provided or checked by a suitably qualified energy modelling engineer or accredited professional, or an LZC specialist. Design drawings, technical data or relevant sections of the building specification or other supporting evidence confirming the specification of the modelled LZC systems.	accredited professional, or an LZC specialist. Final construction or equivalent drawings, technical data and assessor site inspection report and photographic evidence to verify that the specification for the modelled LZC systems matches what has been installed.
EU Taxonomy		
M4	An as-designed Energy Performance Certificate (EPC).	An as-built Energy Performance Certificate (EPC).

Definitions

Accredited energy assessor

For England, Wales and Northern Ireland, accredited energy assessors can be found at: www.gov.uk/get-new-energy-certificate

For Scotland, accredited energy assessors can be found at: www.scottishepcregister.org.uk

Actual building

This has the size, shape, orientation, internal layout, with the specified fabric and buildings services performance as the actual building, but with the standardized occupancy assumptions for the building type and is modelled using weather data that reflects the building location.

See also Baseline building and Notional building.

Baseline building

This is the same as the notional building except that the notional space heating system is always defined as a gas boiler with notional efficiency. In addition, where the connection is to an existing district heating system where the carbon or primary energy factor is higher than that of a notional gas boiler, then the actual system is assigned the carbon and primary energy factor for a notional gas boiler.

See also Actual building and Notional building.

Green lease agreement

A green lease is a contract that includes additional clauses which provide for the management and improvement of the environmental performance of a building by both owners and occupiers. To be acceptable for BREEAM a green lease agreement must cover all relevant BREEAM requirements and must be signed by both the lessor and the lessee or, where the lessee is unknown, a commitment must be provided by the client that the green lease agreement will be implemented when the building is let.

Low and zero carbon (LZC) specialist

An individual who:

- Is not professionally connected to a single LZC technology or manufacturer.

  AND, either:

- Has carried out LZC assessments for at least 3 years.

  OR

- Has a recognised qualification for undertaking assessments, designs, and installations of LZC solution in the building sector.

National Calculation Method (NCM)

National or regional calculation tools that are used to calculate compliance against minimum energy performance standards set for buildings to comply with regulation.

Notional building

A hypothetical building that has the same size, shape, orientation, internal layout, fabric as the actual building but with fabric and building service specifications that define the minimum energy performance level required by local regulations.

The notional building uses that same standard occupancy assumptions and is and is modelled using weather data that reflects the actual building location.

See also Actual building and Baseline building.

Operational energy

Energy consumption for all end uses present when the building is operational except for industrial scale process loads. Operational energy includes both regulated and unregulated energy consumption.

Regulated energy

Building energy consumption resulting from the specification of fixed building services and fittings, including space heating and cooling, hot water, ventilation, fans, pumps, and lighting that are controlled through the applicable building regulations.

See also Unregulated energy and Operational energy.

Room for residential purposes

Room for residential purposes means a room, or suite of rooms, which is not a dwelling-house or a flat and which is used by one or more persons to live and sleep. This includes a room in a hostel, a hotel, a boarding house, a hall of residence or a residential home but does not include a room in a hospital, or other similar establishments, used for patient accommodation.

Suitably qualified energy modelling engineer or accredited professional

An individual who has:

- A minimum of 3 years relevant experience in building energy modelling within the last 5 years.
- A recognised qualification or chartership such as a building services engineer or building energy modelling engineer.
- Broad expertise to cover all required technical aspects, guaranteeing that the data entry in the energy model is appropriate and the results reflect the actual performance of the building.

Where the modelling is being carried out a team of modellers their combined experience must meet the individual requirements.

Unregulated energy

Building energy consumption resulting from building services and fittings that are not addressed by applicable building regulations.

Additional information

Directories of accredited energy assessors

For England, Wales and Northern Ireland, accredited energy assessors can be found at:
www.gov.uk/get-new-energy-certificate

For Scotland, accredited energy assessors can be found at:
www.scottishepcregister.org.uk

Ene 02 Prediction of operational energy and carbon

Aim

This issue encourages and rewards the use of detailed energy modelling to explore the impact of occupancy and use patterns, encourage design choices that mitigate risks relating to underperformance in use and generate a realistic prediction of operational energy consumption and carbon emissions in use to facilitate comparison with benchmarks.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	12 + 4 exemplary	Excellent, Outstanding	All (see ref 3.0)
Shell and core	12 + 4 exemplary	Excellent, Outstanding	All (see ref 1.0 and 3.0)
Shell only	0	None	Not applicable

Assessment type specific notes

Ref	Assessment type specific note
1.0	**Shell and core – Predictive energy modelling credits** Where the building occupiers are unknown the modelling assumptions should be based on typical occupancy and servicing for the building type unless green lease commitments are in place.

Building type specific notes

Ref	Building type specific note
-	None

Issue specific notes

Ref	Issue specific note
3.0	All credits for this issue can be filtered out if: — Total occupied GIA of the building (including common areas) < 1000 m² The minimum standard for "No fossil fuels on-site" (criterion 14) still applies.

Assessment criteria

Up to five credits – Predictive energy modelling process

One credit – Energy strategy

1 Define an energy strategy for the building at the concept design stage that describes qualitatively how the operational energy and carbon performance of the building will be minimised (see M1.1).

Three credits – Predictive energy modelling

2 Estimate unregulated energy uses and occupancy patterns for the building (see M1.2.1).

3 Construct a detailed energy model during the technical design stage and undertake sensitivity analysis and scenario modelling to explore the impact of key parameters and assumptions on energy consumption (see M1.2.2).

4 Predict annual operational energy consumption in use by fuel type for the building based on the scenario modelling. The modelling must be updated at the post-construction stage to account for any changes to the building specification (see M1.2.3 and M1.2.4).

One credit – Risk assessment and mitigation

5 Achieve the predictive energy modelling credits.

6 Highlight any significant design, technical, and process risks that might prevent the buildings achieving energy performance target and indicate how these risks will be mitigated throughout the construction and commissioning process (see M1.3).

Up to seven credits – Predicted operational energy performance score

7 Achieve the predictive energy modelling credits.

8 Credits are awarded based on the Operational Energy Performance score for New Construction (OEP_{NC}) as shown in Table 6.3 below (see M2).

Table 6.3: Credits awarded according to OEP_{NC}

Operational energy performance score OEP_{NC}	Number of credits	Minimum standard*
≥ 0.1429	1	
≥ 0.2857	2	
≥ 0.4286	3	Excellent*
≥ 0.5714	4	
≥ 0.7143	5	Outstanding** AND No fossil fuels on-site (criterion 14)
≥ 0.8571	6	
≥ 1.0	7	

*Alternatively meet the minimum EPR_{NC} score specified for Excellent in Ene 01.

**Alternatively meet the minimum EPR_{NC} score specified for Outstanding in Ene 01.

One exemplary credit – Disclosing an in-use energy performance target

9 An in-use energy performance target has been disclosed to stakeholders and been made publicly available prior to practical completion (see M3).

One exemplary credit – Third-party validation of predictive energy modelling

10 The predicted energy consumption modelling results have undergone third-party validation (see M4).

One exemplary credit – Preparing for in-use measurement of energy consumption

11 Achieve maximum available credits in Ene 03 Energy monitoring.

12 The energy modelling outputs include a breakdown of the energy use by sub-meter that aligns with the energy monitoring strategy for the building.

One exemplary credit – Commitment to measure energy consumption in-use

13 The client or building occupier commits funds to pay for the in-use energy consumption to be measured by a suitably qualified energy assessor once the building reaches the occupancy threshold (see M5).

Minimum standard – No fossil fuels on-site

14 No fossil fuels will be used by the building in operation (see M6).

Methodology

M1: Predictive energy modelling

M1.1: Energy strategy

An energy strategy for the building must be generated at the concept design stage. This should outline the fabric performance specification and the energy servicing strategies and describe qualitatively how these will contribute to reducing operational energy consumption in use. The energy strategy should also demonstrate that the use of local low and zero carbon (LZC) technologies have been considered and specified, where feasible.

The energy strategy may be supported by early-stage design models, tools and calculation. It should indicate any energy related performance targets that are set for the building at the concept design stage.

M1.2: Predictive energy modelling

The energy modelling process described in this section is based primarily based on CIBSE TM 54:2022. Other equivalent methodologies for modelling predicted operational energy use at the design stage may also be used.

Accepted alternative methodologies include:

- ASHRAE Standard 209 (2018) modelling Energy Simulation Aided Design for Buildings Except Low-Rise Residential Buildings - Design and construction phase modelling guidance
- Net Zero Public Sector Buildings Standard Dynamic Simulation modelling guide

For office projects in the UK, NABERS UK Guide to Design for Performance Version 2.0 is an accepted methodology and can be used to demonstrate compliance for specific Ene 02 credits (see CN1).

Predictive energy modelling must be carried out by a suitably qualified energy modelling engineer or accredited professional. For most projects dynamic simulation modelling (DSM) with advanced capabilities for heating ventilation and air conditioning (HVAC) systems and controls should be used to explore how the building will perform under different operating conditions.

DSM with advanced capabilities for modelling HVAC systems and controls should always be used for predictive energy modelling where:

- Centralised HVAC servicing systems provide multiple services, or serve multiple zones, and will require complex control strategies to operate efficiently.

  OR

- The building envelope has complex geometry, relies on high thermal mass or has complex façade systems.

  OR

- There are plant or equipment items where the energy performance will vary significantly based on load or weather conditions.

Suitable energy modelling software includes:

- Dynamic modules of IES
- TAS
- DesignBuilder
- EnergyPlus
- Modellica/Dymola

In all cases the suitably qualified energy modeller must confirm that the software has the capability to adequately model the energy performance of the specific building.

DSM modelling without advanced capabilities for modelling HVAC systems and controls may be used when the building meets all of the following criteria:

- It will be controlled by a single occupier.
- Is serviced by simple building systems with no complex controls.

- The building does not rely on thermal mass.
- The building does not have complex geometry.

BREEAM approved dynamic simulation (DSM) with advanced capabilities for HVAC systems and controls must be used to explore how the building will perform under different operating conditions.

Where the criteria listed above have been met and alternative modelling approach is used a suitably qualified energy modelling engineer must confirm that the alternative approach selected will be able to model the building performance with sufficient accuracy.

For "Single dwellings" it is acceptable to use PassivHaus Planning Package (PHPP) as the base energy model where input assumptions e.g., thermal bridging, are calculated externally and used in place of default assumptions.

In all cases the suitably qualified energy modeller must confirm that the software has the capability to adequately model the energy performance of the specific building and must predict the operational energy consumption of the building over the course of a year based on the expected unregulated energy loads and expected occupancy patterns for the building.

Assuming the standard occupancy patterns used for Ene 01 is not sufficient for this issue.

M1.2.1: Estimating unregulated energy loads and occupancy patterns

Significant energy end uses that will be present in the building must be identified. As a minimum the following end uses should be considered:

- Energy use for lighting not covered by building regulations
- Energy use for lifts and escalators
- Energy use for small power
- Energy use for catering
- Energy use for server rooms
- Energy use for domestic hot water
- Energy use for any other types of unregulated plant and equipment – e.g., commercial refrigeration, medical equipment etc.
- Energy use for industrial process load

For each of the end uses present, estimate the energy use profiles. This should be based on project specific information, occupancy, and usage patterns, wherever possible.

The anticipated operating hours should be requested from the intended occupier, for example through structured interview. This information together with the design and control regimes for proposed systems (e.g. optimum start controls, night set back and night purge) should be used to estimate the hours of operation for the plant and equipment.

Where no intended occupier has been identified, the assumptions should be based on in use benchmarks or unregulated energy loads and occupancy patterns for similar buildings.

M1.2.2: Sensitivity analysis and scenario modelling

Sensitivity analysis should be undertaken to explore the effect of key operational assumptions on energy performance. This should focus on modelling inputs that are likely to have a high impact on the energy performance or where there is greatest uncertainty.

The following operational assumptions should be considered when selecting input variables for the sensitivity analysis:

- The efficiency of major energy consuming components
- Alternative system configurations and control strategies
- Occupancy density and hours of use
- Management and occupant behaviour
- Current and future weather scenarios

This analysis involves varying the selected input assumptions one at a time to determine those that will have the greatest impact on the energy performance.

It is not necessary to consider all input variables, but the sensitivity analysis should focus on those that are expected to have the most significant impact on energy consumption.

The results of the sensitivity analysis should be used to inform the development of scenarios that reflect the likely energy performance range for the building. The scenarios must include:

- A central case scenario which represents the most reasonable assumptions about occupancy, fabric and building system efficiencies and control strategies.
- A high energy consumption scenario based on uncertainties relating to key input parameters which result in higher energy consumption.
- A low energy consumption scenario based on uncertainties relating to key input parameters which result in lower energy consumption.

M1.2.3: Predicting annual operational energy

The predicted annual operational energy consumption for the building must be based on the scenario modelling results and be higher than that for central case scenario.

How high the predicted energy performance should be set above the central case scenario should be informed by the range of the scenario modelling results, the extent to which risks of underperforming in use have been mitigated, and previous experience with other similar projects.

An uncertainty margin of 25% over the central case scenario should be used as a default unless a lower modelling margin is recommended by a suitably qualified energy modeller in which case the margin used must be justified in the energy modelling report (see M1.2.4).

M1.2.4: Reporting modelling results

An energy modelling report must be produced covering the following:

- The approach to modelling the building fabric, HVAC systems, and control strategies.
- Sources of the information for the assumptions and inputs about occupancy patterns and unregulated energy loads.
- The levels of uncertainty that can be ascribed to the key assumptions and inputs.
- The selection of input parameters for the sensitivity analysis and scenario modelling.
- The energy modelling margin and any justification.

The report should also identify variables that are under the control of the designers and those that will be controlled by the occupants.

The report must also provide breakdowns of energy consumption as follows:

- Annual energy consumption for the central case scenario by end use and energy source for all energy uses associated with the operation of the building.
- Annual energy consumption for the central case scenario by end use and energy source for all energy uses not associated with the operation of the building (e.g., electric vehicle charging points, industrial processes, and data centres serving users outside of the building).
- Annual energy consumption by energy source for the scenario modelling and for predicted operational energy.
- Annual on-site renewable energy generation and exports.
- Hourly peak demand for grid supply electricity.

Example templates for energy reporting are provided in Guidance Note 53 (GN53).

M1.3: Risk assessment and mitigation

The risk assessment should consider situations where the design assumptions and operational situation could have a significant negative impact on energy consumption in use.

Risks to be considered (where relevant) include:

- Product specification and the management of value engineering decisions
- Construction quality
- System installation considerations, particularly for complex or novel systems
- Appropriate commissioning of servicing systems
- Ensuring that end users understand how to operate the building as intended.

Options for mitigating these risks include:

- Product specification and the management of value engineering decisions – Contractual requirements relating to changes to the design specification.

— Construction quality – Achieving the Testing and inspecting building fabric credit in Man 04.

— System installation considerations, particularly for complex or novel systems – The use of experienced installers and contractors.

— Appropriate commissioning of servicing systems – Achieving the Commissioning building services credit in Man 04 and/or the In-use commissioning credit in Man 05.

— Ensuring that end users understand how to operate the building as intended – Achieving the Handover credit in Man 04.

Note that alternative mitigation measures may be used.

Where it can be demonstrated that the expected benefits of implementing a mitigation measure is minimal the measure does not have to be implemented.

M2: Predicted operational energy score

The operational energy score is compared to BREEAM New Construction benchmark values for energy use intensity (EUI) in kWh/m² and carbon intensity (CI) in kgCO_2e/m² for the relevant building type.

M2.1: Calculating the predicted operational energy score

The annual predicted energy consumption for all operational energy uses in the building, except for industrial process loads, must be entered into BREEAM Platform for each of the following energy sources:

— Grid supply electricity
— Natural gas
— Burning oil/kerosene
— Gas oil
— Fuel oil
— Diesel
— Petrol
— LPG
— Other petroleum gas
— Coal
— Biodiesels
— Landfill gas
— Other biogas
— Wood
— Renewable heat source or renewable cooling source
— District heating
— District cooling
— Renewable electricity generated on site
— Renewable electricity generated on site and exported from the building

For buildings with district heating or cooling the carbon emission factor for the system must also be entered.

The energy use intensity (EUI) is calculated in the BREEAM Platform based on the energy consumption data entered and the floor area of the building. The EUI includes all energy sources used by the building, including renewable energy generated onsite. Net annual exports of renewable energy that are exported e.g., renewable electricity generated onsite and exported to the grid, may be excluded.

The carbon intensity (CI) is calculated in the BREEAM Platform using the appropriate carbon emission factors for each energy source and the floor area of the building.

An Operational Energy Performance score is determined relative the building benchmarks for both EUI (OEP_{EUI}) and CI (OEP_{CI}) for the building.

To account for different building use areas within a single building up to 5 building use types and floor areas may be entered into the BREEAM Platform. This is used to calculate a building specific benchmark within the BREEAM Platform.

The overall Operational Energy Performance score (OEP_{NC}) is calculated as follows:

$$OEP_{NC} = 0.5 \times OEP_{EUI} + 0.5 \times OEP_{CI}$$

M2.2: Calculating the carbon emission factor for district heating or cooling systems

The carbon emissions factor for district heating or cooling ($EF_{DH/DC}$) must be calculated on an annual basis as follows:

$$EF_{DH/DC} = (kgCO_2e_{generation} + kgCO_2e_{distribution}) / kWh_{heat/cooling}$$

where:

- $kgCO_2e_{generation}$ = Annual carbon emissions from all energy sources used to generate heat or cooling. This is calculated from the energy used to the generate all heat or cooling multiplied by the respective emissions factors.
- $kgCO_2e_{distribution}$ = Annual carbon emissions from all energy sources used to distribute heat or cooling to final users. This is calculated from the energy used to distribute all heat or cooling multiplied by the respective emission factors.
- $kWh_{heat/cooling}$ = Annual kWh of heat or cooling delivered to all final users.

For existing systems this should be based on the most recent 12 month of operation and for new plant based on engineering calculations.

M2.3: Carbon emission factors for electricity and heat from combined heat and power

Electricity consumed by the building that is generated from combined heat and power is assigned the grid supply emission factor and should be entered into the BREEAM Platform as such.

The carbon emission factor for heating from a combined heat and power plant ($EF_{CHPheat}$) must be calculated on an annual basis as follows:

$$EF_{CHPheat} = ((kgCO_2e_{generation} + kgCO_2e_{distribution}) - (kWh_{electricity} \times EF_{electricity})) / (kWh_{CHPheat}$$

where:

- $kgCO_2e_{generation}$ = Annual carbon emissions from all energy sources used to generate heat and power calculated from the sum of energy used multiplied by their respective emissions factors.
- $kgCO_2e_{distribution}$ = Annual carbon emissions from all energy used to distribute heating to final users calculated from the energy inputs used to distribute the heat multiplied by their respective emission factors.
- $kWh_{electricity}$ = Annual kWh of electricity delivered to final users.
- $kWh_{CHPheat}$ = Annual heat delivered to all final users.
- $EF_{electricity}$ = Emission factor for grid supply electricity ($kgCO_2e/kWh$)

Where the calculation results in a negative emission factor an emission factor of zero must be entered into the BREEAM Platform.

For existing systems this should be based on the most recent 12 months of operation. For new plant this should be based on engineering calculations.

M3: Disclosing an in-use energy performance target

The energy target should be expressed as an annual energy intensity normalised by floor area.

The scope of energy uses included in the target must be explicitly stated, for example, whole building or core building services and common areas only.

Where a target is set in units other than delivered energy (for example, carbon emissions or primary energy), factors to convert these to delivered energy must be provided. In all cases the floor metric must be defined (for example, GIA or NIA).

This information must be made available to building stakeholders (for example, prospective owners and occupiers of the building) and be accessible to members of the public.

M4: Third-party validation of energy prediction model

The energy prediction model and the predicted operational energy values should be validated by a suitably qualified energy modelling engineer or accredited professional who is not involved with the project team or the client.

A validation report must be produced that presents an unbiased analysis of the energy model carried out and recommendations for improving the modelling. The recommendations for improving the modelling must either be implemented, or justification for not implementing recommendations provided.

M5: Commitment to measure in-use energy consumption

The funding for in-use energy consumption measurement must be sufficient to cover monitoring of energy consumption for the first 12 months of normal occupancy (≥ 80% full occupancy) for all relevant end uses and compare these to the predicted energy consumption and any energy targets set for the building.

This could be demonstrated by undertaking a BREEAM In-Use assessment of operational energy or for office buildings in the UK, NABERS UK Energy for Offices.

Where the building will be sold or let a green lease agreement must include clauses that guarantee access to energy consumption data once the building is occupied.

M6: No fossil fuels on-site

The scope of fossil fuel use on site includes all fossil fuel use by the building except for:

- Industrial scale process loads.
- Emergency and life safety systems such as those for firefighting, evacuation, or back-up power for safety-critical systems and equipment, or within healthcare settings.
- Essential back-up systems serving buildings with functions where it is essential to maintain their continuous use, particularly in response to a disaster, for example hospitals, fire stations, police stations and emergency vehicle garages.
- Essential back-up systems serving data centres.

Compliance notes

Ref	Terms	Description
CN1	NABERS UK Design for Performance (DfP)	For offices completing energy modelling for NABERS UK DfP, completion of the following process steps can be used to demonstrate compliance for specific Ene 02 credits: 1. Sign an agreement a. Energy strategy – 1 credit b. Disclosing an in-use energy performance target – Exemplary credit 2. Design, document and model a. Predictive energy modelling – 3 credits b. Preparing for in-use measurement of energy consumption – criterion 12 3. Get an IDR Report a. Third-party validation of predictive energy modelling – Exemplary credit 4. IDR Report approved a. Risk assessment and mitigation – 1 credit 5. NABERS UK Accredited assessor appointed a. Commitment to measure energy consumption in-use – Exemplary credit
CN2	Building contains untreated areas	Where the assessment contains a mix of treated and untreated spaces, untreated spaces may be excluded, and the performance may be based on the treated spaces only.
CN3	Energy centre or LZC technologies connected at a later stage	If a project specifies LZCs that have been proposed in the feasibility report and reduce emissions, and/or will be connected to a site-wide energy centre operational at a later stage of the phased development, after the post-construction stage review has been submitted, this issue can be assessed as follows: — In a phased development where the primary heating system will be upgraded at a later stage than the building being assessed, a commitment to install the new heating source must be made in the General Contract Specification. BREEAM does not specify a particular time for phasing as it is difficult to set parameters, however, as a rule building users should have to wait the least time possible

Ref	Terms	Description
		before they can use the upgraded heating source. — For the quality audit, two energy model outputs/EPCs must be produced at the final stage – one with the actual interim system installed for building control, and one for the BREEAM assessment which can include the predicted energy from the proposed energy centre. — Additionally, the legally binding general contract specification for the new heating source must be submitted with details of the timescales proposed for the completion of the second phase of work. Where this approach is to be followed BREEAM must be consulted in each case to ensure that the arrangements are sufficiently robust to award the credits.
CN4	Parts of the building not subject to national thermal regulations	Where parts of the assessed building are not subject to national thermal regulations, these parts may be omitted from the EPR calculation.

Evidence

Criteria	Interim design stage	Final post-construction stage
Energy strategy		
1	Energy strategy statement for the building, detailing all the requirements within M1.1.	No further actions required post-construction; no additional evidence is required other than that listed for the design stage.
Predictive energy modelling		
2–4	Energy modelling report which includes: — Estimated unregulated energy uses and occupancy patterns used within the detailed energy modelling. — Sensitivity analysis and scenario modelling. — The predicted annual operational energy consumption in use by fuel type based on the results. Confirmation of the energy modeller's qualifications and experience.	Updated energy modelling report to account for any changes to the building specification, where required. Confirmation of the energy modeller's qualifications and experience.
Risk assessment and mitigation		
6	Energy modelling report or other document that includes a risk assessment and details of mitigation measures, in line with M1.3.	Same evidence as the design stage but with confirmation of mitigation measures that have already been implemented.
Predicted operational energy performance score		
8	Results of the predictive energy modelling confirming the predicted operational energy consumption for all energy uses. Where appropriate, calculations showing how the carbon emission factor for district heating and district cooling have been determined.	Updated energy modelling report to account for any changes to the building specification, where required. Where appropriate, calculations showing how the carbon emission factor for district heating and district cooling have been determined.
Disclosing an in-use energy performance target		
9	Contract documentation or a letter of commitment from the client or developer to disclose the in-use energy performance target to stakeholders and make it publicly available prior to practical completion.	Weblink or other documentation that indicates where the performance target can be viewed by stakeholders and the general public.
Third-party validation of predictive energy modelling		
10	Energy model validation report.	Energy modelling report or other

Criteria	Interim design stage	Final post-construction stage
	Evidence to show this was completed by a suitably qualified third party. Energy modelling report or other documentation indicating improvements made to the model post validation.	documentation indicating improvements made to the model post construction.
Preparing for in-use measurement of energy consumption		
12	Energy modelling report showing a breakdown of results of the energy use by sub-meter.	Updated energy modelling report to account for any changes to the building specification, where required.
Commitment to measure energy consumption in-use		
13	Commitment from the client that funds will be available to pay for the in-use energy consumption to be measured by a suitably qualified energy assessor.	Confirmation from the client that funds have been committed and how the requirements will be met. Identify the assessor or assessment scheme that will be used. A signed contract for the scope of work with the person or organisation who will be carrying out the assessment. Evidence to support that the appointed person meets the definition of a suitably qualified energy assessor. Where applicable, clauses in the green lease agreement that guarantee access to in-use energy consumption data.
No fossil fuels onsite		
14	Design drawings, relevant section of the building specification, contract clauses or letter of confirmation from the project team which demonstrates that no fossil fuels will be used onsite.	Final construction drawings or equivalent, assessor site inspection and photographic evidence or other supporting documentation to show that no fossil fuels are being used onsite.

Definitions

Combined heat and power

The concurrent production of electricity or mechanical power and useful thermal energy (heating and/or cooling) from a single source of energy.

Green lease

A green lease is a contract that includes additional clauses which provide for the management and improvement of the environmental performance of a building by both owners and occupiers.

To be acceptable for BREEAM a green lease agreement must cover all relevant BREEAM requirements and must be signed by both the lessor and the lessee or, a where the lessee is unknown, a commitment must be provided by the client that the green lease agreement will be implemented when the building is occupied.

Industrial scale process loads

The energy used during manufacturing, production, waste treatment or other industrial processes (for example, chemical, physical, electrical, or mechanical processes during the production or manufacture of products).

The energy may be used for activities such as heating, cooling, mechanical work, chemical reactions, and other operations essential for the transformation of raw materials into finished products or goods.

Local LZC technologies

To be recognised as a local LZC technology the system must be located on-site or near-site and must either:

— Have a direct (private wire) connection to the assessed building.

OR

— Where it is impractical to physically connect the assessed building, the LZC system(s) must be located on the same site and be owned and managed by the same organisation as the assessed building.

Operational energy

Energy consumption for all end uses present when the building is operational except for industrial scale process loads. Operational energy includes both regulated and unregulated energy consumption.

Regulated energy

Building energy consumption resulting from the specification of fixed building services and fittings, including space heating and cooling, hot water, ventilation, fans, pumps, and lighting that are controlled through the applicable building regulations.

Suitably qualified energy assessor

An individual who:

— has experience of carrying out energy audits or in-use energy performance assessments in accordance with legislation or voluntary measurement and reporting standards.

OR

— has accreditation from a suitable and recognised scheme certifying that they are qualified to assess the energy efficiency of buildings.

Suitably qualified energy modelling engineer or accredited professional

An individual who has:

1. A minimum of 3 years relevant experience in building energy modelling within the last 5 years.
2. A recognised qualification or chartership such as a building services engineer or building energy modelling engineer.
3. Broad expertise to cover all required technical aspects, guaranteeing that the data entry in the energy model is appropriate and the results reflect the actual performance of the building.

Where the modelling is being carried out a team of modellers their combined experience must meet the individual requirements.

OR

For DSM modelling:

— Is a certified ASHRAE Building Energy Modelling Professional or equivalent.

For PHPP modelling:

— Is a Passivhaus Designer or Consultant.

Unregulated energy

Building energy consumption resulting from building services and fittings that are not addressed by applicable building regulations.

Additional information

None.

Ene 03 Energy monitoring

Aim

To encourage installation of energy sub-metering to monitor operational energy consumption. To enable predicted and actual energy performance to be compared and to inform ongoing energy management.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	up to 2	Very Good	All (see ref 3.0 and 3.1)
Shell and core	up to 2	Very Good	All (see ref 3.0 and 3.1)
Shell only	0	None	Not applicable

Assessment type specific notes

Ref	Assessment type specific note
-	None

Building type specific notes

Ref	Building type specific note
2.0	**Education – Preschool** For Education – Preschool buildings, the energy monitoring for different occupiers and functional areas credit is filtered out.
2.1	**Residential institution (long term stay)** For Residential institution (long term stay) buildings, the energy monitoring for different occupiers and functional areas credit is filtered out.

Issue specific notes

Ref	Issue specific note
3.0	**Energy monitoring for separately occupied areas and different functional areas** Where there are no separately occupied areas or different functional areas (criterion 6) this credit will be filtered out.
3.1	**No relevant energy sources** Where no relevant energy sources are present in the building this issue is filtered out.

Assessment criteria

One credit – Energy monitoring by end-use

1 Identify the energy sources that will be used by the building and estimate the annual energy consumption for the following (see M1):

- 1.a Grid supply electricity
- 1.b Grid supply gas
- 1.c District heating
- 1.d District cooling
- 1.e Renewable electricity generated on-site.

2 Energy monitoring is installed that allows ≥ 90% of the estimated annual energy consumption for each energy source to be assigned to an end-use category (see M2).

3 Renewable electricity generated on-site and exported from the building must be separately monitored.

4 There is an energy metering system appropriate for the size of the building:

4.a For buildings with a gross internal area ≥ 1000 m², the energy meters are connected to an energy monitoring and management system.

4.b For buildings with a gross internal area < 1000 m², the energy meters are either:

4.b.i Connected to an appropriate energy monitoring and management system. OR

4.b.ii Are accessible meters with pulsed outputs or other open protocol communication outputs.

5 Those responsible for monitoring the building's energy consumption can clearly identify the end-use category covered by each meter.

One credit – Energy monitoring for different occupiers and functional areas

6 Energy monitoring is installed that allows energy consumption to be assigned to separately tenanted or occupied areas and to relevant functional areas within the building (see M3).

7 There is an energy metering system appropriate for the size of the building:

7.a For buildings with a gross internal area ≥ 1000 m², the energy meters must be connected to an energy monitoring and management system.

7.b For buildings with a gross internal area < 1000 m², the energy meters are either:

7.b.i Connected to an appropriate energy monitoring and management system. OR

7.b.ii Are accessible meters with pulsed outputs or other open protocol communication outputs.

8 Those responsible for monitoring the building's energy consumption can clearly identify the functional or occupier area covered by each meter.

Methodology

M1: Estimating expected annual energy consumption

Identify all energy sources that will be used within the building, including renewable electricity generation that will be used within the building.

Estimate the expected annual energy operational energy consumption of the building for each of the energy sources:

- Grid supply electricity
- Grid supply gas
- District heating
- District cooling
- Renewable electricity generated on-site.

Where annual operational energy consumption has been calculated in accordance with Ene 02 predictive energy modelling methodology, these results should be used, otherwise, energy consumption estimates may be derived from simple energy modelling results (including NCM calculations), benchmarks, data for similar projects, or simple engineering calculations.

An alternative method may be used to determine the building's energy consumption where a suitably qualified energy professional confirms that the methodology is appropriate.

M2: Monitoring energy consumption by end-use

Identify the end use that are collectively expected to account for 90% of the building's annual operational energy consumption.

As a minimum the following end-uses must be considered, where present:

- Space heating and cooling generators
- Hot water generator
- Fans for mechanical ventilation, space heating or cooling
- Pumps for distribution heating or cooling
- Commercial scale refrigeration or cold storage
- Internal lighting
- External lighting
- Controls and telecommunications
- IT equipment and small plug-in loads
- Internal transport (lifts and escalators)

Devise an energy metering strategy that ensures that end uses are separately monitored where it is technically feasible and cost effective to do so.

For this issue, metering is considered cost effective where the cost of installing a sub-meter is lower than the energy cost savings arising from improved energy management over the expected lifetime of the building.

Where direct metering is not feasible, monitoring may be achieved by one of the following means:

- Measuring the run-hours of a piece of equipment that operates at a constant known load.
- Based on temperature differences for metered hot water consumption.

M2.1: Combining end use categories for sub-metering

Some common examples of end uses that are often metered together include:

- **Lighting and small power** – lighting and small power can be combined where it is not cost effective to sub-meter lighting and small power separately.
- **Heating and hot water** – space heating and domestic hot water may be combined with a single heat or gas meter where a common plant provides both end-uses (e.g. a boiler) and it is impractical to meter the end uses separately.
- **Heating and cooling** – space heating and space cooling may be combined when both services are provided by a single piece of equipment (e.g. a reversible heat pump).
- **Modular heating or cooling systems** – modular systems can be monitored as a whole.
- **Multiple fans** – multiple fans may be monitored together (for example, where there are multiple fans within an air handling unit (AHU).

Note that for tenanted office, industrial, or retail units with a GIA of < 250 m² that are separately monitored it is acceptable to sub-meter:

1. Space heating
2. Electricity
3. Hot water (where feasible)

M2.2: Documenting the metering strategy

In all cases a metering schedule or metering strategy document must be produced that sets out for each energy source:

1. Main end uses
2. Monitored areas
3. Estimated energy consumption
4. Metering method used
5. Meter number or code
6. Physical location of the meter

For a worked example, see General Information Leaflet 65: Metering energy use in new non-domestic buildings[89]. This document also includes an example of a metering schedule and a metering strategy.

M3: Monitoring energy consumption for different occupants and functional areas

Identify units or areas in the building with different tenants or occupiers, OR, where the building is designed for a single occupancy, different functional areas.

Devise an energy metering strategy that ensures that different occupants or functional areas are separately monitored where it is technically feasible and cost effective to do so.

For this issue metering is considered cost effective where the cost of installing a sub-meter is lower than the energy cost savings arising from improved energy management over the expected lifetime of the building.

M3.1: Different tenants or occupants

For buildings with different tenants or occupants, meters must be installed on the energy supply to each separate tenanted unit or area.

For buildings with a gross internal floor area of ≥ 500 m², with a single tenant or occupant, and with only one function, the area must be split up into smaller, discrete, logical areas that provides useful information to building management about energy use.

M3.2: Different functional areas

For this issue, a different functional area is defined as an area where there is expected to be significantly different energy loads, controls, occupation, or usage patterns.

Meters must be installed on the energy supply to each different functional area ≥ 100 m².

Functional areas that typically require submetering are listed in Table 6.4 below, but it is up to the project team to determine the relevant functional areas that require monitoring.

Table 6.4: Examples of relevant functional areas for different building types[(1)]

Building type	Relevant functional areas
Residential institution (long term stay)	1. Residential unit 2. Common areas
Office	1. Office areas, typically by floor (or similar beneficial grouping) 2. Common areas 3. Catering
Retail	1. Sales area 2. Storage and warehouse 3. Cold storage 4. Offices 5. Catering 6. Tenant units
Industrial	1. Office areas 2. Operational area 3. Ancillary areas (e.g. canteens)
Hotels	1. Office areas 2. Catering (e.g. kitchen, restaurant) 3. Conference suites 4. Swimming pool or leisure facilities 5. Bedrooms, by floor or core (or similar beneficial grouping)
Education	1. Kitchens (excluding small staff kitchens and food technology rooms) 2. Workshops 3. Classrooms 4. Lecture halls 5. Conference rooms 6. Swimming pools 7. Sports halls 8. Process areas 9. Laboratories 10. IT server rooms Note: Individual sub-metering of standard classrooms or seminar rooms is not required.
Hospitals and other	1. Medical physics facilities

1 This table lists common functional areas by building type. The lists are not exhaustive and where other areas exist with high or variable energy loads, these should also be considered as part of the overall metering strategy.

Building type	Relevant functional areas
healthcare facilities	2. Rehabilitation when including hydrotherapy pools 3. Central sterile supplies departments (or equivalent) 4. Areas with specialist equipment (e.g. commercial-scale kitchens and laundries) 5. IT server rooms 6. Pharmacy departments 7. Laboratories 8. Tenanted areas (e.g. catering, retail, laundry) Note: Sub-meters can be provided per floor plate in small healthcare buildings (gross internal floor area < 1000 m²) that have no functional areas with a high energy load.
Other	Other types of single occupancy buildings can use the functional areas above as a guide to the type of areas that may require sub-metering.

Compliance notes

Ref	Terms	Description
CN1	Extensions to existing buildings	Where an existing building is being extended and it uses existing building services plant and systems that will be common to both the new extension and existing building, the criteria can be met by either: Metering the services supplied to energy-consuming systems from the existing building at the entry points to the extension, e.g. hot water, chilled water, gas and electricity. OR Meeting the metering requirements at the whole building level.
CN2	Buildings situated on campus developments	Buildings situated on campus developments must be monitored using either an appropriate energy monitoring and management system or another automated control system, e.g. outstations linked to a central computer. The criteria only apply to the assessed building. Where energy services are supplied from an existing building on the campus, they must be metered at the entry points to the assessed building, e.g. hot water, chilled water, gas and electricity. Pulsed or other open protocol communication output meters are not sufficient to award the credit for these building types.
CN3	Combined sub-metering – Electric space heating or water heating and small power equipment	For bedrooms and associated spaces in residential institution (long-term stay) building types, it is acceptable for an electric heating system to be combined with lighting and small power for metering purposes. Sub-metering must be provided for each floor plate or other appropriate sub-division.
CN4	Excluding large untreated areas	For industrial buildings, where there are offices and the internal spaces are not serviced by heating ventilation or HVAC systems and will have no energy-intensive systems or processes, the warehouse space can be excluded from the calculation of 'gross internal floor area' to determine whether option a) or b) is applicable for criteria 4 or 7.
CN5	Self-contained dwellings or units with individual utility meters	Where self-contained dwellings or units covered by the assessment have their own individual energy supply and utility meter (e.g. water, gas, or electricity), this supply is excluded from assessment. All shared energy supplies and common areas under the responsibility of building management are still included. For example, if self-contained flats in an assisted living development have individual gas supplies with their own utility meter, this supply will be excluded from the assessment. If the lighting and small power is shared on each floor, this shared supply will need to be sub-metered in accordance with the criteria.
CN6	Sub-metering by calculation / monitoring by	Two direct meters may be used to estimate a third by difference, e.g., where total external lighting consumption and car park lighting consumption are both measured, the difference between the two will be other external lighting consumption.

Ref	Terms	Description
	difference	Where an energy monitoring and energy management system is used, the software should be capable of calculating and displaying all required end-uses in line with the criteria.
CN7	Point of use water heaters	'Point of use' water heaters are excluded from the sub-metering requirements.
CN8	Centralised air handling units (AHU)	Where it is not technically feasible to separately meter energy use by floor plate or functional area of a centralised AHU, the requirements of the second credit do not need to be applied to the AHU. The credit will be assessed based on the rest of the energy uses applicable.
CN9	Shell and core buildings with capped services	Where a tenanted area within the building will have its own individual energy supply and utility meter, this supply is excluded from assessment. All shared energy supplies and common areas under the responsibility of building management must still be included.

Evidence

Criteria	Interim design stage	Final post-construction stage
Estimating annual energy consumption		
1	Estimates of energy consumption by energy source including an indication of how the estimates were derived	No further actions required post-construction; no additional evidence is required other than that listed for the design stage.
Energy monitoring by end-use and for different occupiers and functional areas		
2, 3, 6	The metering schedule or metering strategy document. Floor plans showing functional or tenanted areas, where applicable.	The final construction or equivalent metering schedule or metering strategy document. Assessors site inspection report and photographic evidence. OR Screenshots from the energy monitoring system showing data from the meters where installed.
4, 7	Specification for the energy monitoring system and/or meters.	Final construction drawings, specification, manufacturer's product data or O&M documentation for the installed energy monitoring system and/or meters. Assessors site inspection report and photographic evidence.
5, 8	The metering schedule or metering strategy document.	Assessor site inspection report and photographic evidence showing the labelled meters. OR Screenshots from the energy monitoring system showing data from the meters and what they relate to, where installed.

Definitions

Accessible meters

Energy meters located for easy access to allow regular monitoring and readings by building occupants or facilities managers. Typically, this will be a plant room, main distribution room or control room where a building energy management system (BEMS) is installed.

Common areas

Shared facilities, spaces, and access that are not owned or controlled by any individual tenant or occupier. These are typically managed and maintained by the development's owner or managing organisation. Examples include atria, stairwells, entrance foyers and external areas.

Energy meters

Devices that measure the amount of energy used on a circuit while energy is flowing.

- Primary meters measure main incoming energy and are used for billing by the utility supplier.
- Sub-meters are installed to measure consumption by specific items of plant or equipment, or to discrete physical areas, e.g. individual buildings, floors, tenanted areas or function areas.

Energy monitoring and management system

A system that provides users with data about energy consumption patterns in a building to facilitate informed energy management decisions.

In addition to providing real time data on energy consumption they may also flag faults in equipment and in some cases remotely activate or deactivate equipment. They may have the ability to provide performance indicators that can be used to measure performance against targets and provide real time alerts in instances where energy use is unexpected such as equipment left on after hours.

Energy supply

All types of energy supplied to a building area (function area, department, tenancy, or unit) within the boundary of the assessed development. This includes electricity, gas, heat or other forms of energy or fuel that are consumed from the use of, and operations within, each relevant area.

Functional areas

Areas with significantly different energy loads, controls, occupation, or usage patterns.

Operational energy

Energy consumption for all end uses present when the building is operational except for industrial scale process loads. Operational energy includes both regulated and unregulated energy consumption.

Pulse output meters (and acceptable alternatives)

A pulsed output meter generates an output signal when a specified amount of electricity, water, or gas passes through it.

Acceptable alternatives must meet or exceed the capabilities of a pulsed output meter.

The following metering standards or technologies are currently recognised as alternative to pulsed output meters:

- M-bus (i.e. systems that comply with the EN 13757 series of standards). Also includes systems complying with OMS (Open Metering System) standards.

Additional information

None.

Ene 04 Low carbon design

Aim

To encourage design measures that reduce energy demand and the installation of local low and zero carbon energy generation technologies to reduce carbon emissions.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	5	None	All
Shell and core	5	None	All
Shell only	5	None	All

Assessment type specific notes

Ref	Assessment type specific note
-	None

Building type specific notes

Ref	Building type specific note
-	None

Assessment criteria

One credit – Building form optimisation

1 The project team carries out an analysis of the site and proposed development during the Concept Design stage to explore the effect of building form on energy demand (see M1).

2 Demonstrate that the analysis has informed the building design and will lead to a reduction in building energy consumption in use.

Up to two credits – Fabric performance optimisation

Analysis of alternative fabric specifications

3 The project team carries out an analysis of the proposed development to explore the impact of alternative fabric specifications on the building's demand for heating and cooling.

One credit – 5% reduction in building energy demand

4 Achieve criterion 3.

5 Implement fabric performance measures which reduce the overall building heating and cooling energy demand by ≥ 5% compared to minimum values set by building regulations.

OR

Two credits – 10% reduction in building energy demand

6 Achieve criterion 3.

7 Implement fabric performance measures which reduce the overall building heating and cooling energy demand by ≥ 10% compared to minimum values set by building regulations.

OR

Two credits – Fabric performance has been optimised

8 Demonstrate that the fabric specification has minimised the demand for heating and cooling.

See Methodology M2.

Up to two credits – Low and zero carbon energy generation technologies

One credit – Installation of LZC energy generation technologies

9 One or more eligible LZC energy generation technologies have been installed by competent installers.

One credit – Meeting LZC energy generation targets

10 Achieve the 'Installation of LZC energy generation technologies' credit (criterion 9).

11 The energy generated by the installed LZC energy generation technologies meet the following targets:

11.a Where photovoltaic (PV) panels are the only LZC energy generation technology installed, the electricity generated must:

11.a.i Be equal to, or exceed, that generated by reference PV panels covering 50% of the ground floor area.

OR

11.a.ii Account for ≥ 60% of the building's annual electricity consumption.

11.b Where only LZC energy generation technologies other than PV panels are installed, the energy generated must:

11.b.i Be equal to, or exceed, 137 kWh/year/m² of ground floor area.

OR

11.b.ii Meet ≥ 60% of the building's annual demand for the relevant energy source.

11.c Where the installed LZC energy generation technologies include both PV panels and other LZC energy generation technologies, selected generation targets as listed in 11.a and 11.b should be used in conjunction scaled proportionally to the amount of electricity generated by each technology (see M3.4).

Methodology

M1: Building form optimisation

Building form analysis must be carried out at concept design stage, using appropriate early design stage energy modelling tools or calculation methods. This should be done by a suitably qualified member of the project team with experience in building form analysis. It must be specific to the site location, weather and microclimate and should take account the expected building occupancy. The analysis must consider alternative design options that consider each of the following factors:

1. Building layout
2. Building orientation
3. Building form
4. Daylighting strategy
5. Ventilation strategy

Where site constraints mean that not all the points can be addressed, a suitably qualified member of the project team must justify any exclusions.

It must be demonstrated how the building form analysis has influenced the building form to reduce energy demand for space heating, space cooling, ventilation and lighting.

Where the building form analysis identifies no scope for reducing energy consumption in use, the credit cannot be awarded.

If the results of the building form analysis are compiled after concept design stage, the person that undertook the passive design analysis must confirm that the outcome would not be different if the analysis had been carried out during the concept design stage.

M2: Fabric performance optimisation

M2.1: Analysis of fabric performance

The analysis to reduce energy demand from heating and cooling must consider the following:

1. Fabric insulation
2. Thermal mass to store heat or coolth
3. Air tightness
4. Solar gains

The analysis should consider the effect of different products and materials using energy modelling tools that take account of heat transfer characteristics, solar gains and the effect of thermal mass and other types of fabric thermal storage on heating and cooling.

Where site constraints mean that some fabric performance considerations cannot be addressed, any exclusions must be clearly justified by a suitably qualified energy modelling engineer or accredited professional. Where none of the points can be addressed, the credit cannot be awarded.

M2.2: Quantifying a reduction in the energy demand

The reduction in energy demand must be measured by comparing the demand for heating and cooling for the actual building compared to standard practice. Where standard practice is a version of the actual building with a fabric specification set by either:

— Baseline fabric values for the relevant climate region from ASHRAE Appendix G 2016 or later.

OR

— Minimum fabric specifications defined by local building regulations.

One of the energy modelling software packages or calculation tools for either Ene 01 or Ene 02 must be used, and the modelling must be carried out by a suitably qualified energy modelling engineer or accredited professional.

M2.3: Optimised fabric performance

Fabric performance is optimised where a change in the value of any of the fabric parameters in either direction would lead to an increase in the total heating and cooling demand.

M3: Low and zero carbon energy generation technologies

M3.1: Eligible LZC energy generation technologies

Only local LZC energy generation technologies that use the following energy sources can be used for this issue:

— Wind
— Solar radiation (solar thermal and solar photovoltaic)
— Geothermal and hydrothermal energy sources
— Hydropower
— Waste heat from operational processes

Waste heat from operational processes includes manufacturing processes, high temperature oven or kiln, compressors serving process plant, microbrewery, crematorium, testing and commissioning boilers for training or manufacture, and data centres.

It does not include waste heat from IT or server rooms, which could be used as part of conventional heat recovery measures.

The following are **not** eligible LZC energy generation technologies for this issue:

— Heat or electricity generated from a waste incineration plant
— Biomass or biofuels from first generation biomass feedstock
— Heat generated by heat pumps

For further information, see Additional information on page 181.

Biomass from second generation biomass feedstock or waste sources may be eligible provided they meet the specific requirements for these sources outlined below.

M3.1.1: Biofuels from second-generation biomass feedstock or waste

BREEAM **may** recognise systems using biofuels generated from locally sourced second-generation feedstocks or biofuels manufactured from biodegradable waste materials, including landfill gas and sewage treatment gas. Further detail about the biomass source, the supply chain, and the installed plant is required for review by BRE Global prior to confirmation of acceptability.

The details provided should include:

1. Type, source, and sustainability of the biomass feedstock.
2. Avoidance or minimisation of fossil fuel use in:
    a. extraction
    b. transportation of the biomass or biofuel.
3. Presence of a supply agreement and a robust supply chain.
4. Compatibility of the biofuel with the specified boiler or plant and manufacturer's warranty issues.

BREEAM does not define the term 'locally sourced' or specify a minimum supply contract. However, the assessor must determine and demonstrate that these are reasonable for the application.

For the definitions of first- and second-generation biofuels, see Definitions on page 180.

M3.2: Local LZC energy generation technologies

To be recognised as a local LZC energy generation technology the system must be located on-site or near-site and must either:

- Have a direct (private wire) connection to the assessed building.

  OR

- Where it is impractical to physically connect the assessed building, the LZC energy generation system(s) must be located on the same site and be owned and managed by the same organisation as the assessed building.

M3.3: Competent installation

Where an independent regional or national certification scheme for renewable energy system installers exists, these technologies must be certified in accordance with the relevant scheme.

Where such schemes do not exist, the design team must show that they have investigated, and are confident in, the skill and competence of the installers to install the technology appropriately.

M3.4: Calculating energy generated by LZC technologies

The predicted annual energy generated by LZC systems should be calculated on an annual basis and take account of climate and the orientation and location of the system. For example, for PV panels the calculation should take account of hours of peak sunlight for the location, the orientation of the panels, and any shading.

The calculation must be carried out by, or checked by, a suitably qualified energy modelling engineer or accredited professional, or an LZC specialist.

Where the installed LZC energy generation technologies include both PV panels and other LZC energy generation technologies, the generation targets should be adjusted proportional to the amount of electricity generated by each.

For example, if 50% of local LZC energy is generated by PV panels and 50% by a wind turbine this could be met with PV panels with an efficiency of 0.2 kWp/m² covering 25% of the ground floor area and a wind turbine that generates 68.5 kWh per year for each square metre of ground floor area.

M3.4.1: Reference PV panels

A reference PV panel has a rated peak power output of 0.2 kWp/m² is oriented horizontally, with no or very little overshading, and with strongly ventilated or forced ventilated modules.

M3.5: Calculating the reduction in energy consumption

The percentage of the building's predicted energy consumption that will be met by energy generated by LZC technologies must be calculated on a net annual basis for each energy source e.g., electricity, heat.

$$\frac{\textit{Energy generated by local LZC technology per year}}{\textit{Energy consumption of the building per year}} \times 100 = \%\ \textit{net annual energy generated}$$

Where energy consumption has been predicted for Ene 02, these values should be used to determine the proportion of the building's predicted energy consumption that is generated by LZC technologies. Otherwise, energy consumption estimates may be derived from simple energy modelling results (including NCM calculations), benchmarks, data for similar projects, or simple engineering calculations.

Where the energy consumption is uncertain (for instance, if the project is shell only) it may be based on the expected use and loads specified in the design brief or for likely scenarios.

M3.6: LZC energy generation systems that serve more than one building

Where an LZC energy generation system will serve more than one building, the proportion of annual energy that is attributed to the assessed building should be based on the predicted annual energy consumption of that building compared to the measured or estimated annual energy consumption for all buildings connected to the LZC energy generation system, minus net annual renewable energy exports to the grid.

Compliance notes

Ref	Terms	Description
CN1	Fabric performance optimisation – Existing building elements are retained	In circumstances where an existing building element (e.g., a facade) is being retained they must be included in the baseline fabric specification when calculating the reduction in energy demand.
CN2	LZC energy generation technologies – Systems connected at a later stage	If LZC energy generation systems are owned by a third-party and will be connected after post-construction certification, a binding contract specification for the proposed work must be submitted. This must include proposed timescales for this work.
CN3	LZC energy generation technologies – District heating system using multiple fuels	Where the building is connecting to a district heating system and this burns a mixture of eligible and non-eligible energy sources, only the proportion of output generated from eligible renewable fuels can be considered for this issue. For instance, a system burns 25% compliant biofuels and 75% fossil fuels – only 25% of heat is recognised for this issue. As fuel mixes may vary over time, provide at least one year or more of historical information to account for seasonal variations. Where the system is new or proposed, robust evidence must be provided of the anticipated fuel mix. The fuel mix must be calculated based on the energy content of the input fuels in kWh.
CN4	LZC energy generation technologies – Technologies already available on site	Energy from existing local LZC energy generation technologies may be recognised where it can be demonstrated that the energy supplied to the building will be additional to that which is already being supplied to other buildings or infrastructure entities.

Evidence

Criteria	Interim design stage	Final post-construction stage
Building form optimisation		
1, 2	A copy of the compliant building form analysis, completed in line with M1. Supporting documentary evidence to verify how it has influenced the final building form such as design drawings and specifications.	Final construction drawings or equivalent or assessor site inspection report and photographic evidence to show how the outcomes of building form analysis have been implemented within the final design.
Fabric performance optimisation		
3	A copy of the analysis of fabric performance, completed in line with M2.1.	A copy of the analysis of fabric performance, completed in line with M2.1.
5, 7, 8	Modelling results demonstrating the reduced energy demand for heating and cooling arising from the proposed fabric specification and, where relevant, that the fabric performance has been optimised as far as possible.	Final construction drawings or equivalent, air test results or assessor site inspection report and photographic evidence to show how the outcomes of fabric performance analysis have been implemented within the final design.
Low and zero carbon energy generation technologies		
9	Technical specification for LZC energy generation technology and where appropriate, plan drawings of the building showing the LZC energy generation systems Confirmation that the systems will be installed by competent installers or that the installation will be certified.	Specification for the LZC energy generation system(s) and final construction drawings or equivalent of the building showing the LZC energy generation systems. Confirmation of the competency of the installers or certification of the installation.
11.a	Technical specifications of PVs and plan drawings of the building with the PV panels. Calculations showing the predicted carbon reduction from the PV panels meets the energy generation target.	Technical specifications of PVs and final construction drawings or equivalent of the building with the PV panels. OR Assessor site inspection report and photographic evidence. AND Updated calculations for the installed system showing the predicted carbon reduction from the PV panels meets the energy generation target.
11.b	Technical specifications of LZC energy generation system(s) and plan drawings of the building with the LZC energy generation systems(s) installed. Calculations showing the predicted carbon reduction from the LZC energy generation systems(s) meets the energy generation target.	Technical specifications of LZCs and plan drawings of the building with the LZCs as built. OR Assessor site inspection report and photographic evidence. AND Updated calculations for the installed systems showing the predicted carbon reduction from the LZCs meets the energy generation target.

Definitions

First generation biofuels

Fuels that are produced from edible food crop that are grown or farmed for the purposes of biofuel production.

Ground floor area

The maximum area of a building or structure to the outside wall measurement.

Low and zero carbon specialist

An individual who:

a. Is not professionally connected to a single LZC technology or manufacturer.

   AND, either:

b. Has carried out LZC assessments for at least 3 years.

   OR

c. Has a recognised qualification for undertaking assessments, designs, or installations of LZC solution in the building sector.

Second generation biofuels

Biofuels produced from non-food feedstocks or biofuels manufactured from biodegradable waste materials, e.g., biogas, waste vegetable oil or locally and sustainably sourced solid biofuels, e.g., woodchip, wood pellets.

Suitably qualified energy modelling engineer or accredited professional

An individual who has:

1. A minimum of 3 years relevant experience in building energy modelling within the last 5 years.
2. A recognised qualification or chartership such as a building services engineer or building energy modelling engineer.
3. Broad expertise to cover all required technical aspects, guaranteeing that the data entry in the energy model is appropriate and the results reflect the actual performance of the building.

Where the modelling is being carried out a team of modellers, their combined experience must meet the individual requirements.

Suitably qualified member of the project team – building form analysis

A building design professional with a minimum of 3 years relevant experience in building form analysis.

Additional information

Exclusion of waste heat or electricity from an incineration plant from LZC energy generation technologies

BREEAM no longer recognises waste heat or electricity from an incineration plant for this issue. This is because of the potential for adverse health and environmental impacts associated with this form of energy particularly from older plants. And because waste from heat can act as a disincentive for reuse and recycling and may destroy recoverable materials.

Exclusion of heat pumps from the list of LZC energy generation technologies

BREEAM no longer recognises heat pumps for this issue. This is because a heat pump does not generate heat, but transfers heat from outside the building and requires electricity or another energy source to operate. This applies to all types of heat pumps including ground source, air source, and water source systems.

The energy efficiency benefits of heat pumps are recognised in Ene 01 and Ene 02.

Exclusion of first-generation biomass feedstock from LZC technologies

BREEAM does not reward building systems fuelled by first generation biofuels. This is because of the high levels of uncertainty over their impact on biodiversity, global food production, and their life cycle greenhouse gas savings.

Ene 05 Energy efficient equipment

Aim

To recognise and encourage the procurement of energy efficient equipment to minimise energy consumption and carbon emissions in operation.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	up to 5	None	All (see ref 3.0)
Shell and core	up to 5	None	All (see ref 3.0)
Shell only	0	None	Not applicable

Assessment type specific notes

Ref	Assessment type specific note
-	None

Building type specific notes

Ref	Building type specific note
-	None

Issue specific notes

Ref	Issue specific note
3.0	This issue is filtered out where there is no “in-scope” equipment present.

Assessment criteria

Up to five credits – Energy efficient equipment

1 Identify items of equipment in the project specification (in-scope equipment) that are users of unregulated energy (see M1).

2 Estimate the expected annual energy consumption by the in-scope equipment identified in criterion 1 (see M2).

3 Determine the ratio of in-scope unregulated energy use by equipment to regulated energy use to determine the number of credits available (see Table 6.5 below and M3).

Table 6.5: Energy efficient equipment credits available

In-scope unregulated energy use by equipment / regulated energy use (%)	Credits available
No in-scope equipment OR Energy consumption of in-scope equipment is not significant	Issue filtered out
< 10%	1
≥ 10% and < 20%	2
≥ 20% and < 30%	3
≥ 30% and < 40%	4
≥ 40%	5

4 Determine which in-scope equipment items are energy efficient (see M4).

The number of credits awarded is proportional to the percentage of energy use by in-scope equipment that uses energy efficient equipment as follows:

Number of credits = (% of in-scope equipment that is energy efficient × number of credits available) rounded to the nearest whole number.

Methodology

M1: Scope of unregulated energy using equipment

Items of equipment included in the project specification are considered to be in-scope unless one or more of the following conditions apply:

1. They are part of an industrial process.
2. They provide temporary services e.g., external lighting for theatrical, stage, and local display installations.
3. They are only used when maintenance work is being carried out.
4. They are only used in an emergency.
5. There are overriding safety, security or accessibility requirements that prevent energy efficiency criteria being met by any relevant compliance routes.
6. Existing equipment is used in place of new equipment (due to the reduction in embodied carbon).
7. The equipment is mobile and is likely to be used outside of the building (for example, laptop computers).

Energy using equipment **may** be excluded from the assessment where the additional cost of procuring energy efficient equipment is expected to exceed the cost savings from reduced energy consumption over the lifetime of the equipment. This is more likely to be the case for items with low annual energy consumption. As a guide this is likely to occur where the expected annual energy consumption of equipment is lower than 100 kWh per year, which equates to a small domestic refrigerator.

M2: Estimating energy use by in-scope equipment

Where annual operational energy consumption has been calculated in accordance with Ene 02, the annual energy uses for in-scope equipment should be based on data inputs for prediction modelling. Otherwise, energy consumption estimates may be derived from simple energy modelling results (including NCM calculations), benchmarks, data for similar projects, engineering calculations (see simple example of an engineering calculation below), or other appropriate estimation methods.

kWh per year = kW rating × Load factor × Annual use hours

where:

kW rating = Maximum power consumption of the equipment.

Load factor = Average power consumption when the equipment is in use/kW rating.

The estimated annual energy consumption for each type of in-scope equipment must be entered into the BREEAM Platform.

At the pre-assessment stage the number of credits available may be estimated by entering a rough estimate of the total energy consumption for all in-scope equipment. This must be replaced by estimates of the energy consumption for each item of equipment before the assessment is submitted.

M3: Determining the number of credits available

The methodology for calculating the annual energy consumption for in-scope energy using equipment is described in M2.

Where operational energy consumption has been predicted for Ene 02, the regulated energy consumption should be derived from the central case modelling outputs. Otherwise, regulated energy consumption derived from other energy modelling results (including NCM calculations), data for similar projects, or benchmarks may be used. In all cases the annual regulated energy must be entered into the BREEAM Platform and is used to determine the ratio of in-scope equipment to regulated energy use as follows:

$$\frac{\textit{Total annual energy consumption for all in-scope equipment}}{\textit{Annual energy consumption for regulated end uses}} \times 100\%$$

This is used to determine the number of credits according to Table 6.5 on the previous page.

M4: Demonstrating energy efficiency

There are two routes for demonstrating that equipment is energy efficient:

1. Where the equipment is more energy efficient than that of a standard item of equipment (see M4.1).
2. Where the equipment meets specific "deemed to comply" energy efficiency requirements (see M4.2).

Deemed to comply energy efficiency requirements are only provided for some types of equipment.

Where deemed to comply requirements exist, the energy efficiency compared to a standard version of the equipment may still be used to demonstrate compliance for this issue.

M4.1: Demonstrating energy efficiency compared to a standard version of the equipment

A standard version of equipment is defined as having an energy performance that is typical and only has energy efficient features that are common for that type of equipment.

The performance of a standard version of equipment might be determined based on a non-exhaustive search for products of the same type.

To demonstrate that the actual equipment procured is more energy efficient than the standard version of equipment, it must be demonstrated that the energy performance of the actual equipment achieves a meaningful reduction in energy consumption compared to the standard version.

Where technical data on both the actual and standard version of the equipment is readily available, this should be used to calculate the percentage reduction in energy consumption. This calculation, alongside justification for both the selection of the standard product and the acceptance of the achieved percentage reduction over the standard product as meaningful, should be provided in each case to demonstrate that a given item of equipment is energy efficient.

Note: The percentage reduction in energy consumption does not impact the number of credits awarded.

M4.2: Deemed to comply energy efficiency requirements for equipment

Energy labelling and listing schemes that are deemed to comply with the energy efficiency requirements for this issue are listed in Table 6.6 below.

Table 6.6: Deemed to comply requirements for energy labelling and listing schemes

Equipment	Labelling scheme or list	Requirement
All equipment types	ENERGY STAR® (United States Environmental Protection Agency)(1)	Certified
	Energy Technology List (UK Government)(2)	Listed
Fridges	EU Energy Efficiency Labelling Scheme (March 2021)(3)	E or above
	Energy Rating label (Australian Government)(4)	3.5 stars or above
Fridge freezers	EU Energy Efficiency Labelling Scheme (March 2021)	E or above
Freezers	EU Energy Efficiency Labelling Scheme (March 2021)	D rating or above
	Energy Rating label (Australian Government)	3.5 stars or above
Washing machines	EU Energy Efficiency Labelling Scheme (March 2021)	B rating or above
	Energy Rating label (Australian Government)	4 stars or above
Washer dryers	EU Energy Efficiency Labelling Scheme (March 2021)	D rating or above
Tumble dryers	EU Energy Efficiency Labelling Scheme (March 2021)	D rating or above
Room air conditioners	EU Energy Efficiency Labelling Scheme (original)	B or above
Computer monitors	EU Energy Efficiency Labelling Scheme (March 2021)	D rating or above
	Energy Rating label (Australian Government)	6 stars or above

1 https://www.energystar.gov/products

2 https://etl.energysecurity.gov.uk/products

3 https://eprel.ec.europa.eu

4 https://calculator.energyrating.gov.au

Equipment	Labelling scheme or list	Requirement
Dishwashers	EU Energy Efficiency Labelling Scheme (March 2021)	C rating or above
	Energy Rating label (Australian Government)	3.5 stars or above
TVs	EU Energy Efficiency Labelling Scheme (March 2021)	E rating or above
	Energy Rating label (Australian Government)	5 stars or above

M4.3: Other energy labelling schemes and energy efficiency list

Other energy labelling schemes and energy efficiency criteria are recognised where it can be demonstrated by the assessor that the scheme or criteria:

1. Are nationally or regionally recognised.
2. Effectively identify energy efficient products.
3. Are independently managed and operated by governments or other independent bodies.

Where other energy labelling schemes or energy efficiency criteria are used, the assessor must confirm that the labelling scheme or list meets these requirements.

M5: Determining the number of credits achieved

The total annual energy consumption of in-scope equipment is determined based on the estimated energy consumption data entered in the BREEAM Platform, as described in M2.

Where equipment is demonstrated to be energy efficient in accordance with M4 this should be indicated in the BREEAM Platform.

The number of credits achieved is calculated in the BREEAM Platform as follows:

$$\frac{\text{Total annual energy consumption by in-scope equipment that is energy efficient}}{\text{Total annual energy consumption from in-scope equipment}} \times \text{Number of credits available}$$

Compliance notes

Ref	Terms	Description
CN1	Design team lacks relevant specialist knowledge	Where the design team lack the relevant specialist knowledge, calculations and analysis may be carried out by specialist contractors, manufacturers, suppliers, or installers. The assessor must be satisfied that the analysis has been carried out correctly and compliant evidence provided.

Evidence

Criteria	Interim design stage	Final post-construction stage
1	Design drawings, relevant sections of the building specification, equipment schedules or other documentary evidence identifying all proposed in-scope equipment. Where items with low annual energy consumptions have been excluded from the scope due to the cost of replacement, this must be stated and justified.	Final construction drawings or equivalent, assessor site inspection report and photographic evidence or other documentary evidence to verify the in-scope energy using equipment that has been installed. Where items with low annual energy consumptions have been excluded from the scope due to the cost of replacement, this must be stated and justified.
2	Calculations to show the estimated energy consumption for all in-scope equipment.	Updated calculations to account for any changes to the building specification.
3	Where not automatically calculated from Ene 02, supporting data to confirm regulated energy consumption values.	No further actions required post-construction; no additional evidence is required other than that listed for the design stage.

<table>
<tr><th>Criteria</th><th>Interim design stage</th><th>Final post-construction stage</th></tr>
<tr><td>4</td><td>Where compliance demonstrated by comparison to a standard version of the equipment, acceptable evidence sources include:
Written justification for the selection and benchmarking of the standard product based on reasonable assumptions or basic market research.
Specific clauses from reports or manufacturer's literature relating to the energy performance of the actual product.
Specific clauses from reports or manufacturer's literature relating to the energy performance of the standard product.
Plus:
Where available, calculations showing that the actual product is more energy efficient than the standard product. Where a percentage reduction in energy consumption has been accepted as signifying a meaningful reduction in energy efficiency, then this should be stated and justified.
Where this is demonstrated by meeting the deemed to comply energy labelling schemes and lists, acceptable evidence sources include:
Relevant section of the building specification, equipment schedules or contract clauses.
Where products are specified, manufacturer's literature or copy of the energy rating label, indicating the energy labelling scheme and the rating achieved,
AND
In addition to the above, where this is demonstrated by meeting other energy efficient labelling schemes or energy efficiency listings, confirmation that the energy efficient labelling scheme or listing is:
Nationally or regionally recognised.
Effectively identifies energy efficient products.</td><td>Where compliance is demonstrated by comparison to a standard version of the equipment, acceptable evidence sources include:
Manufacturer' literature relating to the energy efficiency of the actual installed equipment.
Final construction drawings/equipment schedules or equivalent, assessor site inspection report and photographic evidence or proof of purchase to verify installed products or equipment.
Plus:
Calculations showing that the actual product is more energy efficiency than the standard product. Where a percentage reduction in energy consumption has been accepted as signifying a meaningful reduction in energy efficiency, then this should be stated and justified.
Where compliance is demonstrated by meeting the deemed to comply energy labelling schemes and lists, acceptable evidence sources include:
Final construction drawings/equipment schedules or equivalent, assessor site inspection report and photographic evidence or proof of purchase to verify installed products or equipment.
Manufacturer's literature or copy of the energy rating label, indicating the energy labelling scheme and the rating
AND
In addition to the above, where this is demonstrated by meeting other energy efficient labelling schemes or energy efficiency listings, confirmation that the energy efficient labelling scheme or listing is:
Nationally or regionally recognised.
Effectively identifies energy efficient products.</td></tr>
</table>

Definitions

Energy using equipment

A standalone item of machinery that can perform its intended function without additional components or controls.

Energy using equipment is assessed in this issue (Ene 05).

Energy using system

Machinery that consists of multiple components that must be connected and configured to perform its intended function.

Energy using systems are assessed in Ene 06.

Regulated energy

Building energy consumption resulting from the specification of fixed building services and fittings, including space heating and cooling, hot water, ventilation, fans, pumps and lighting that are generally controlled through the applicable building regulations and are included in the scope of the Ene 01 assessment.

Unregulated energy

Building energy consumption resulting from building services and fittings that are not generally covered by building regulations and are not included in the scope of the Ene 01 assessment.

Additional information

Worked example of credits available and credits awarded

In-scope equipment are fridges, servers, and computer monitors.

Regulated energy consumption is 7000 kWh per year.

The estimated energy consumption for in-scope equipment is estimated to be:

- Fridges: 700 kWh per year
- Servers: 1400 kWh per year
- Computer monitors: 300 kWh per year

Unregulated energy use/regulated energy use = (2400/7000) × 100 = 34.29% = 4 credits available

Of the in-scope equipment, the fridges and the computer monitors are deemed to be energy efficient, but the servers are not.

% energy consumption for in-scope equipment that meet the requirements = ((700+300)/(700+300+1400)) × 100 = 41.66%

0.4166 × 4 = 1.67 = 2 credits achieved (out of 4 credits available)

Note that this calculation procedure is provided for information only. The credits available and awarded will be determined within the BREEAM Platform based on data entered into the system.

Ene 06 Energy efficient systems

Aim

To recognise and encourage the procurement of energy efficient systems to minimise energy and carbon emissions in operation.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	up to 9	None	All (see ref 3.0)
Shell and core	up to 9	None	All (see ref 3.0)
Shell only	0	None	Not applicable

Assessment type specific notes

Ref	Assessment type specific note
-	None

Building type specific notes

Ref	Building type specific note
-	None

Issue specific notes

Ref	Issue specific note
3.0	This issue is filtered out where there are no “in-scope” systems present.

Assessment criteria

Up to nine credits – Energy efficient systems

1 Identify systems in the project specification (in-scope systems) that are users of unregulated energy (see M1).

2 Estimate the expected annual energy consumption by in-scope systems identified in criterion 1 (see M2).

3 Determine the ratio of in-scope unregulated energy used by systems to regulated energy use to determine the number of credits available (see Table 6.7 below and M3).

Table 6.7: Credits available

In-scope unregulated energy using systems / regulated energy use	Credits available
No in-scope equipment OR Energy consumption of in-scope systems is not significant	Issue filtered out
< 10%	1
≥ 10-20%	2
≥ 20-30%	3
≥ 30-40%	4
≥ 40-50%	5

In-scope unregulated energy using systems / regulated energy use	Credits available
≥ 50-60%	6
≥ 60-70%	7
≥ 70-80%	8
≥ 80%	9

4 Determine in-scope systems that are energy efficient (see M4).

> The number of credits awarded is proportional to the percentage of energy use by in-scope systems that uses efficient systems as follows:
>
> Number of credits = (% in-scope systems that are energy efficient × number of credits available) rounded to the nearest whole number.

Methodology

M1: Identifying in-scope unregulated energy using systems

Systems included in the project specification are considered to be in-scope unless one or more of the following conditions apply:

1. They are part of an industrial process.
2. They provide temporary services e.g., external lighting for theatrical, stage, and local display installations.
3. They are only used when maintenance work is being carried out.
4. They are only used in an emergency.
5. There are overriding safety, security or accessibility requirements that prevent energy efficiency criteria being met by any relevant compliance routes.
6. Existing systems are used in place of new systems (due to the reduction in embodied carbon).

Energy using systems **may** be excluded from the assessment where the additional cost of procuring energy efficient system is expected to exceed the cost savings from reduced energy consumption over the lifetime of the system. This is more likely to be the case for systems with low annual energy consumption.

M2: Estimating energy use by in-scope systems

Where annual operational energy consumption has been calculated in accordance with Ene 02, the annual energy uses for in-scope systems should be based on data inputs for prediction modelling, otherwise, energy consumption estimates may be derived from simple energy modelling results (including NCM calculations), benchmarks, data for similar projects, engineering calculations (see equation below), or other appropriate estimation methods.

$$\text{kWh per year} = \text{kW rating} \times \text{Load factor} \times \text{Annual use hours}$$

where:

kW rating = Maximum power consumption of the system.

Load factor = Average power consumption when the system is in use/kW rating.

The estimated annual energy consumption for each type of in-scope system must be entered into the BREEAM Platform.

At the pre-assessment stage the number of credits available may be estimated by entering a rough estimate for energy consumption for all in-scope systems but will need to be replaced by energy estimates for each in-scope system before the assessment is submitted.

M3: Determining the number of credits available

The methodology for calculating the annual energy consumption for in-scope energy using systems is described in M2.

Where operational energy consumption has been predicted for Ene 02, the regulated energy consumption should be derived from the central case modelling outputs. Otherwise, regulated energy consumption derived from other energy modelling results (including NCM calculations), data for similar projects, or benchmarks may be used. In all cases the annual regulated energy consumption must be entered into the BREEAM Platform and is used to determine the ratio of in-scope equipment to regulated energy use as follows:

$$\frac{Annual\ energy\ consumption\ for\ in{-}scope\ systems}{Annual\ energy\ consumption\ for\ regulated\ end\ uses} \times 100\%$$

This is used to determine the number of credits available according to Table 6.7 on page 188.

M4: Demonstrating energy efficiency

There are two routes for demonstrating that a system is energy efficient:

1. Where the system is more energy efficient than that of a standard version of the system (see M4.1).
2. Where the systems meet specific "deemed to comply" energy efficiency requirements (see M4.2).

Deemed to comply energy efficiency requirements are only provided for some types of systems.

Where deemed to comply requirements exist, the energy efficiency compared to a standard version of the system may still be used to demonstrate compliance for this issue.

M4.1: Demonstrating energy efficiency compared to a standard version of the system

A standard system is defined as being a system that:

1. Has energy using components with energy efficiency levels that are typical for the component types.
2. Has not been designed to optimise energy consumption.
3. Has only energy efficient features and controls that are typical for the system type.

The performance of a standard version of a system might be determined based on a non-exhaustive search for systems of the same type.

To demonstrate that the actual version of the system procured is more energy efficient than a standard version of the system, it must be demonstrated that the energy performance of the actual system achieves a meaningful reduction in energy consumption compared to a standard version.

Where technical data on both the actual and standard version of the system is readily available, this should be used to calculate the percentage reduction in energy consumption. This calculation, alongside justification for both the selection of the standard product and the acceptance of the achieved percentage reduction over the standard product as meaningful, should be provided in each case to demonstrate that a given system is energy efficient.

Note: The percentage reduction in energy consumption does not impact the number of credits awarded.

M4.2: Deemed to comply energy efficiency requirements for systems

This is an alternative compliance route that is available for the following types of system:

- External lighting
- Cold storage
- Lifts and escalators
- Swimming pools
- Commercial laundries
- Cooling systems in server rooms

These system types do not have to meet the deemed to comply requirements and, may instead demonstrate that the actual system is more energy efficient than a standard version of the system (see M4.1).

M4.2.1: External lighting systems

The deemed to comply requirements for external lighting systems are set out in Table 6.8 on the next page.

Table 6.8: Deemed to comply requirements for external lighting systems

Ref	Requirements for external lighting systems
1	The average initial luminous efficacy across all in-scope external lighting systems within the construction zone achieves ≥ 70 luminaire lumens per circuit watt.
2	All external light fittings are automatically controlled to prevent operation during daylight hours and are fitted with presence detection in areas of intermittent pedestrian traffic.

Average initial luminous efficacy is calculated as the individual luminous fluxes of all luminaires within the construction zone summed (in lumens), then divided by the total circuit watts for all the luminaires.

The luminous flux of a luminaire is calculated as follows:

$$\frac{\sum_{all\ luminares}(Luminous\ flux\ lamp \times Light\ output\ ratio\ luminare)}{\sum_{all\ luminares} Total\ circuit\ watts}$$

Note: LED lighting typically has integral luminaires.

M4.2.2: Cold storage systems

M4.2.2.1: Scope of cold storage systems

This covers freezer or cold storage rooms which are integral to the building and includes cooling systems that require commissioning and optimisation for the specific requirements of the cold storage space. This applies whether the cold storage space has a dedicated cooling system serving this space, or one which is connected to wider building cooling services.

Commercial-sized, but self-contained, off-the-shelf cold storage system units such as large freezers, fridges, or stand-alone self-contained walk-in cold storage units that are manufactured as a self-contained product, and contain their own integral cooling systems, that operate according to manufacturer pre-sets, and do not require commissioning of the cooling system should be assessed under Ene 05 Energy efficient equipment.

M4.2.2.2: Deemed to comply requirements for cold storage systems

The deemed to comply requirements for cold storage systems are set out in Table 6.9 below.

All relevant requirements must be met for the system to be deemed energy efficient.

Table 6.9: Deemed to comply requirements for cold storage systems

Ref	Requirements for cold storage systems
1	**Energy efficient components** Where the following components are included, they must meet with the requirements of independent external labelling or listing criteria: 1. Air-cooled condensing units 2. Cellar cooling system 3. Evaporative condensers 4. Packaged chillers 5. Refrigeration compressors 6. Refrigeration system controls. Note: The energy technology list sets out energy efficiency criteria for these components (etl.energysecurity.gov.uk/products/refrigeration-equipment).
2	**Designed to minimise heat loss** Demonstrate the following: — High levels of insulation — Reduced air infiltration
3	**Controls to optimize temperature, humidity, and airflow management** This can be achieved by installing central automatic controls that include anti-tamper controls, automatic lighting controls, fixed set-point temperature and temperature dead bands.
4	**System will undergo commissioning and testing** The refrigeration system has been commissioned in compliance with criterion 7 in Man 04 Commissioning and handover. This does not require the 'Commissioning' credit to be awarded.

Ref	Requirements for cold storage systems
	Note: Documentation of the test and commissioning procedures relevant to the installation, such as pressure testing, leakage testing and validation to specification must be provided.

M4.2.3: Lifts and escalators

M4.2.3.1: Scope of lifts and escalator

This compliance route may be used for any lifting device with a rated speed > 0.15 m/s, inclusive of goods lifts, vehicle lifts, and passenger lifts.

M4.2.3.2: Deemed to comply requirements for lift and escalators

The deemed to requirements for lifts and escalators set out in Table 6.10 below.

All relevant requirements must be met for the system to be deemed energy efficient.

Table 6.10: Deemed to comply requirements for lifts and escalators

Ref	Requirements for lifts and escalators
1	The number and size of lifts, escalators or moving walkways that are needed to meet the expected transport demand and usage patterns has been determined and minimised.
2a	For lifts, the energy consumption for a standard system and the actual system have been estimated in accordance with ISO 25745 Energy performance of lifts, escalators and moving walks: Part 2: Energy calculation and classification for lifts (elevators)
2b	For escalators and moving walkways, the energy consumption for a standard system and the actual system have been estimated in accordance with ISO 25745 Energy performance of lifts, escalators and moving walks: Part 3: Energy calculation and classification for escalators and moving walks.
3a	The lifts have achieved energy efficiency class A under ISO 25745. OR The following measures are incorporated into the lifts where applicable: 1. Regenerative drives. 2. The lifts operate in a standby condition when the lift has been idle for a prescribed length of time. 3. All lift car lighting, digital signage, and electronic displays have an efficiency of ≥ 70 lamp lumens per circuit watt. 4. Drive controllers capable of variable speed, variable-voltage, and variable-frequency (VVVF) control of the drive motor or, other type of drive providing equivalent optimal energy efficiency.
3b	The escalators or moving walkways have achieved energy efficiency class A+++ under ISO 25745. OR The following measures are incorporated into the escalators or moving walkways where applicable: 1. Load sensing devices that synchronise motor output to passenger demand through a variable speed drive, with an inverter operating full-time to moderate output based on passenger demand. OR 2. Passenger sensing devices for automated operation (auto walk), so the escalator operates in standby mode when there is no passenger demand.
4	When following the “measures” route for 3a or 3b, a suitably qualified member of the project team must confirm the measures have been included in the specification or justify why they are not applicable. For example, because it not technically feasible, or because the additional cost or impact on embodied carbon is unlikely to pay back over the lifetime of the system.

M4.2.4: Swimming pools

The deemed to requirements for swimming pools are set out in Table 6.11 below.

All relevant requirements must be met for the system to be deemed energy efficient.

Table 6.11: Deemed to comply requirements for swimming pools

Ref	Requirements for swimming pools
1	Pool pumps must have variable speed drives.
2	Pool heating systems must be energy efficient, for example using heat pumps or heat from on-site renewable energy sources.
3	Automatic or semi-automatic pool covers, or 'liquid' pool covers with an automatic dosing system, are fitted to

Ref	Requirements for swimming pools
	entire pool surface area for ALL pools, including spa pools and hot tubs (if relevant).
4	The air temperature in the pool hall can be controlled so that it is 1°C above the water temperature.

M4.2.5: Commercial laundries

The deemed to comply requirements for commercial laundries which include commercial sized appliances are set out in Table 6.12 below.

All relevant requirements must be met for the system to be deemed energy efficient.

Table 6.12: Deemed to comply requirements for commercial laundries

Ref	Requirements for commercial laundries
1	Heat recovery from waste-water is fitted to all appliances.
2	Greywater is used for part of the washing process. This may be recycled from the final rinse and used for the next pre-wash.

M4.2.6: Cooling systems in server rooms

The deemed to comply requirements for cooling servers in server rooms are set in Table 6.13 below.

All relevant requirements must be met for the system to be deemed energy efficient.

Table 6.13: Deemed to comply requirements for cooling systems in server rooms

Ref	Requirements for cooling systems in server rooms
1	Cooling is provided by natural or forced ventilation. Active cooling may only be used when the internal temperature cooling in server rooms is designed to meet the widest allowable operating conditions as defined in the ASHRAE temperature classes (or local / national equivalent) to minimise cooling loads. These operating conditions must consider the type of servers which will be installed, and how they will be operated. A suitably qualified specialist justifies the operating conditions which are the most suitable.
2	There is a mechanism to achieve automatic power down of systems when not in use, including overnight.

M5: Determining the number of credits achieved

The total annual energy consumption of in-scope systems is determined based on the estimated energy consumption data entered in the BREEAM Platform, as described in M2.

Where systems are demonstrated to be energy efficient in accordance with M4 this should be indicated in the BREEAM Platform.

The number of credits achieved is calculated in the BREEAM Platform as follows:

$$\frac{\text{Total annual energy consumption by in-scope systems that are energy efficient}}{\text{Total annual energy consumption from in-scope systems}} \times \text{Number of credits available}$$

Compliance notes

Ref	Terms	Description
CN1	Design team lacks relevant specialist knowledge	Where the design team lack the relevant specialist knowledge, calculations and analysis may be carried out by specialist contractors, manufacturers, suppliers, or installers. The assessor must be satisfied that the analysis has been carried out correctly and compliant evidence is provided.

Evidence

<table>
<tr><th>Criteria</th><th>Interim design stage</th><th>Final post-construction stage</th></tr>
<tr><td>1</td><td>Documentation or correspondence identifying the unregulated energy using systems that are included within the project specification.

Where systems with low annual energy consumptions have been excluded from the scope due to the cost of replacement, this must be stated and justified.</td><td>Final construction drawings or equivalent, assessor site inspection report and photographic evidence or other documentary evidence to verify the unregulated energy using systems that have been installed.

Where systems with low annual energy consumptions have been excluded from the scope due to the cost of replacement, this must be stated and justified.</td></tr>
<tr><td>2</td><td>Calculations to show the estimated energy consumption by each in-scope system.</td><td>Updated calculations to account for any changes to the building specification.</td></tr>
<tr><td>3</td><td>Where not automatically calculated from Ene 02, supporting data to confirm regulated energy consumption values.</td><td>No further actions required post-construction; no additional evidence is required other than that listed for the design stage.</td></tr>
<tr><td rowspan="3">4</td><td>Where compliance is demonstrated by comparison to a standard version of the system acceptable evidence sources include:
— Written justification for the selection and benchmarking of the standard product based on reasonable assumptions or basic market research.
— Specific clauses from reports or manufacturer literature relating to the energy efficiency of the specified actual system
— Design drawings.
— Specific clauses from reports or manufacturer's literature relating to the energy performance of the standard product.

Plus:
— Calculations showing that the actual system is more energy efficiency than a standard system. Where a percentage reduction in energy consumption has been accepted as signifying a meaningful reduction in energy consumption, then this should be stated and justified.

Where this is demonstrated by meeting the deemed to comply route as set out within M4.2, acceptable evidence sources are listed for each system type in the following rows.</td><td>Where compliance is demonstrated by comparison to a standard version of the system acceptable evidence sources include:
— Manufacturer's literature relating to the energy efficiency of the actual installed system.
— Final construction drawings or equivalent, Assessor site inspection report and photographic evidence or proof of purchase to verify installed products or systems.

Plus:
— Calculations showing that the actual system is more energy efficiency than a standard system.

Where a percentage reduction in energy consumption has been accepted as signifying a meaningful reduction in energy consumption, then this should be stated and justified.
Where this is demonstrated by meeting the deemed to comply route as set out within M4.2, acceptable evidence sources are listed for each system type in the following rows.</td></tr>
<tr><td colspan="2">External lighting</td></tr>
<tr><td>Relevant section of the building specification or contract clauses.
OR
Where available, design drawings such as external lighting layout or luminaire schedules.</td><td>Assessor site inspection report and photographic evidence.

Final construction or equivalent external lighting layout drawings or luminaire schedules.</td></tr>
</table>

Criteria	Interim design stage	Final post-construction stage
	Where products are specified, manufacturer's literature for the proposed luminaires and calculations to show average initial luminous efficacy.	Manufacturer's literature for the installed luminaires and calculations to show average initial luminous efficacy.
	Cold storage	
	Design drawings, relevant section of the building specification or contract clauses. Where specific systems are specified: Evidence of the ETL listing for the specific product or evidence to show they are on equivalent list.	Final construction drawings or equivalent and assessor site inspection report and photographic evidence. Evidence of the ETL listing for the specific product or evidence to show they are on equivalent list. Refrigeration plant commissioning record.
	Lifts and escalators	
	Transport analysis. Energy consumption calculations. Relevant section of the building specification or contract clauses confirming energy efficient measures. Where specified, manufacturer's product specifications.	Final construction drawings or equivalent and assessor site inspection report and photographic evidence. Manufacturer's product data.
	Swimming pools	
	Relevant section of the building specification or contract clauses. Where products are specified, manufacturer's product data.	Final construction drawings or equivalent and assessor site inspection report and photographic evidence. Manufacturer's product data. Confirmation of room and pool temperatures.
	Commercial laundries	
	Relevant section of the building specification or contract clauses. Where products are specified, manufacturer's product data.	Final construction drawings or equivalent and assessor site inspection report and photographic evidence confirming installed systems. Manufacturer's technical data on the installed systems to demonstrate they are compliant.
	Cooling systems in server rooms	
	Relevant section of the building specification or contract clauses. Confirmation from a suitably qualified specialist of the most suitable operating conditions.	Final construction drawings or equivalent and technical data on the installed systems to demonstrate they are compliant.

Definitions

Energy using equipment

A standalone item of machinery that can perform its intended function without additional components or controls.

Energy using equipment is assessed in Ene 05.

Energy using system

Machinery that consists of multiple components that must be connected and configured to perform its intended function.

Energy using systems are assessed in this issue (Ene 06).

Regulated energy

Building energy consumption resulting from the specification of fixed building services and fittings, including space heating and cooling, hot water, ventilation, fans, pumps and lighting that are generally controlled through the applicable building regulations and are included in the scope of the Ene 01 assessment.

Unregulated energy

Building energy consumption resulting from building services and fittings that are not generally covered by building regulations and are not included in the scope of the Ene 01 assessments.

Additional information

Worked example of credits available and credits awarded

In-scope systems are a commercial scale laundry, a swimming pool, and lifts.

Regulated energy consumption is 110 MWh per year.

The estimated energy consumption for in-scope systems is estimated to be:

— Commercial scale laundry: 3 MWh per year

— Swimming pool: 20 MWh per year

— Lifts: 15 MWh per year

Unregulated energy use/regulated energy use = (38/110) × 100 = 34.54% = 4 credits available

The swimming pool and the commercial scale laundry meet the energy efficiency system requirements, but the lifts do not.

% energy consumption for in-scope systems that meet the requirements = ((3+20)/(3+20+15)) × 100 = 60.52%

0.6052 × 4 = 2.42 = 2 credits achieved (out of 4 credits available)

Note that this calculation procedure is provided for information only. The credits available and awarded will be determined within the BREEAM Platform based on data entered into the system.

Exclusion of laboratory systems from this issue

Laboratory systems are classed as industrial processes and are no longer included for BREEAM New Construction assessments.

Ene 07 Flexible demand response

Aim

This issue recognises installed electrical building systems which have the capability to automatically modify their electricity consumption patterns in response to signals from the electricity supplier. This allows consumption patterns to be aligned with the availability of renewable energy and so reduce carbon emissions from grid supply electricity.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	2	None	All
Shell and core	2	None	All
Shell only	0	None	Not applicable

Assessment type specific notes

Ref	Assessment type specific note
-	None

Building type specific notes

Ref	Building type specific note
-	None

Assessment criteria

Up to two credits – Flexible demand response

1 Identify installed systems present on-site and their flexible demand response capability.

2 The number of credits awarded is based on the number of credits available and the percentage of flexible demand response points awarded (see Table 6.14).

Table 6.14: Number of credits awarded

Points awarded	1 credit available	2 credits available
≥ 1% of available points	1 credit awarded	1 credit awarded
> 33% of available points	1 credit awarded	2 credits awarded

Methodology

M1: Flexible demand response

The number credits available is determined by the number of flexible demand response points available (see Table 6.15).

Table 6.15: Number of credits available

Number of flexible demand response points available	Number of credits available
0	0
1–3	1
> 3	2

The percentage of flexible demand response points awarded is calculated as follows:

$$\frac{\mathit{Number\ of\ flexible\ demand\ response\ points\ awarded}}{\mathit{Number\ of\ flexible\ demand\ response\ points\ available}} \times 100$$

where:

The number of flexible demand response points available is determined by the electrical systems that are present in the building (see Table 6.16).

The number of points awarded is determined by the flexible demand response capability of each system (see Table 6.16).

Table 6.16: Flexible demand side response points available and points awarded

Systems present	Points available	Flexible demand capability	Points awarded
Electric space heating	1	Operation can be optimised based on signals from the electricity supplier or local renewable sources.	1
Electric space cooling	1	Operation can be optimised based on signals from the electricity supplier or local renewable sources.	1
Electric domestic hot water	1	Operation can be optimised based on signals from the electricity supplier or local renewable sources.	1
Electric vehicle charging points	2	Charging with **one-way control** based on signals from the electricity supplier or local renewable sources.	1
		Charging with **two-way control** based on signals from the electricity supplier or local renewable sources.	2
Other systems or equipment with flexible demand capability	3	Present	1
		The battery energy storage system is capable of charging based on signals from the electricity supplier or local renewable sources.	1
		The battery energy storage system is capable of feeding electricity back into the grid.	1

The types of electrical systems present in the building and their flexible demand response capabilities must be entered in the BREEAM Platform. This will automatically calculate the number of points available and awarded and hence the number of credits available and awarded.

Example calculation

A building has the following electrical systems installed.

— Electric space heating system – 1 point available

— Electric domestic hot water – 1 point available

— Electric vehicle charging point – 2 points available

The only electrical system with flexible demand capability is the vehicle charging point which has one-way control so according to Table 6.16 1 flexible demand response point is awarded.

This means 4 flexible demand response points are available so according to Table 6.15 which means 2 credits are available.

According to Table 6.16 vehicle charging points with one-way control is worth 1 flexible demand response point.

The building therefore achieves 1 out of 4 available points which equates to 25%. In accordance with Table 6.14 this means that one of the two available credits is achieved.

Compliance notes

Ref	Terms	Description
CN1	Single building assessments on larger developments or campuses (and extensions to existing buildings)	Where the building being assessed forms part of a larger development (or is an extension to an existing building) containing common areas and other buildings, the scope of the flexible demand side response criteria applies only to new and existing elements within the construction zone of the assessed building.

Evidence

Criteria	Interim design stage	Final post-construction stage
All	Design drawings, relevant section or clauses of the building specification or contract. Where products are specified, manufacturer's product details, confirming the flexible demand capability of specified systems.	Final construction drawings or equivalent or assessor site inspection report and photographic evidence showing installed systems. Manufacturer's technical data confirming the flexible demand capability of the installed systems.

Definitions

None.

Additional information

None.

Ene 08 Installed controls

Aim

To encourage the installation of controls that facilitate energy efficient operation of HVAC systems in use.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	2	None	All (see ref 3.0 and 3.1)
Shell and core	2	None	All (see ref 3.0 and 3.1)
Shell only	0	None	Not applicable

Assessment type specific notes

Ref	Assessment type specific note
-	None

Building type specific notes

Ref	Building type specific note
-	None

Issue specific notes

Ref	Issue specific note
3.0	This issue will be filtered out for buildings which have no space heating, no space cooling and no mechanical ventilation.
3.1	This issue may be filtered out where the building has separate local building services for space heating, space cooling and/or mechanical ventilation AND where the occupants or an onsite facilities manager will be able to effectively control HVAC systems manually.

Assessment criteria

Up to two credits – Installed controls

1 Determine the number of installed controls points available based on the installed HVAC services and relevant system details.

2 Determine the number of installed controls points achieved based on the functionality of the controls.

3 The number of credits awarded is determined by the proportion of available installed controls points that are achieved (see Table 6.17 below and M1).

Table 6.17: Credits for installed controls

Percentage of available installed control points achieved	Number of credits
< 33%	0
≥ 33%	1
≥ 66%	2

Methodology

M1: Installed controls

Identify which of the building services are present in the building from space heating, space cooling, and mechanical ventilation.

Where the building has no systems that provide space heating or space cooling or centralised mechanical ventilation this issue will be filtered out.

For each building service present identify system characteristics to determine the number of installed control points available.

Where different HVAC systems provide the same buildings service to different areas of the building, the characteristics for the system that serves the highest proportion of the building's floor area must be assessed.

Back-up servicing systems that are only used when the main servicing systems are out of action are not considered under this issue.

Identify the functionality of installed controls that are relevant for the installed system to determine the number of installed control points awarded.

Where the system has more than one of the listed control functionalities, select the option that achieves the most points.

The number of credits awarded is determined by the percentage of available points that are achieved which is calculated as follows:

$$\frac{\textit{Number of installed control points achieved}}{\textit{Number of installed control points available}} \times 100$$

The number of points available and awarded are calculated within the BREEAM Platform based on the answers to questions about the installed HVAC system(s) and functionality of the installed controls as shown in Table 6.18, Table 6.19, and Table 6.20.

Table 6.18: Installed controls (space heating systems) – points available and awarded

Building service	System type	Points available	Control type	Control functionality	Points awarded
Space heating	Any	4	Room level heating output – all heat generators	Heating output controlled at the room/zone level	1
				Heating output controlled at the room/zone level with communication between the room controllers and the building control system and or occupancy detection	2
			AND		
			Heat generator output – heat pumps	Variable control (e.g., hot gas bypass, inverter frequency control)	1
				Variable control (e.g., hot gas bypass, inverter frequency control)	2
			OR		
			Heat generator output – other types of heat generator	Outside temperature sensor	1
				Load, for example supply water temperature set point	2
	Systems with a heat distribution medium (e.g., air or water)	3	Heat distribution temperature	Outside temperature sensor	1
				Indoor temperature sensor	2
			Variable speed control of pumps and/or	Present	1

Building service	System type	Points available	Control type	Control functionality	Points awarded
			fans		
	Systems with more than one heat generator	2	Sequencing of heat generators	Generators operate in a fixed priority order	1
				Generators operate in a dynamic priority order	2

Table 6.19: Installed controls (space cooling systems) – points available and awarded

Building service	System type	Points available	Control type	Control functionality	Points awarded
Space cooling	Any	2	Room level cooling output	Cooling output controlled at the room/zone level	1
				Cooling output controlled at the room/zone level with communication between the room controllers and the building control system and or occupancy detection	2
		2	Cooling generator output	Multi-stage control (e.g., several on/off compressors)	1
				Variable control (e.g., hot gas bypass, inverter frequency control)	2
	Systems with a coolth distribution medium (e.g., air or water)	3	Cooling distribution temperature	Outside temperature sensor	1
				Cooling demand sensor	2
			Variable speed control of pumps and/or fans	Present	1
	Systems with more than one generation	2	Sequencing of cooling generators	Fixed priority order	1
				Dynamic priority order	2
	Systems that supply both heating and cooling	2	Interlock controls	Partial interlock	1
				Full interlock	2

Table 6.20: Installed controls (mechanical ventilation systems) – points available and awarded

Building service	System type	Points available	Control type	Control functionality	Points awarded
Mechanical ventilation	Any	5	Control of ventilation output at room level	Air flow controlled by occupancy detection	1
				Air flow controlled centrally based on air quality sensors	2
				Local air flow control based on air quality sensors	3
			Control of air handling unit output	Multistage controller	1
				Automatic flow or pressure control where load depends on the air flow demand for all connected rooms	2
	Systems in buildings with	2	Heat recovery	Heat recovery controlled by sensors in the exhaust air	1

Building service	System type	Points available	Control type	Control functionality	Points awarded
	space heating			Heat recovery controlled by multiple room temperature sensors or predictive control	2
	Systems in buildings with cooling	2	Free cooling	Air flows always modulated to minimise mechanical cooling	1
				Air flow modulated to minimise mechanical cooling based on temperature and humidity	2

Compliance notes

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
All	Relevant section or clauses of the building specification, contract or drawings confirming the HVAC systems and installed controls specified to support the answers entered within the BREEAM Platform.	Final construction drawings or equivalent, assessor site inspection report and photographic evidence, technical data sheets, invoices or other robust post-construction documentation confirming the installed HVAC systems and control functionality to support the answers entered within the BREEAM Platform.

Definitions

Air handling unit (AHU)

Air handling units are used to distribute conditioned air around the building via ductwork. They usually contain filters to clean the air and heating and/or cooling coils to control the air temperature.

Free cooling

The use of low temperature outside air to reduce the indoor air temperature to reduce the demand for mechanical cooling.

Heat recovery

A mechanical ventilation system that is fitted with a heat exchanger. The heat exchanger extracts heat from exhaust air and uses it to preheat incoming air to reduce the demand for heating.

Interlock control

A control that switches off the heating generator, and any associated pumps, when there is no demand for heating and switches off the cooling generator, and any associated pumps, when there is no demand for cooling.

Partial interlock

Heating and cooling interlock controls are separate but can be set up to minimise the possibility of simultaneous heating and cooling.

Total interlock

Heating and cooling interlock control is connected so that simultaneous supply of heating and cooling is not possible.

Additional information

None.

Transport

Summary

This category encourages provision of and improved access to local amenities and to sustainable means of transport, i.e. public transport and other alternative transport solutions for building users. The aim is to reward locations and solutions that support reductions in car journeys and, therefore, congestion and CO_2 emissions over the life of the building.

Assessment issues

Tra 01 Transport assessment and travel plan	2 credits
Tra 02 Sustainable transport measures	10 credits

Tra 01 Transport assessment and travel plan

Aim

To enhance awareness of existing local transport and identify opportunities for sustainable transport improvements.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	2	None	All
Shell and core	2	None	All
Shell only	2	None	All

Assessment type specific notes

Ref	Assessment type specific note
-	None

Building type specific notes

Ref	Building type specific note
-	None

Assessment criteria

Two credits – Transport assessment and travel plan

1 Conduct a site-specific transport assessment by the end of the Concept Design stage; see M1.

2 Develop a site-specific travel plan following the transport assessment recommendations by the end of the Concept Design stage; see M3.

3 Demonstrate that the travel plan can guide the appropriate implementation of sustainable transport measures during the design, construction, and occupancy stages and be supported by the building's management during operation.

Methodology

M1: Transport assessment

Compliance with criterion 1 can be achieved by either a transport assessment or a transport statement, depending on the expected impact of the proposed development:

a. **Transport assessment:** a comprehensive evaluation is required where the proposed development is expected to impact the transport network significantly.

b. **Transport statement:** a less detailed report suitable when the development is expected to have limited impact and will implement minimal sustainable transport measures from Tra 02.

The transport assessment or statement must cover the following elements as a minimum:

1. **Development description:** An overview of the proposed development, including its size, type, location, and intended use.
2. **Existing transport infrastructure:** An analysis of current transport infrastructure and services to identify relevant constraints and opportunities. This must include the travel patterns of existing building users in relation to:
    a. Walking infrastructure: sidewalks, paths and crossings
    b. Cycle infrastructure: cycling lanes and cycle parking
    c. Public transport: the site's connectivity to public transport services
3. **Inclusive design:** Evaluation of transport infrastructure for people with disabilities, such as mobility, visual, and age-related requirements.
4. **Accessible amenities:** The number and type of existing accessible amenities within 500 m of the site. The distance to an amenity must be measured via a safe pedestrian route from the main building entrance. See Definitions and Table 7.1.
5. **Public Transport Accessibility Index (PTAI):** Calculate the existing PTAI, see M2.
6. **Future travel patterns:** Predicted travel patterns and transport impacts of future building or site users.
7. **Stakeholder engagement:** Consultation with local authorities, building users, and the surrounding community to ensure the travel plan aligns with local needs.

When certain elements may not be applicable or relevant, a brief justification can be provided for each consideration, explaining why it is not relevant to the project's scope or scale.

For further guidance on transport assessment and travel plans, it is essential to consult the relevant local transportation authorities, as regulations and guidelines can vary at national, regional, and local levels.

Table 7.1: Amenities in proximity to the site

Amenities
Appropriate food outlet
Access to an ATM (cash)
Access to a suitable outdoor open space
Access to a recreation or leisure facility for fitness or sports
Publicly available postal facility
Community facility
Dispensing pharmacy
Public sector doctor's surgery or general medical centre
Childcare facility or school

M2: Public Transport Accessibility Index (PTAI)

The Public Transport Accessibility Index (PTAI) is calculated as part of the transport assessment. Its value relates to the site location and informs transport-related design decisions. The PTAI must be based on current information, including any planned and publicly notified changes during the transport assessment, and should be used as the benchmark for the assessment.

Where unforeseen changes to public transport availability are later implemented before post-construction certification, the PTAI should not be updated at the post-construction stage.

M2.1: Calculating the PTAI

Enter the following information into the BREEAM Platform to determine the PTAI of the assessed building:

1. Public transport type (bus, rail, tube/metro, tram, other services).
2. Distance (m) from the main building entrance to each compliant public transport node.
3. Average number of services per hour at each node during the building's operating hours.

Compliant public transport node criteria:

a. A bus stop within 650 m or a railway station (or other transport service) within 1000 m of the main entrance, measured via a safe pedestrian route.

b. The service must connect to an urban centre, major transport node, or community focal point (e.g., school, library, doctor's surgery).

c. Only local services are assessed; national services are excluded unless they function as local commuter routes.

d. For prisons and military sites: The distance requirement is 1000 m for both bus and rail.

M2.2: Calculating the average number of services for PTAI

Follow the steps below to calculate the average number of services:

1. For each public transport node (e.g., bus stop, train station), count the total number of services stopping during the identified operating hours.
2. Determine the building's operating hours: Identify the building's peak arrival and departure times or its typical daily operating hours (e.g., 08:00–19:00, a total of 11 hours). If the building operates 24/7 or the hours are unknown, use Table 7.2 below.
3. Calculate the average number of services per hour: Divide the total number of stopping services by the total operating hours.
4. Repeat this calculation for each public transport node associated with the assessment project

Example calculation

— Operating hours: 08:00–19:00 (11 hours)

— Stopping services: 35 services during this period

— Average services per hour: 35/11 = 3.2 services per hour

Table 7.2: Default hours of operation by building type for a typical day

Building type	Default hours
Education: Preschool, school, sixth form college	07:30–10:00, 15:00–17:30
Education: Further education and higher education institutions	08:00–19:00
Healthcare	07:00–20:00 (encompassing visiting hours and the typical daytime shift pattern)
Retail: Shopping centre	09:00–19:00
Retail: Supermarket	08:00–22:00
Retail: Retail services	08:00–18:00
Retail: Convenience store	07:00–22:00
Retail: Retail park or warehouse	08:00–20:00
Retail: Retail store	08:30–17:30
Residential	08:00–19:00
Government services: Law court	08:00–19:00
Prison	07:00–20:00 (encompassing visiting hours and the typical daytime shift pattern)
Other	08:00–19:00 *Or use any of the above hours, as appropriate to the building type.*
24-hour building	07:00–20:00

M2.3: On-demand public bus services

Demand-based bus services operated by public transport providers can be included in the PTAI calculation. The project team must determine an average number of stops per hour to allow input into the BREEAM Platform.

These can be recognised as follows:

- The location of the transport node should be determined as the nearest available pick-up point to the assessed building.
- The frequency of the service should be considered as the published maximum wait time (or actual average wait time if the service is established and this data is available).
- Such services, while serving multiple destinations, should be considered as a single route.
- It must be demonstrated that information on the availability and how to access the service is made available to building users.

This is limited to genuine on-demand bus services, which are operated as public transport with multiple pick-up and drop-off points. It does not extend to private hire, taxis, or other similar operations.

M2.4: Multiple services

Services that operate from more than one node within proximity of the building must be considered only once, at the node closest to the building. Different services at the same node count as separate services.

M2.5: Bi-directional routes

Routes may be bi-directional; however, for the purpose of calculating the index, consider only the direction with the highest frequency.

M3: Travel plan measures

A travel plan should demonstrate how the transport assessment has influenced its development, outlining the specific required outcomes, targets, and measures while setting out plans for future monitoring and management. It guides the implementation of sustainable transport measures during the design, construction, and occupancy stages. It is also intended to be a live document adopted by building management to support an ongoing sustainable transport strategy.

Measures to consider
When developing the travel plan, consider the following measures as a minimum:

1. Engaging with local authorities, building users, and the surrounding community to ensure the travel plan aligns with local needs.
2. Considering all types of users, ensuring equitable access and inclusivity.
3. Negotiating with public transport companies to increase the local service for the development.
4. Providing a public transport information system in a publicly accessible area.
5. Providing electric vehicle charging infrastructure.
6. Providing priority parking spaces for car sharers.
7. Designating priority parking spaces for individuals with disabilities.
8. Reducing parking spaces or implementing parking charges.
9. Consulting with the local authority on the state of, and improvements to, the local cycling network.
10. Providing a pedestrian and cyclist-friendly environment. This includes providing:
    a. Cycle lanes.
    b. Safe crossing points.
    c. Direct routes.
    d. Appropriate tactile surfaces.
    e. Landscaping and shelter for public transport waiting areas.
    f. Good lighting, signposting to other amenities, public transport nodes, and adjoining off-site pedestrian and cycle routes.
11. Providing dedicated and convenient cycle storage.
12. Providing cyclists' facilities.
13. Identifying existing amenities and assessing potential enhancements.
14. Providing suitable taxi drop-off or waiting areas.
15. Ensuring rural buildings have appropriate access to transport to serve the local community adequately.

Consider the following scenarios regarding the building occupiers:

Building occupier is known

- Confirm that the building occupier has been actively involved in developing the travel plan.
- Ensure that the building owner agrees to implement the travel plan to support their transport strategy.

Building occupier is unknown

- A travel plan is still required, even if the end-user or occupier is unknown.
- The developer must confirm that the travel plan will be handed over to the building owner or future occupier.
- Include provisions in the handover documentation to ensure the future implementation of the travel plan.

When certain measures may not be applicable or relevant, a brief justification can be provided for each consideration, explaining why it is not relevant to the project's scope or scale.

Evidence of the implementation of specific travel plan measures is not required for Tra 01 (this is addressed under Tra 02).

Compliance notes

Ref	Terms	Description
CN1	Transport assessment included in the travel plan	The transport assessment can be incorporated into the travel plan instead of a separate report. Relevant information must be distinctly identified between the transport assessment and the travel plan document. The travel plan must effectively showcase how the transport/travel assessment has informed the strategic elements of the plan.
CN2	Travel plan – Existing travel plan	An up-to-date organisational travel plan for a site on which an assessed building is located can be used to meet the relevant criteria. The existing plan must comply with the requirements in M3. All building users (in existing and new buildings) and additional travel resulting from users of the new building must be considered.
CN3	Accessible amenities and PTAI – Main building entrance to consider for campus-style developments	When 80% or more of the buildings are within 1 km of the campus main entrance; the campus main entrance can be used to determine the distance to an accessible amenity or compliant node. When less than 80% of the buildings are within 1 km of the campus's main entrance, the assessed building's main entrance must be used as the reference point to determine the distance to an accessible amenity or compliant node. This rule implies that for large campus developments, where distances are too great to be comfortably covered on foot, the needs of building users are better served by locating public transport nodes within or on the periphery of the campus. When the site has multiple main entrances, the most convenient main entrance can be used for the calculation. For buildings that are not part of a centralized campus, the building's main entrance must be used as the reference point for this assessment.
CN4	PTAI – Government Planning Information Database	Approved Government Public Transport Accessibility Level (PTAL) can be used as alternative evidence for compliance with the BREEAM PTAI. For approved PTAL, see the BREEAM Knowledge Base. When a local government creates a detailed and accurate Planning Information Database to provide a PTAI, it can be submitted to BRE Global for review. The PTAI must be derived from the (PTAL) method used by Transport for London.
CN5	PTAI – Community transport schemes in rural areas	In rural areas, where scheduled public services may be limited, community transport schemes, including 'on-demand services', should be noted in the 'Transport assessment and travel plan'; however, unscheduled services cannot be accounted for when calculating the PTAI.
CN6	PTAI – Future transport nodes	Where a transport node is currently inactive but will become active soon after project completion, it can be included when calculating the existing PTAI. To demonstrate this, the appropriate public transport authority or company must confirm the start of service date and frequency.
CN7	PTAI – Park and Ride services	Park-and-ride bus services run from one or more car parks to a city centre or other destination. They allow travellers to park their cars at a convenient location and complete their journey by bus. These generally stop at transport nodes *en route* to allow passengers to board or alight. In such cases, where appropriate, this can be considered as contributing to the PTAI.

Evidence

Criteria	Interim design stage	Final post-construction stage
1	A copy of the transport assessment or statement. Justification of why transport statement was chosen over transport assessment (if applicable).	No further actions required post-construction; no additional evidence is required other than that listed for the design stage.
	Submit the PTAI calculation inputs to the BREEAM Platform. Scale map highlighting the location of the building and all public transport nodes in the proximity of the building via a safe pedestrian route; updated digital sources such as online mapping services may be used. Timetables for each service at each public transport node are considered. Calculations to show average services per hour for each node. When applicable, information about the on-demand bus service. For developments that utilise a BRE-approved Public Transport Accessibility Level (PTAL) report, no additional evidence is required to demonstrate compliance with the criteria. To-scale maps or drawings to show the location and type of key local amenities present and their distance from the assessed development via a safe pedestrian route; digital sources such as online mapping services may be used.	When web-based maps are outdated, the Assessor's site inspection and photographic evidence are needed to confirm: — Location of public transport nodes. — Location of key local amenities. — Key areas of safe pedestrian route.
2	A copy of the travel plan.	No further actions required post-construction; no additional evidence is required other than that listed for the design stage.
2, 3	Where the building occupier is known, documentation confirming the building occupier's involvement in the travel plan. Where the building user is not known, documentation confirming provided that the travel plan will be handed by the developer to the building owner.	Written agreement from the building owner to implement the travel plan to support their transport strategy. Handover documentation to ensure the travel plan's future implementation.

Definitions

Accessible amenities

Amenities are accessible via safe pedestrian routes. All listed amenities must be open during typical working hours for the asset type and when employees benefit from them.

- **Appropriate food outlet:** a fixed asset that caters to the day-to-day needs of most building users — for example, a café, take-away, restaurant or food shop. A vending machine can qualify as a food outlet if it consistently offers a variety of items that reasonably meet the needs of building users and is confirmed to be a permanent fixture. A food truck or mobile catering service would not be sufficient to meet the criteria for this issue.
- **Access to an ATM (cash):** this refers to the availability and convenience of reaching an Automated Teller Machine (ATM) to access cash. Building users should have access to cash at all relevant times of the day. An ATM inside a building is acceptable as long as its operating hours are convenient for building users.
- **Suitable outdoor open space:** a space that allows building users to sit outside and take a break. This could be an open-air courtyard or external space within the site, a pedestrianised public piazza, or a local park. The space must be suitably sized for the number of people likely to use it and must not form part of the public highway. Where a compliant outdoor open space also meets the criteria for 'Outside space' in Hea 07, it can be considered under both issues.
- **Recreation or leisure facility:** a building that allows building users to exercise and maintain a healthy lifestyle. Examples include a local leisure centre, tennis courts, or a gym.
- **Publicly available postal facility:** a physical location accessible to the public for sending, receiving, and forwarding postal items. It excludes services such as package lockers and any postal services that are exclusive only to users of a particular service.
- **Community facility:** a space facilitating community activities for the assessed building's users. Examples include a community centre or hall, collaborative work areas, recreational zones, shared gardens, or allotments. Note that suitability depends on the building's purpose and the needs of its occupants.
- **Dispensing pharmacy:** an accessible pharmacy that provides prescribed medicines for building users. If services are confirmed, an internal pharmacy within a hospital or an on-site controlled medical dispensary may be acceptable.
- **Public sector doctor's surgery or general medical centre:** a healthcare facility or general medical centre providing general practitioner services and basic medical care to the community.
- **Childcare facility or school:** a dedicated facility or institution that provides child support for potential building users, such as nurseries or schools.

Building users

This can be any of the following, as appropriate to the building type:

1. Staff (commuter journeys and business travel)
2. Pupils and students
3. Visitors
4. Patients
5. Customers
6. Community users
7. Delivery workers, contractors, or service providers who regularly work at or access the building
8. Residents.

Main building entrance

The main building entrance is the entrance to the assessed building, which is directly connected to the main building reception, circulation routes, lifts, or stairs. It is available to most of the building's staff and visitors on arrival. It is not the site entrance (unless the site entrance is also the building entrance, e.g., a building with a boundary on a public highway). In the context of campus-style developments, the site entrance may serve as the building entrance (see CN3 on page 209).

For prison or military site assessments, the main entrance should be taken as the gatehouse entrance.

Operating hours in a typical day

Operating hours refer to the period during which a building is in use on a typical day. In choosing a typical day, the assessor should check that timetabled information for that day is, within reason, representative of the public transport provision for the entire operating week. In most cases, the building's normal operating hours can be used.

Where shift patterns see most building users (≥ 80%) arriving or leaving during a certain period, that period can be used as an alternative to the operating hours of the building.

For example, this could be an office building where most office workers arrive between 08:00 and 10:00. This accounts for some building types that operate a 24-hour day and on shifts.

During late night hours, when there is little public transport, such periods do not need to be accounted for when assessing this issue.

Public Transport Accessibility Index (PTAI)

An indicator of the accessibility and density of the public transport network at a point of interest (the BREEAM-assessed building). The BREEAM PTAI is adapted from the Public Transport Access Level method. The index is influenced by the proximity and diversity of the public transport network and the frequency of services at the accessible nodes. The greater the number of compliant nodes, services, and their proximity to the building, the higher the PTAI.

Safe pedestrian route

Safe pedestrian routes include pavements, paths and safe crossing points. The distance should not be measured in a straight line but along the actual walking route.

Transport assessment

Transport assessments and transport statements evaluate potential transport impacts of development and may propose measures to promote sustainable development. To be effective, they must be carried out during the early design stages to influence time-critical aspects of the design.

Travel plan

A travel plan is a strategy for managing all travel and transport within an organisation. It contains physical and behavioural measures to increase sustainable travel choices to a site or development. It must be developed at the early design stage closely collaborated with, and informed by, a transport assessment or statement.

Additional information

None.

Tra 02 Sustainable transport measures

Aim

To maximise the potential for people to choose public, active and lower-emission private transport by providing the site with convenient, sustainable options.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	10	None	All
Shell and core	10	None	All
Shell only	10	None	All

Assessment type specific notes

Ref	Assessment type specific note
-	None

Building type specific notes

Ref	Building type specific note
-	None

Assessment criteria

Prerequisite – Transport assessment and travel plan

1 Complete a transport assessment and travel plan in line with Tra 01. If these documents are completed after Concept Design, they can still be used to meet this prerequisite.

Up to 10 credits – Transport options implementation

2 Calculate the credits as follows:

2.a Refer to the score given in the Public Transport Accessibility Index (PTAI) as calculated in Tra 01. This score will be used to weight the points awarded in Tra 02.

2.b Award points for the sustainable transport measures implemented in Tra 02, as per Table 7.3 below.

2.c Use Table 7.4 on the next page to convert the number of points achieved for sustainable transport measures into credits, as weighted by the PTAI score.

Table 7.3: Summary of sustainable transport measures and points

Option	Sustainable transport measures	Points
Public transport measures		
1	The existing PTAI calculated as per Tra 01 is worth one point if it is: a. ≥ 4 for prison or military sites, rural location buildings, and further and higher education buildings. b. ≥ 8 for all other building types.	1
2	Improve the existing PTAI by at least 1.00 – any successful intervention receives the full three points.	3

Option	Sustainable transport measures	Points
	For example: — *Negotiating with local public transport companies to increase service provision for the development.* — *Providing a diverted bus route, a new bus stop, or similar.* — *Providing a dedicated transport service, such as a bus route.*	
3	Provide up-to-date local public transport information in a convenient, accessible area to help building users plan journeys by public transport.	1
Private transport measures		
4	Provide electric vehicle charging infrastructure, ≥ 7 kW EV charging points and associated cable routes, see M1.	1 or 2
5	a. Set up a car sharing group or facility to promote car sharing among building users. b. Actively market the car sharing scheme and provide communication channels that make it easy to join and use. c. Provide priority spaces for car sharers, allocating ≥ 5% of the total staff car parking capacity. d. Ensure that car share spaces are placed near the building entrance as the requirements of other types of priority parking (disabled, etc.) allow.	1
Active travel measures		
6	a. Engage with the local authority at the earliest (brief) stage to review public cycle and pedestrian routes. b. Agree on possible improvements to the local active travel network that supplement existing plans and are relevant to the site/project. c. Select at least one such improvement and carry it out.	2
7	Install at least the minimum number of cycle storage spaces as set out in Table 7.8 (see M2).	1
8	Having supplied cycle storage space as per Option 7 above, provide building users with at least two of the following facilities: — Showers — Changing facilities — Lockers — Drying spaces. *Where facilities are combined – e.g. showers and changing facilities – it must be possible for different people to use them at the same time if they are to count as more than one facility.*	1
9	**Existing amenities:** Ensure at least three relevant amenity types within less than or equal to 500 m of proximity (see M4).	1
10	**New or enhanced amenities:** Provide relevant and accessible new amenities within less than or equal to 500 m of the building entrance. These can be an enhanced existing amenity, or a new type of amenity (see M4).	2 or 3
Alternative transport measures		
11	Carry out one site-specific improvement measure in line with the travel plan not listed as an option in Tra 02. Submit this for BRE review.	1 to 3

Use Table 7.4 below to calculate how many credits to award for the points achieved from implementing a selection of Options 1–11 in Table 7.3 above.

Table 7.4: Credits awarded based on PTAI and the number of points achieved for sustainable transport measures

Number of points achieved for sustainable transport measures			Credits awarded
PTAI < 25	25 ≤ PTAI < 40	PTAI ≥ 40	
1	1		1
2		1	2

Number of points achieved for sustainable transport measures			Credits awarded
PTAI < 25	25 ≤ PTAI < 40	PTAI ≥ 40	
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 or more	8 or more	6 or more	10

Example

- Options 1, 2, 7 and 8 have been successfully implemented = 1 + 3 + 1 + 1 = 6 points for sustainable transport measures.
- The PTAI score for the site is 30.
- For a site with a PTAI score between 25 and 40, 6 points are worth 8 credits.

Methodology

M1: Electric vehicle charging infrastructure

Option 4 (up to 2 points) from Table 7.3 on page 213

- **1 point:** Minimum requirements for EV charging infrastructure have been met (see below).
- **2 points:** Minimum requirements have been met, and the EV charging score is 20 or above, as calculated using all EV charging infrastructure combined (i.e. active and passive). OR, 30% of total parking spaces must be provided as active EV charging spaces, each with a charging point of ≥ 7 kW.

Minimum requirements
EV charging infrastructure requirements apply exclusively to the parking spaces associated with the assessed building. At least 30% of total parking spaces must have EV charging infrastructure comprising:

- **At least 10% active EV charging:** A minimum of 10% of the total parking spaces must have fully operational EV charging point providing a minimum capacity of ≥ 7 kW.
- **Remaining 20% as passive EV charging:** The remaining 30% requirement must have the necessary infrastructure (e.g., cable routes, electrical supply) to support future demand.

EV charging places must be accessible to all building users. The design team should consider designating a proportion of EV charging spaces to priority parking.

Calculation method
The EV charging score is calculated as follows:

$$EV\ charging\ score = \frac{\sum(PS \times PST)}{TS} \times 100$$

Where:

PS = Provision score (see Table 7.5 on the next page)

PST = Number of parking spaces with the same provision score

TS = Total number of parking spaces associated with the assessed development

Table 7.5: Provision score for EV charging infrastructure

Provision	Provision score
Active EV charging infrastructure (≥ 7 kW)	0.5
Active EV charging infrastructure (≥ 22 kW)	1
Passive EV charging infrastructure	0.5

Example calculation

For 2 points:

As stated above, a result of ≥ 20 is needed to achieve the maximum 2 points available for providing EV charging infrastructure. This example shows how a building with 100 parking spaces would achieve a result of 20 using the EV calculation method (see Table 7.6 and Table 7.7).

Table 7.6: Example of the provision score for EV charging infrastructure

Example 1	Qty	% total space allocated
Parking spaces	100	-
Active EV charging infrastructure (≥ 7 kW)	0	0%
Active EV charging infrastructure (≥ 22 kW)	10	10%
Passive EV charging infrastructure	20	20%

Table 7.7: Example score calculation for EV charging infrastructure

Provision	Calculation	Subtotal
Active EV charging infrastructure (≥ 7 kW)	0 × 0.5 =	0
Active EV charging infrastructure (≥ 22 kW)	10 × 1 =	10
Passive EV charging infrastructure	20 × 0.5 =	10

EV charging score = (20 / 100) × 100 = **20**

The assessed building meets the minimum requirement that 30% of its parking spaces have EV charging infrastructure, comprising at least 10% active and 20% passive EV charging. Therefore, it receives **2 points**.

M1.1: Communal car parking and site-wide campus

Where the assessed building uses a communal car park or is part of a campus:

- The provision for EV charging infrastructure is calculated based solely on the parking spaces (existing and new) associated with the assessed building.
- Where the overall parking area(s) are shared with other buildings, the proportion of communal parking spaces associated with the assessed building should be calculated pro rata. For this calculation, use the building's occupancy relative to the occupancy of the entire site. If occupancy is unknown, use the building's relative floor area.
- The EV charging spaces must be conveniently located near the building and managed to ensure availability for its users.
- Where visitor parking spaces are designated for short-term use only (a maximum of 15 minutes), such as for order collection or drop-off at retail outlets, they can be excluded from the calculation for EV spaces. Other scenarios may be considered where appropriately justified.

M1.2: Phased development

Where phases of a project are assessed at different times:

- Calculations relating to EV charging provision should be based on the spaces associated with the assessed building.
- Pro-rata calculations can include EV infrastructure completed in the current and previous phases, provided it aligns with the phasing plan.
- EV infrastructure from future phases may count if a binding contract ensures delivery, with clear timelines and alignment with the phasing plan.

M1.3: Extensions

Where parking is integrated with the main building:

- The EV infrastructure requirement applies only to the parking spaces associated with the assessed extension.
- Calculate the proportion of the building's total floor area or occupancy represented by the extension.
- Apply this proportion to the total parking provision (new and existing) to determine the number of spaces associated with the extension.
- Use this number of spaces to determine the EV infrastructure requirements based on the relevant criteria.

M2: Cycle storage spaces and cyclists' facilities

Option 7 (1 point) and Option 8 (1 point) from Table 7.3 on page 213

Table 7.8 summarises the **minimum number of cycle storage spaces** required for each type of building. See compliant cycle storage in Definitions.

The number of **cyclist facilities** required is based solely on the number of cycle storage spaces provided for **staff**. Cycle storage for visitors, clients or patients does not affect the number of related facilities required (for example, visitors arriving by bicycle don’t need facilities to take a shower).

1. The calculation for the required cycle storage spaces and facilities must always be rounded up. For example, a calculated minimum of 5.3 cycle spaces means that 6 spaces must be provided.
2. Minimum cycle space provision:
   a. 4 cycle spaces for all building types.
   b. 10 cycle spaces for large retail assets.
3. These rules apply regardless of any reduction permitted under M2.3 (high PTAI), M2.4 (rural location), or M2.5 (sliding scale).

Table 7.8: Cycle storage spaces required for each type of building (Option 7)

Building type	Number of spaces	Unit of measure	Notes
Type A	1 per	10 staff	A building predominantly occupied by staff or employees with occasional business-related visitors, e.g. office, industrial, fire station, police station. This includes hospitality, where visitors typically stay for less than one month.
Type B	1 per	10 building users (staff **and** visitors)	A building occupied by core staff or employees with a consistently frequent visitors or users (either resident or non-resident). This includes cafés, restaurants, culture and entertainment, sports and leisure and secure accommodations. Compliant cyclists' facilities are required for staff only.
Specific building types			
Retail			
Large retail	1 per	10 staff **and**	For staff calculation, use the maximum number of staff at any one time or shift. Provide a minimum 10 cycle spaces for building users.
	1 per	20 public car parking spaces	

Building type	Number of spaces	Unit of measure	Notes
Small retail	4	In total	Spaces are publicly accessible within proximity of a main building entrance. Compliant cyclists' facilities are required for staff only.
Education			
When an educational facility consists of buildings in more than one category (e.g. nursery and primary school), select the dominant building type in the BREEAM Platform. Calculate the requirement separately for each user group and combine the results. For instance, a combined preschool and primary school will need to meet both 1 space per 10 staff and 5 spaces per class in year group requirements.			
Preschool	1 per	10 staff	-
Primary school	5 per	Class in the largest year group	Where the number of classes varies across year groups. For example, a primary school with five classes in its biggest year group would provide 25 cycle storage spaces for the whole school.
Secondary school or higher education	1 per	10 staff **and**	Secondary school covers education from ages 11–18. Higher education: all students accounted for: — Undergraduates — Post-graduates — PhD students — Post-doctorates
	1 per	10 students	
Healthcare			
All healthcare building types	1 per	10 beds **or**	Use the largest unit of measure for the building type. For example: — Use beds for a hospital. — Use consulting rooms for a doctor's surgery. — Use staff where this is the largest unit of measure, based on the maximum number at any time or shift.
	1 per	2 consulting rooms **or**	
	1 per	10 staff	
Residential institution			
Student accommodation (Halls of residence), key worker accommodation, military barracks, local authority secure residential accommodation	1 per	10 staff **and**	-
	1 per	2 residents	
Residential care home, sheltered housing	1 per	10 staff **and**	-
	1 per	10 visitors or beds	
Sliding scale of compliance Where the number of building users (based upon the unit of measure) exceeds 200, the sliding scale of compliance can be used to identify the appropriate number of cycle spaces required (see M2.5).			

M2.1: Estimating provision – Unknown building occupancy

If building occupancy is unknown, estimates must be based on either:

— Default occupancy rates (see Table 7.11 on page 228), or

— Rates from a comparable building type and size

Justifications must be included in the assessor's report.

M2.2: Cyclists' facilities requirements

Cyclists' facilities (e.g., showers, lockers, drying spaces, changing rooms) must be provided based on the number of staff cycle storage spaces. Visitors, clients, and patients are excluded from this calculation.

Facilities must meet the specifications outlined in the Definitions section for compliant facilities.

M2.3: Adjustment for high Public Transport Accessibility Index (PTAI)

Where the site achieves a high PTAI score in accordance with Option 1 (from Table 7.3 on page 213), the number of required cycle storage spaces and associated cyclist facilities may be reduced by 50%.

Note: This reduction cannot be combined with those in M2.4 (rural location), M2.5 (sliding scale), or M2.6 (public bicycle sharing systems).

M2.4: Rural locations

Cycle storage and associated facility requirements are reduced for rural sites, based on their distance from the nearest urban centre. The applicable reductions are shown in Table 7.9 below.

Table 7.9: Rural location distance to reduce the number of cycle storage spaces and cyclists' facilities

Distance to nearest urban location	Cycle storage and cyclist facility requirement adjustment
> 15 km	Reduced by 50%
> 30 km	Reduced by 70%
> 50 km	Reduced by 90%

M2.5: Adjustment for large user assets – Sliding scale

Option 7 from Table 7.3 on page 213

Where the number of building users exceeds 200, a sliding scale can be used to reduce the required number of cycle storage spaces, as set out in Table 7.10 below.

This scale applies up to 5,000 users. Beyond 5,000 users no further cycle storage is required.

The sliding scale of compliance **does not** apply to the following building types:

— Large retail

— Primary schools

— Residential institutions and military residential buildings

Table 7.10: Sliding scale of compliance – multiplier based on number of users

Number of users	Multiplier for standard unit of measure
1–200 users	× 1.0
201–300 users	× 1.5
301–400 user	× 2.0
401+ users	× 2.5

Example calculation

For example, an office building with 800 users:

— *1–200 users @ 1 space per 10 users = 20 spaces*
— *201–300 users @ 1 space per 15 users (unit of measure × 1.5) = 6.7, rounded up to 7 spaces*
— *301–400 users @ 1 space per 20 users (unit of measure × 2) = 5 spaces*
— *401+ users @ 1 space per 25 users (unit of measure × 2.5) = 16 spaces*

Total compliant cycle storage spaces required = 48 spaces.

M2.6: Public bicycle sharing systems – Partial compliance option

Public bicycle sharing systems and cycle storage

Up to half (50%) of the required cycle spaces for staff (see "Customers and visitors", below) may be provided by a public bicycle-sharing system if the system is:

1. Implemented by the local government through a public-private partnership.
2. Open to casual users who wish to use it for one-way rides.
3. Available at unattended urban locations throughout the city.
4. Supplied with service terminals at maximum 500 m (on average) distance from each other in inner city areas.
5. Available within 500 m of the main building entrance.

Unlike all other cycle storage spaces referred to in this issue, the bicycle terminals of a public cycle sharing system do not need to be compliant as described in the Definitions.

Cyclists' facilities and public bicycle-sharing systems

Using public bicycle-sharing systems to supply cycle spaces does not reduce the requirement for cyclists' facilities. This is still based on the total number of spaces, including public cycle spaces.

Cycle spaces for customers and visitors for retail assets

For most types of building, shared/public bicycle spaces can only be used to offset the staff cycle space requirement. However, for retail projects, public bicycles count towards up to 50% of customer cycle spaces as well.

M3: Cycle storage spaces and cyclists' facilities on sites with multiple buildings

Option 7 (1 point) and Option 8 (1 point) from Table 7.3 on page 213

Where:

- A new or infill building is constructed on an existing site or
- Multiple new buildings are to be constructed on the same site,

Compliance can be assessed either for one building or for the whole site, depending on the configuration and location of the proposed cycle storage and associated facilities. Whichever approach is chosen, the assessor must justify this choice in their report.

M3.1: Standalone approach

The guidance for calculating the cycle storage requirement and associated facilities for a building on a multi-building site is the same as for any single building.

In this case, the location, signage and access must make clear that the cycle spaces assigned to users of the assessed building are for their specific use.

M3.2: Site-wide approach

Where a group of buildings are on a site sharing cycle storage spaces and/ or facilities, the requirement can be calculated based on all site users.

Cyclists' facilities may be located in designated areas to ensure easy access and usability, and existing compliant facilities can be included in the calculation. However, the route to the cycle storage and facilities must be within 500 metres of the main entrance of the assessed buildings, measured along a safe and convenient path.

For sites with strict security protocols, where all staff are required to pass through a centralized facility (e.g., staff room or security checkpoint) before proceeding to their work areas, it is acceptable to calculate the distance only between the cycle storage and the centralized cyclist facilities. Evidence should include a site plan and confirmation of staff movement through the centralized location.

M3.3: Combination of the two approaches

Where appropriate, cycle storage can be provided based on a site-wide assessment, with facilities provided on a building-by-building basis.

In the opposite instance, where cycle storage spaces are provided for a single building, but associated facilities are shared by buildings across the site, the number of facilities must be based on the number of site users rather than on cycle spaces for the single building. Such facilities must be close to cycle storage for all users.

M3.4: Provision for extensions

When assessing an extension to a building, partial refurbishment, or a stand-alone building that extends an existing facility for the same building users, the site-wide approach can be used to determine the number of cycle spaces required.

M3.5: Phasing or pending demolition works

Where cycle storage cannot be installed at the construction stage due to phasing or pending demolition works, compliance can still be shown, provided that:

- Context and justification are given for why the storage is unavailable.
- A written contractual agreement is in place to provide BREEAM-compliant storage within a clear and justifiable time scale, accounting for related works that could reasonably delay the final installation of facilities related to the development.
- In the meantime, alternative storage is provided that allows bikes to be easily stored, removed and locked securely against a fixed structure.

These temporary measures apply to cycle storage spaces only. Provision of cyclists' facilities must be assessed in the usual way.

M4: Existing and new amenities

Option 9 (1 point) and Option 10 (2 or 3 points) from Table 7.3 on page 213

To achieve points under Option 9 or Option 10, the building must have access to relevant amenities. All amenities, whether new or existing, must be within 500 m of the assessed building's main entrance via a safe pedestrian route (see Definitions). The relevant types of amenities are listed below and apply to all building types:

1. Appropriate food outlet
2. Access to an ATM (cash machine)
3. Access to an outdoor open space (public or private, provided suitably sized and accessible to building users)
4. Access to a recreation or leisure facility for fitness or sports
5. Publicly available postal facility
6. Community facility
7. Dispensing pharmacy
8. Public sector doctor's surgery or general medical centre
9. Childcare facility or school

Notes:

1. An amenity can be provided by the assessed building itself if it includes that function, for example, if it provides an appropriate food outlet or a pharmacy.
2. Amenities may be within an assessed building or on-site, for example as part of a campus, retail or business park or centre.
3. Amenities may be part of a masterplan where this has been produced by a single developer, and such amenities may be assessed as new, rather than existing, for building-level assessments on the site.
4. More than one amenity may be provided at a single location, for example, an ATM and a pharmacy within a supermarket development could be considered as three amenities.

M4.1: Existing amenities

Option 9 (1 point) from Table 7.3 on page 213

One point can be awarded for providing at least three accessible types of amenities ≤ 500 m via a safe pedestrian route.

M4.2: New or enhanced amenities

Option 10 (2 or 3 points) from Table 7.3 on page 213

Two or three points can be awarded for providing new or enhanced amenities ≤ 500 m via a safe pedestrian route.

An existing amenity that has been enhanced to significantly improve the user experience counts as new and should be assessed as such.

If new amenities duplicate the services provided by existing amenities, this is still recognised. This is because these duplicate amenities still create additional choices for users in terms of services offered and location.

- **2 points:** at least one new or enhanced amenity type.
- **3 points:** two or more new or enhanced amenities type.

Compliance notes

Ref	Terms	Description
CN1	PTAI calculation – Changes to public transport services during the assessment	The PTAI is calculated as part of the design stage transport analysis described in Tra 01. It serves as a benchmark from that time and should not be updated at the post-construction certification stage.
CN2	More onerous requirements	Where the local authority's requirements are more onerous than BREEAM (e.g., number of electric recharging points or cycle storage spaces), these must be met for credits to be awarded.
CN3	Cycle spaces – Public realm provision	Where it is not possible to locate short-term visitor or customer cycle storage spaces within the assessment boundary, these may be provided in a suitable and convenient location within the public realm. The assessor must be satisfied that there is a legal agreement and a long-term commitment to maintain these spaces. Overhead covering may be waived if justified. Existing public spaces do not count toward compliance.
CN4	Cycle spaces – Specialist education assessments	For specialist educational institutions (for example non-acute SEN facilities) assessors should use their judgment on how to base their cycle storage calculations. Supporting evidence needs to be provided, along with the assessor's comments or notes, to clarify the calculations used to demonstrate compliance.
CN5	Cyclists' facilities – Education: Primary schools	Additional facilities for pupils can include adequate cloakroom space for storing outdoor clothing and cycle helmets. For staff, facilities should include 1 locker per 10 staff members and 1 shower per 10 lockers, with at least one shower provided. Primary school pupils are not expected to have private showers or cyclist facilities.
CN6	Cyclists' facilities – Education: Secondary schools	In secondary schools with sports facilities, compliance is met for **students** by providing lockers, as showers and changing spaces are assumed to be included with the sports facilities and do not need separate assessments. For **staff**, separate showers and changing facilities must be provided. While locker facilities can be shared with students if appropriately located, staff lockers should be conveniently situated near other staff facilities. The number of showers for staff should be based on the total number of staff, with a minimum of one shower for every 100 staff members.
CN7	Cyclists' facilities – Residential institution (long term stay)	Where there is a BREEAM requirement for residents, compliant facilities within their accommodation can be considered as cyclists' facilities. Separate facilities for staff must be provided as required to achieve compliance.
CN8	Cycle facilities – Shell only or shell and core assessments	Developers must provide all aspects of additional cyclists' facilities within their scope of work and enable future completion of any remaining aspects. For example: if core areas lack facilities such as showers, drying space, or internal walls to tenanted areas, these must be noted on design drawings, with necessary services provided for future installation by tenants. Developers must show that they are enabling future installation of BREEAM compliant facilities within their scope of work. Where internal walls are within scope, a compliant changing area must be provided, however for lockers, compliance can be achieved by providing a design drawing showing that there is an adequately sized and suitably located space for the required number of compliant lockers.
CN9	Limiting or restricting car parking capacity	Compliance typically relies on external requirements such as site constraints, planning restrictions, or nearby public parking, which are not active efforts to reduce private car

Ref	Terms	Description
		reliance. Restricting parking is not generally an alternative sustainable transport measure, except when meeting specific criteria: — The travel plan recommends the absence of standard parking. — The development has an Public Transport Accessibility Index ≥ 25. — There is adequate site access, but parking has been deliberately omitted to promote alternative transport. Please submit this as assessment Option 11 for BRE to review.
CN10	Phased developments	Where new sustainable transport measures will be provided but at a later stage than the completion of the assessed building, they can still count toward BREEAM compliance provided there is a formal commitment (e.g. within the General Contract Specification or a Section 106 Agreement) to deliver them within the shorter of: — When 25% of all phases are complete and occupied, or — Within 25% of the total build time for the phase of the assessed building (measured from that phase's completion). Importantly, if these transport measures will not be available within five years of the building's occupation, they cannot be considered for compliance.

Evidence

Criteria	Interim design stage	Final post-construction stage
1	A copy of the transport assessment or statement. A copy of the travel plan.	No further actions required post-construction; no additional evidence is required other than that listed for the design stage.
2	Documentary supporting evidence to verify how the assessment options have been or will be achieved. Evidence may include: — Design drawings — Clauses of building specifications — Contracts — Commitment letters See individual options for more details.	Robust post-construction evidence to verify measures have been implemented. See individual options for more details.
Sustainable transport options		
Option 1	Submit the PTAI calculation inputs to the BREEAM Platform. Scale map highlighting the location of the building and all public transport nodes in the proximity of the building. Timetables for each service at each public transport node are considered. Calculations to show average services per hour for each node. Where applicable, information about on-demand bus services.	No further actions required post-construction; no additional evidence is required other than that listed for the design stage.
Option 2	Documentary supporting evidence showing how the PTAI improvement will be achieved i.e. meeting minutes, correspondence with local public transport companies or contractual agreements. PTAI calculations demonstrating the	Final PTAI calculations confirming improvement. Updated evidence, including public transport services, timetables, and maps, submitted for final assessment.

Criteria	Interim design stage	Final post-construction stage
	improvement over the existing PTAI.	
Option 3	Specifications for the public transport information system (e.g., digital displays or online tools). Proposed location and accessibility plan for the information system.	Assessor's site inspection report and photographic evidence of the installed public transport information system. Documentation showing the system is fully operational and provides real-time updates.
Option 4	Design drawings showing the planned EV charging parking spaces (passive and active) and total number of parking spaces provided. Specifications for the EV charging points (e.g., ≥ 7 kW). Submit the calculation inputs to the BREEAM Platform. Contractual agreements or purchase orders for EV charging infrastructure.	Assessor's site inspection report and photographic evidence of the EV charging infrastructure. Final construction drawings or equivalent showing the location of EV charging parking spaces (passive and active) and total number of parking spaces provided. Confirmation of installation of EV charging points (minimum 7 kW) such as manufacturer's data sheets and electrical capacity verification.
Option 5	Car sharing group or policy evidence (e.g., documentation, meeting minutes). Marketing or communication materials. Marked-up site plan showing priority spaces for car sharers and total number of parking spaces provided.	Final policy confirmation, including final car sharing scheme. Assessor's site inspection report and photographic evidence showing car share spaces in place. Final construction drawings or equivalent showing the priority spaces for car sharers and total number of parking spaces provided.
Option 6	Correspondence, meeting minutes, or contractual agreements showing consultation with the local authority on cycling and pedestrian routes.	Assessor's site inspection report and photographic evidence confirming the implementation of agreed cycle or pedestrian route improvements. Final construction drawings or equivalent where required.
Option 7, Option 8	Assumptions and calculations used to determine the number of building users for cycle storage and facilities required. Design drawings, relevant sections of the building specifications or contract clauses to confirm compliant cycle storage and facilities will be provided.	Assessor's inspection and photographic evidence confirming the installation of compliant cycle storage and associated cyclist facilities (e.g., showers, changing facilities, lockers). Final construction drawings or equivalent showing the installed cycle storage and facilities.
Option 9, Option 10	Marked-up site plan or web-based map viewer highlighting: — Building location — Location and type of amenities — Route to amenities — Plan/map scale. For amenities under development, a letter from the client or developer confirming: — Location and type of amenities — Timescale for development	Assessor's site inspection and photographic evidence confirming: — The existence of local amenities. — Route and distance to amenities. OR Updated and dated marked-up site plan or a web-based navigation map viewer highlighting: — Current location and type of local amenities. — Current route and distance from the building via a safe pedestrian route. — Plan or map scale.

Criteria	Interim design stage	Final post-construction stage
		OR Where amenities are under development, evidence such as the developer's letter outlining progress and timescale for amenities being available.
Option 11	Submitted proposal and confirmation from BRE.	Will be dependent on the proposed improvement measures. General requirements might include: — Assessor's site inspection and photographic evidence. — Final construction drawings or equivalent.

Definitions

Accessible amenities

Amenities are deemed as accessible if they can be reached via **safe pedestrian routes** during typical working hours for the type of building. Amenities that are unavailable when appreciable numbers of site users would like to use them are not considered accessible.

- **Appropriate food outlet:** a fixed asset that caters to the day-to-day needs of most building users — for example, a café, take-away, restaurant or food shop. A vending machine can qualify as a food outlet if it consistently offers a variety of items that reasonably meet the needs of building users and is confirmed to be a permanent fixture. A food truck or mobile catering service would not be sufficient to meet the criteria for this issue.
- **Access to an ATM (cash machine):** refers to the availability and convenience of reaching an Automated Teller Machine (ATM) to access cash. The building users should have access to cash at all relevant times of the day. An ATM inside a building is acceptable as long as its operating hours are convenient for building users.
- **Suitable outdoor open space:** a space that allows building users to sit outside and take a break. For example, an open-air courtyard or external space within the site, a pedestrianised public piazza or a local park. The space must be suitably sized for the number of people likely to use it and must not form part of the public highway.
- **Recreation or leisure facility:** a building that allows building users to exercise and maintain a healthy lifestyle. Examples include a local leisure centre, tennis courts, or a gym.
- **Publicly available postal facility:** a physical location accessible to the public for sending, receiving, and forwarding postal items. It excludes services such as package lockers and any postal services that are exclusive only to users of a particular service.
- **Community facility:** a space that facilitates community activities for the assessed building's users. For example, a community centre or hall, collaborative work areas, recreational zones, shared gardens, or allotments. Note that the suitability depends on the building's purpose and the needs of its occupants.
- **Dispensing pharmacy:** an accessible pharmacy that provides prescribed medicines for building users. If services are confirmed, an internal pharmacy within a hospital or an on-site controlled medical dispensary may be acceptable.
- **Public sector doctor's surgery or general medical centre:** a healthcare facility or general medical centre providing general practitioner services and basic medical care to the community.
- **Childcare facility or school:** a dedicated facility or institution that provides child support for potential building users, such as nurseries or schools.

Building user

Building users are those who will utilize the cycle storage and facilities. Depending on the type of building being assessed, this includes specific groups based on the building's function, such as office staff, commercial staff and visitors, or school staff and students.

Car sharing group

Car sharing refers to a coordinated initiative established, promoted and overseen by asset management to assist building users in sharing private car journeys to and from work. The primary goal is to reduce overall reliance on individual cars for commuting; they differ from vehicle rental or loan schemes. Car sharing must be accessible to all building users who regularly commute by private car. The designated spaces for car sharing must be distinct from customer or visitor areas in the development.

Compliant cycle storage spaces

Cycle storage must be secure, protected, conveniently located, safe to use and sufficiently spacious to manoeuvre. The cycle storage spaces must meet the following criteria:

1. Cycle storage spaces must provide with the means to secure one or more cycles with fixings that allow both the wheel and frame to be locked securely. Cycle spaces must be set in or fixed to a permanent structure (building or hardstanding) and covered overhead. Alternatively, they may be located in a locked structure fixed to, or part of, a permanent structure with appropriate surveillance.
2. The distance between each cycle rack, and between cycle racks and other obstructions such as walls, must allow cyclists to access storage easily.
3. Cycle storage spaces must be in a prominent location that is easily seen, either from an occupied building or from the main access to a building. Where cycle storage spaces are within the building, prominent signage should indicate their location to building users.
4. The cycle storage spaces must have adequate lighting, demonstrated by meeting the lighting criteria in Hea 02 Artificial light. Shell only to demonstrate evidence of future provision.
5. Lighting must be controlled to avoid out-of-hours use and operation during daylight hours when natural light suffices.
6. Cycle storage that is only suitable for folding bicycles or scooters is not compliant.

> BREEAM New Construction is not prescriptive about the cycle storage dimensions and type required to demonstrate compliance. The assessor is expected to exercise their professional judgement to determine whether the cycle parking spaces meet the aims of Tra 02 and the requirements listed.
>
> BREEAM is used to certify buildings, not products. Therefore, cycle parking systems are not inherently 'BREEAM compliant'. These must be assessed in the context of their location and intended user profile.

Compliant changing facilities

Compliant changing facilities are defined as those that meet the following:

1. Changing areas must be appropriately sized for the likely or required number of users. The assessor should judge whether the changing area is sufficient based on the number of showers or number of cycle storage spaces provided.
2. Private spaces (not toilets or showers – see 4 below) must be provided for cyclists of any gender to change.
3. Changing areas must include adequate space and facilities to hang or store clothing and equipment while changing or showering, e.g. bench seat or hooks.
4. Toilet or shower cubicles cannot be counted as changing facilities

Compliant drying spaces

A compliant drying space is defined as one that is specifically designed and designated for this purpose. It should have suitable finishes, adequate heating and ventilation, and the facility to hang wet clothes with sufficient air movement around them to dry effectively.

Examples of non-compliant spaces include:

— Plant rooms: their use as a drying space may create a health and safety hazard.

— Coat hooks in cloakrooms or staff changing areas are unlikely to provide adequate ventilation to dry clothing effectively.

Compliant lockers

Compliant lockers are defined as:

1. Sized appropriately for the storage of cyclists' equipment.
2. Adjacent to compliant changing rooms, where provided.
3. The number of lockers is at least equal to the number of cycle spaces required.

Compliant showers

Compliant showers are defined as follows:

1. One shower is provided for every 10 cycle storage spaces, subject to a minimum of one. Any building with eight or more showers complies regardless of the number of cycle storage spaces provided.
2. Showers must cater for both male and female users. Either separate showers within gender-specific facilities (required split 50:50) or single shower cubicles and mixed-use changing spaces. The assessor can consider a deviation from the 50:50 split guidance if justified by occupancy data, or if design teams want a flexible shower arrangement for all users.
3. The showers do not need to be dedicated to cyclists and can be shared with other users or uses.

Dedicated transport service

A dedicated transport service, such as a dedicated bus, provided or managed by the building owner or its management can be considered for any building type with a fixed shift pattern. Examples could include schools, offices, retail, factories, prisons, etc. The dedicated transport must provide a transfer to the local population centre or public transport interchange or be a door-to-door service.

Electric vehicle (EV) charging infrastructure

EV charging infrastructure refers to the network of facilities and equipment designed for charging EVs. This includes:

1. **Active EV charging infrastructure:** specifically designated locations within a parking space with fully installed and functional EV charging points.
2. **Passive EV charging infrastructure:** parking spaces that have the necessary groundwork in place, including cable routes, electrical conduits, and electrical supply capacity in the distribution system to accommodate the future installation of cables and EV charging points.

Large retail

This refers to large retail developments, such as shopping centres, retail parks and supermarkets, which typically will have covered or uncovered parking, or external areas, and therefore scope to provide their own dedicated cyclists' storage.

Priority spaces

Priority spaces are parking spaces designated for users with specific needs, such as people with disabilities, parents with young children, or others who require enhanced accessibility and convenience.

Rural location

This includes any building type for which a rural population has a demonstrable social or economic local need. A rural location is defined as an area outside an urban cluster. Sparse settlements and low population density commonly characterise these areas. Rural locations may face challenges due to limited infrastructure and transportation options. People living in rural areas may be content with longer travel distances and limited access to services and amenities, necessitating greater distances for essential needs.

You may refer to the local government's guidance on classifying rural locations.

Small retail

Smaller retail units or shops that may form part of a wider retail or business district, city or town centre, or mixed-use sites, and typically do not have the scope to provide their own dedicated cyclists' storage.

Additional information

Default occupancy rates by building type

Table 7.11 below provides default occupancy rates for various building types if the number of building occupants commuting to the development cannot be confirmed (see M2.1). Select the most appropriate.

Table 7.11: Default occupancy rates by building type

Building type and function area	Occupant density
Business	
Office area (including reception areas)	0.111
Food preparation area (staffed)	0.108
Small workshop or category lab space	0.050
Industrial	
Food preparation area	0.213
Industrial process area	0.050
Laboratory	0.050
Reception	0.110
Warehouse storage	0.050
Generic office area	0.108
Hospitals, care homes	
Reception	0.152
Post-mortem facility	0.050
Food preparation area	0.161
Physiotherapy studio	0.200
Bedroom unit	0.105
Laundry	0.117
24-hours consulting or treatment areas	0.07
Assembly areas or halls	1.000
Hydrotherapy pool hall	0.100
Industrial process area	0.124
Laboratory	0.080
Operating theatre	0.125
Classroom	1.000
Diagnostic imaging	0.100
Generic ward	0.175
Office and consulting area	0.195
Primary healthcare	
Reception	0.110
Office and consulting areas	0.082
Further and higher education	
Residents bedroom	0.120
Classroom	0.203
Food preparation area	0.096
Hall, lecture theatre or assembly area	0.202
Computer laboratory	0.231
Laboratory	0.106
Laundry	0.105
Reception	0.112
Workshop – small scale	0.068
Office and consulting areas	0.103

Building type and function area	Occupant density
Hotels	
Bedroom	0.050
Food preparation area	0.108
Reception	0.105
Generic office area	0.106
Secure residential institution	
Cell	0.190
Reception	0.121
Hall, lecture theatre or assembly area	0.183
Eating and drinking area	0.141
Workshop – small-scale	0.048
Laundry	0.086
Classroom	0.183
Office and consulting areas	0.093
Food preparation area	0.111
Libraries, museums, galleries	
Reception	0.095
Food preparation area	0.176
Hall, lecture theatre or assembly area	0.150
Laboratory	0.098
Workshop – small-scale	0.062
Display and public areas	0.150
Generic office area	0.099
General assembly and leisure, clubs, theatres	
Dry sports hall	0.047
Fitness studio	0.132
Fitness suite or gym	0.170
Food preparation area	0.131
Hall, lecture theatre or assembly area	0.175
Auditorium	0.341
Ice rink	0.225
Performance area (stage)	0.049
Public circulation areas	0.241
Reception	0.126
Sales area – general	0.102
Swimming pool	0.163
Workshop – small-scale	0.067
Generic office area	0.116
Community or day centres	
Reception	0.108
Dry sports hall	0.047
Food preparation area	0.143
Workshop – small scale	0.064
Hall, lecture theatre or assembly area	0.169
Office and consulting areas	0.106
Other	
Data centre	0.096
Server room	0.096

Building type and function area	Occupant density
Heavy plant room	0.096

Notes

1. The net floor area for each function must be multiplied by the equivalent occupant density to determine an overall occupancy for the function area.
2. Not all potential building areas are listed, only those required to reflect estimated building occupancy for the building type. For example, an office building may have a canteen but it will be the staff that predominantly use the canteen. The office staff numbers will be estimated using the default occupancy rate for the office area; therefore to include the canteen would result in double counting of occupancy.
3. If a building type is not listed, occupancy rates for a similar building type or function area may be used.
4. The above occupancy rates have been sourced from the activity database of the Simplified Building Energy Model (SBEM), v.5.4a.
5. If the occupancy rates produced are unrealistic, please refer to the alternative option to provide the number of occupants (see M2.1).

Water

Summary

This category encourages sustainable water use in the operation of the building and its site. Issues in this section focus on identifying means of reducing potable water consumption (internal and external) over the lifetime of the building and minimising losses through leakage.

Assessment issues

Wat 01 Water consumption	5 credits + 1 exemplary
Wat 02 Water monitoring	1 credit
Wat 03 Water leak detection and prevention	2 credits
Wat 04 Water efficient equipment and systems	up to 3 credits
Wat 05 Prediction of operational water consumption	1 credit + 1 exemplary

Wat 01 Water consumption

Aim

To reduce the operational water consumption for sanitary uses in new buildings by installing water efficient components and rainwater collection and water recycling systems.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	5 + 1 exemplary	Good, Outstanding	All
Shell and core	5 + 1 exemplary	Good, Outstanding	All (see ref 1.0)
Shell only	0	None	Not applicable
EU Taxonomy	-	-	1

Assessment type specific notes

Ref	Assessment type specific note
1.0	Where there will be no in-scope water-using components present in the building when it is operational this issue is filtered out.

Building type specific notes

Ref	Building type specific note
2.0	**Healthcare buildings** Water-using components in clinical areas do not need to be assessed. Components in non-clinical areas may also be excluded where they are not appropriate for the needs of patients or may adversely affect the incidence and propagation of infections, where justified by an appropriate health professional. Where all water fittings are excluded from assessment the minimum standard is not applicable.

Assessment criteria

Up to five credits (plus one exemplary credit) – Water consumption

1 Determine the water efficiency of all in-scope water-consuming components.

2 Determine the amount of recycled water expected from approved blackwater, greywater, and rainwater systems.

3 The number of credits awarded is determined by the percentage improvement in potable water use in litres per person per day for the actual building compared to that of a baseline building are shown in Table 8.1 below.

Table 8.1: Water consumption credits

Percentage improvement over baseline	Number of credits
≥ 15%	1
≥ 30%	2
≥ 45%	3
≥ 60%	4
≥ 75%	5
≥ 85%	5 + 1 exemplary

Methodology

M1: In-scope water-consuming components

Identify which of the following sanitary water-consuming components will be present in the building when it is operational:

- WCs/toilets
- Urinals
- Taps (on wash-hand basins, kitchen sinks and waste disposal units)
- Showers
- Baths
- Dishwashers (domestic and commercial-sized)
- Washing machines (domestic and commercial sized).

Information on the types of water-using components present in the building, and the number of each type of water-using component should be entered into the BREEAM Platform. For components that are included in the project specification, the water efficiency of each component type should be entered. Where the water efficiency is not known, or is outside of the scope of the project, the baseline water efficiencies will be assumed.

M2: Data requirements

M2.1: Data requirements for water-consuming components

The data required for each type of water-consuming component is shown in Table 8.2 below.

Table 8.2: Data requirements for each type of water-consuming component

Water-consuming component	Data requirements
WCs/toilet	Full flush and, where applicable, reduced flush volume in litres per use
Urinal	Flush volume in litres/bowl/hour
Washbasin taps	Maximum flow rate in litres per minute, including any reduction achieved with flow restrictors [note 1]
Shower	Maximum flow rate in litres per minute, including any reduction achieved with flow restrictors
Kitchen tap	Maximum flow rate in litres per minute, including any reduction achieved with flow restrictors
Bath	Capacity to overflow in litres [note 2]
Dishwasher – domestic sized	litres/cycle
Dishwasher – commercial sized	litres/rack
Washing machine – domestic sized	litres/use (based on a typical wash cycle)
Washing machine – commercial sized	litres/kg
Waste disposal unit	Flow rate in litres per minute

Notes

1. The flow rate of a tap or shower will vary depending on the water pressure:
   - For high pressure supply systems, test measurements should be undertaken at 3 ± 0.2 bar (0.3 ± 0.02 MPa).
   - For low pressure supply systems, test measurements should be undertaken at 0.1 ± 0.02 bar (0.01 ± 0.002 MPa).

2. The calculation of water consumption for baths assumes 40% of the capacity to the overflow. This is to reflect that:
   - Users tend not to fill the bath to overflow.
   - The displacement effect the user has on the actual volume of water required for a bath.

M2.2: Calculating flow rates for push and automatic shut-off taps

The water consumption of push and automatic shut-off taps using the following steps:

1. Calculate the water consumption per person per use. If a tap runs for less than 20 seconds per activation, assume it will be activated twice per person for the timed duration.

For example, for a tap with a flow rate of 9 litres/min and a 15 second usage duration, the water consumed per person would be: 9 × (15/60) × 2 = 4.5 litres/min.

If a tap runs for 20 seconds or more per activation, assume one activation per person for the timed duration.

For example, for a tap with a flow rate of 9 litres/min and a 20 second usage duration, the water consumed per person would be: 9 × (20/60) × 1 = 3 litres/min.

2. Multiply the water consumption figure per person by 1.5 and enter this figure into the calculator tool.

   Multiplying by 1.5 adjusts the consumption figure to compensate for the typical non-timed tap use of 40 seconds that has already been taken into account in the tool. Taking the first example above, 4.5 litres/min multiplied by 1.5 gives 6.75 litres/min. When this is used in the tool as the flow rate specification, the consumption is 4.57 litres/person/day which more closely reflects the true level of water consumption for the push tap.

M2.3: Data requirements for blackwater, greywater, and rainwater systems

Where blackwater, greywater, and rainwater systems are installed the following information must be entered into the BREEAM Platform:

For blackwater and greywater systems:
The percentage volume of waste water collected (and reused) from the following where relevant: wash-hand basins, showers, kitchen sinks, dishwashers, baths, washing machines and sources of waste water from non-domestic components.

For rainwater systems:
Either

- Horizontal projection of the collection area (m²)
- Surface yield co-efficient (%)
- Hydraulic treatment efficiency co-efficient (%)
- Annual local rainfall (mm/year)

OR

- Daily rainfall collection (litres)

Daily rainfall collection (litres) must be calculated in accordance with credible and verifiable national or local data, e.g. a regional, national or international meteorological organisation, datasource or equivalent.

M3: Calculating water performance credits

The water consumption of the building is calculated in litres per person per day based on the data inputs for water-consuming components based on a default occupancy pattern determined by the building type.

Where the assessment consists of multiple building types, a tailored occupancy pattern is generated for the building based on the floor area for up to five different building types.

Where blackwater, greywater, or rainwater systems are specified, their yield is used to offset non-potable water demand from components that would otherwise be supplied using potable water.

The baseline building has the same number of each type of water-consuming component present in the actual building. The baseline building is taken to have the same occupancy assumptions as the actual building, no waste-water systems installed, and with water-consuming components with baseline performance levels set as follows in Table 8.3 below.

Table 8.3: Baseline performance levels for water-consuming components

Water consuming component	Baseline performance level
WCs/toilet	6.0 litres effective flush volume
Urinal	8.75 litres/bowl/hour
Washbasin taps	10 litres/minute
Shower	12 litres/minute
Kitchen tap	10 litres/minute
Bath	200 litres
Dishwasher – domestic sized	17 litres/cycle

Water consuming component	Baseline performance level
Dishwasher – commercial sized	8 litres/rack
Washing machine – domestic sized	90 litres/use
Washing machine – commercial sized	14 litres/kg
Waste disposal unit	17 litres/minute

Where sanitary water-consuming components are unknown or not included in the project specification, they should be entered into the BREEAM Platform as having the baseline performance levels specified in Table 8.3 on the previous page.

In instances where there is a green lease agreement that includes specific clauses about the performance of water-consuming components that will be installed, these can be used in place of the baseline values.

Any speculative areas not covered by the agreement must assume systems of baseline efficiency.

The water performance (litres/person/day) for the actual building and the baseline building are calculated within the BREEAM Platform which also determines the number credits awarded in accordance with Table 8.1 on page 232.

M4: EU Taxonomy reporting

The BREEAM Platform also calculates whether all the installed water-consuming components meet the DNSH (Do No Significant Harm) requirements set for sustainable use and protection of water and marine resources for new construction.

Compliance notes

Ref	Terms	Description
CN1	Flow rate for click taps	The flow rate for click taps shall be taken as the maximum flow rate, as quoted by the manufacturer, of the lower range before the water break or ‘click’.

Evidence

Criteria	Interim design stage	Final post-construction stage
All	The relevant sections or clauses of the building specification, design drawings or schedules confirming the number, specification and water consumption of all water-consuming components. Where specific products are specified, manufacturer’s literature, EU Energy Label or European Unified Water Label information must be provided to support the water consumption values used. Technical details for blackwater, greywater, or rainwater collection systems, where specified. Calculations e.g., relating the flow rate for push and automatic shut off taps or for blackwater, greywater, or rainwater collection systems. Relevant clauses from green lease agreements.	Final construction drawings or sanitaryware schedule to confirm the number and type of water-consuming components installed. Assessor site inspection report with photographic evidence or proof of purchase such as purchase orders to confirm that the fittings have been installed as specified. Copy of the manufacturer’s product details, EU Energy Label or European Water Label to confirm water consumption for all installed products. Technical details and calculations for installed blackwater, greywater or rainwater collection systems. Relevant clauses from green lease agreements.

Definitions

Blackwater recycling

The appropriate collection, treatment and storage of waste-water discharged from kitchen and utility sinks, urinals and toilets to meet a non-potable water demand in the building, e.g. WC flushing, or other permissible non-potable use on the site of the assessed building.

Click taps

Taps where the flow volume has more than one preset level rather than permitting continuous adjustment.

Clinical areas

Areas of the building in which medical functions are carried out that require specific restricted environmental conditions, affecting factors such as such as humidity, daylighting, temperature etc. (e.g. X-ray, operating department, delivery room etc.).

Effective flush volume

The effective flush volume of a single flush WC is the volume of water used for one flush. The effective flush volume of a dual flush WC is the ratio of full flush to reduced flush. This is taken to be one full flush for every three reduced flushes for non-domestic buildings and one full flush for every two reduced flushes in domestic (residential) buildings or areas. The effective flush volume can therefore be calculated as follows, using a 6/4 litre dual flush volume WC as an example:

- Non-domestic: {(6 litre × 1) + (4 litre × 3)}/4 = 4.5 litre effective flushing volume (for a 6/4 dual flush WC)
- Domestic: {(6 litre × 1) + (4 litre × 2)}/3 = 4.67 litre effective flushing volume (for a 6/4 dual flush WC).

The differing ratio between non-domestic and domestic buildings reflects the different patterns of user behaviour between these building types.

Where buildings have both domestic and non-domestic function areas, conduct the calculations accordingly for the WCs specified in the relevant spaces. For example, in a hotel building, for WCs in hotel rooms use the 'domestic' effective flush volume calculation and for WCs in staff areas use the 'non-domestic' calculation.

Green lease agreement

A green lease agreement is a contract that includes additional clauses which provide for the management and improvement of the environmental performance of a building by both owners and occupiers. To be acceptable for BREEAM a green lease agreement must cover all relevant BREEAM requirements and must be signed by both the lessor and the lessee or, where the lessee is unknown, a commitment must be provided by the client that the green lease agreement will be implemented when the building is let.

Greywater recycling

The appropriate collection, treatment and storage of waste water discharged from baths or showers, laundry rooms and similar to meet a non-potable water demand in the building, e.g. WC flushing, or other permissible non-potable use on the site of the assessed building.

Hydraulic filter efficiency

This recognises the efficiency of the hydraulic filter. Where the coefficient for the system is not known a default value of 90% may be used.

Non-potable water

Any water other than potable water, also referred to as unwholesome water.

Potable water

Water suitable for human consumption that meets the requirements of Section 67 (Standards of Wholesomeness) of the Water Industry Act 1991 is referred to as 'wholesome water'.

Rainwater recycling

The appropriate collection and storage of rainwater run-off from hard outdoor surfaces to meet a non-potable water demand in the building, e.g. WC flushing, or other permissible non-potable use on the site of the assessed building.

Surface yield coefficient

This recognises that some rainwater is lost due to splashing, evaporation, leakage, overflow and other factors and will vary depending on the surface from which the rainwater is collected. Where the coefficient for the system is not known a default value of 90% may be used.

Additional information

Limitations of water consumption calculation

The building water use calculation uses default usage and occupancy rates to provide a benchmark of the typical consumption based on the specified fittings (in litres/person/day and m^3/person/year). Due to differences between the actual user behaviour and occupancy rates compared to the default values, the results of the method will not reflect the actual water use during building operation. Therefore, the results from the methodology should not be used to predict actual water consumption from a non-domestic building.

European Unified Water Label

The European Unified Water Label is a scheme initiated by bathroom manufacturers across the globe and it provides a database of bathroom products of different levels of water efficiency. It includes products by multiple European bathroom manufacturers and can help project teams identify products appropriate for their specifications. Find out more at: uwla.eu

Wat 02 Water monitoring

Aim

To encourage the installation of water sub-meters and leak detection to ensure water consumption can be monitored and managed in use.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	1	Good	All
Shell and core	1	Good	All (see ref 1.0)
Shell only	1	Good	1 only

Assessment type specific notes

Ref	Assessment type specific note
1.0	**Shell and core** Criteria 2 to 4 only apply to water-consuming plant or building areas that are included within the scope of the development.

Building type specific notes

Ref	Building type specific note
-	None

Issue specific notes

Ref	Issue specific note
3.0	**No water supply to the building or unit** If there is no installed water supply to the assessed building (because there will be no water-consuming fittings in the building in use), this issue will be filtered out.

Assessment criteria

One credit – Water monitoring

1 A water meter with a pulsed or other open protocol output is installed on all potable water supplies entering the building.

2 Water-consuming plant or building areas with significant water demand must be fitted with easily accessible sub-meters or have water monitoring equipment that is integral to the plant or area.

3 There is a water monitoring system that is appropriate for the size of the building.

3.a For buildings with a gross internal area ≥ 1000 m^2, the water meters are connected to a monitoring and management system.

3.b For buildings with a gross internal area < 1000 m^2, the water meters are either:

3.b.i Connected to an appropriate water monitoring and management system.

3.b.ii Accessible meters with pulsed outputs or other open protocol communication outputs.

4 Those responsible for monitoring the building's water consumption must be able to clearly identify the water uses and areas covered by each meter.

Methodology

M1: Scope

The following potable water sources must be metered:

- Water supplied by network suppliers.
- Water supplied from private suppliers (including water supplied from a nearby building).
- Water supplies from boreholes.

Wastewater from blackwater, greywater, or rainwater collection systems are not metered for this issue.

M2: Significant water demand

The following water uses are deemed to be significant:

1. Swimming pools.
2. On sites with multiple units or buildings, e.g. shopping centres, apartment blocks, industrial units, retail parks etc. separate sub-meters are fitted on the water supply to the following areas (where present):
    a. For Residential buildings with multiple dwellings and Residential Institutions with multiple self-contained dwellings, each dwelling counts as a significant water use.
    b. Common areas (e.g., covering the supply to toilet blocks).
    c. Service areas (covering the supply to outlets within storage, delivery, waste disposal areas etc.).
    d. Ancillary or separate buildings to the main development with a water supply.
3. Laboratory: in any building with a laboratory (or containing laboratories), a separate water meter is fitted on the water supply to any process or cooling loop for plumbed-in laboratory process equipment.

All water consuming systems or building areas that are expected to account for more than 10% of the buildings total water demand must be considered when determining significant water uses.

Devise a water metering strategy that ensures that significant water uses in the building are separately monitored where it is technically feasible and cost effective to do so.

For this issue, metering is considered cost effective where the cost of installing a sub-meter is predicted to be fully recovered through the water cost savings arising from improved water management. This is over the expected lifetime of the building or system, whichever is shorter.

Examples where installing water metering may not be cost effective include:

1. Where a building has only one or two small sources of water demand (e.g. an office with sanitary fittings and a small kitchen).
2. Where the building has two sources of water demand, one significantly larger than the other, and the water consumption for the larger demand is likely to mask the smaller demand.

Compliance notes

Ref	Terms	Description
CN1	Extensions to existing buildings	For criteria 1, where a new extension does not have a separate water supply but connects to the water supply for the existing building, the water supply to the building must be metered at the whole building level or a sub-meter must be installed where the water enters the new part of the building. Any significant water uses in the new part of the building must be sub-metered in accordance with assessment criteria 2–4. The meters provided must have a pulsed

Ref	Terms	Description
		output or a connection to the existing water monitoring and management system in accordance with the assessment criteria.
CN2	Existing water monitoring and management system on the same site	If the site on which the building is located has an existing water monitoring and management system that is managed by the same occupier or owner (as the new building), the pulsed or digital water meters for the new building may be connected to the existing water monitoring and management system.
CN3	Remote monitoring systems	Remote monitoring and reporting services which report water consumption to the building user are acceptable in place of a separate water monitoring and management system.
CN4	Sub-metering by calculation / monitoring by difference	Direct meters may be used to estimate an unknown quantity by difference. For example, in a swimming pool with changing rooms: total water consumption is metered, and the swimming pool is metered. The difference between the two can be used to calculate water consumption for the changing rooms. Where a water monitoring and management system is used, the software should be capable of calculating and displaying all required end-uses in line with the criteria.
CN5	Shell and core buildings with capped services	Where a tenanted area within the building will have its own individual water supply and utility meter, this supply is excluded from assessment. All shared water supplies and common areas under the responsibility of building management must still be assessed.

Evidence

Criteria	Interim design stage	Final post-construction stage
All	Calculations and justification relating to the identification of significant water demands. The relevant sections or clauses of the building specification or contract. Design drawings or metering schematics.	Calculations and justification relating to the identification of significant water demands. Assessor's site inspection report and photographic evidence. OR Final construction drawings or equivalent. Where applicable, manufacturer's product details to confirm pulsed output.

Definitions

Accessible meters

Water meters located for easy access to allow regular monitoring and readings by building occupants or facilities managers. Typically, this will be a plant room, main distribution room, or control room where a water monitoring and management system is installed.

Common areas

Shared facilities, spaces, and access that are not owned or controlled by a tenant or occupier. These are typically managed and maintained by the development's owner or managing organisation. Examples include atria, stairwells, entrance foyers and external areas.

Pulse outputs or other open protocol communication outputs

A pulsed output meter generates an output signal when a specified amount of electricity, water, or gas passes through it.

Acceptable alternatives must meet or exceed the capabilities of a pulsed output meter.

The following metering standards or technologies are currently recognised as alternative to pulsed output meters:

— M-bus (i.e. systems that comply with the EN 13757 series of standards). Also includes systems complying with OMS (Open Metering System) standards.

Water meters

Devices that measure the amount of water used on a circuit while water is flowing.

Primary meters measure main incoming water and are used for billing by the utility supplier. They include the principal smart and advanced utility meters to a site for electricity and gas.

Sub-meters are installed to measure consumption by specific items of plant or equipment, or to discrete physical areas, e.g. individual buildings, floors, tenanted areas or function areas.

Water monitoring and management systems

A water monitoring and management system provides users with data about water consumption patterns in a building to facilitate informed water management decisions.

In addition to providing real time data on water consumption they may also flag faults in equipment and in some cases remotely activate or deactivate equipment. They may have the ability to provide performance indicators that can be used to measure performance against targets and provide real time alerts in instances where water use is unexpected such as equipment left on after hours.

Additional information

None.

Wat 03 Water leak detection and prevention

Aim

To reduce the impact of water leaks that may otherwise go undetected.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	2	None	1, 2 (see ref 2.0, 2.1, and 2.2)
Shell and core	2	None	1, 2 (see ref 1.0)
Shell only	1	None	1

Assessment type specific notes

Ref	Assessment type specific note
1.0	**Shell and core – WC area or facilities** The water supplies to WC areas or facilities must be assessed as per criterion 2 regardless of whether or not the WC areas or facilities are fitted out.

Building type specific notes

Ref	Building type specific note
2.0	**Healthcare** Flow control devices criteria are not applicable to toilet facilities in clinical areas.
2.1	**Residential institution** The credit for the specification of flow control devices in WC areas or facilities does not apply to ensuite facilities in residential areas. For example: ensuite facilities in individual private bedrooms and a single bathroom for a collection of individual private bedrooms in halls of residence, key worker accommodation or sheltered accommodation.
2.2	**Short term stay residential institutions (such as hotels)** The credit for the specification of flow control devices in WC areas in hotel rooms can be achieved through providing the required flow control devices to groups of 10 rooms, rather than to each individual room.

Issue specific notes

Ref	Issue specific note
3.0	Where a project under assessment will contain no installed fittings and therefore there is no water supply to the building this issue is filtered out.

Assessment criteria

One credit – Leak detection system

1 Install a leak detection system capable of detecting a major water leak:

1.a On the utilities' water supply within the building, to detect any major leaks within the building.

AND

1.b Between the building and the utilities' water supply, to detect any major leaks between the utilities' supply and the building under assessment.

One credit – Flow control devices

2 Flow control devices that regulate the supply of water to each WC area or facility according to demand are installed.

Methodology

M1: Leak detection system

The leak detection must be either:

1. A permanent automated water leak detection system that alerts the building occupants to any leaks.

   OR

2. An inbuilt automated diagnostic procedure for detecting leaks.

It must be:

- Activated when the flow of water passing through the water meter or data logger is flowing above a pre-set maximum rate for a pre-set period. This usually involves installing a system which detects higher than normal flow rates at meters or sub-meters. It does not necessarily require a system that directly detects water leakage along a part of or the whole length of the water supply system.
- Able to identify different flow and therefore leakage rates. For example: continuous, high or low level, over set time periods. Although high and low-level leakage rates are not specified, the leak detection equipment installed must have the flexibility to distinguish between them. This allows is to be programmed to suit the building type and owner / occupier's usage patterns.
- Programmable to suit the owner / occupier's water consumption criteria.
- Where applicable, designed to avoid false alarms caused by normal operation of large water consuming plant such as chillers.

Where there is physically no space for a leak detection system between the utilities water meter and the building, alternative solutions can be used, provided that a major leak can still be detected.

For all pipework which is the responsibility of the building owner or occupier leak detection is required between the building and the utilities water meter. This requirement is applicable regardless of the length of the pipework.

For campus type developments or those with multiple buildings on the same site served by common pipework, leak detection is required both within the building and externally for the length of pipework that exclusively serves that building.

M2: Flow control devices

Flow control systems may control combined WC areas, such as male and female toilets within a core; they are not required for each individual sanitary appliance. However, all WCs must have either individual or block and group flow controls. The criteria are set to encourage the isolation of the water supply to each WC block when not in use.

The flow control criterion for this issue does apply to facilities which have only a single WC (potentially within smaller or low occupancy buildings). In these instances shut-off could be provided via the same switch that controls the lighting (whether proximity detection or a manual switch).

The following types of flow devices meet the criteria:

- 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 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 that switches water on and off, depending on the detection of occupancy or movement.
- A central control unit, i.e. a dedicated computer-based control unit for the overall management of a water control system, utilising some or all the types of control elements listed above.

Compliance notes

Ref	Terms	Description
CN1	Water utilities' meters	Where there is a water utilities' meter at the site or building boundary, it may be necessary to install a separate flow meter (or alternative measurement system) just after the utility meter to detect leaks; however, if the water utility company agrees to some form of leak detection being installed on their meter, this would also be acceptable.
CN2	Extensions to existing buildings	If the water supply to the new extension is via the existing building, then the water supply to the existing building must be assessed against the criteria of this issue.
CN3	Building safety-critical systems, such as sprinklers and fire hydrants	For building safety-critical systems, such as sprinklers and fire hydrants, it may not be possible to fully meet the criteria. Where this is confirmed by an appropriate project team member, alternative approaches can be used. These must show how they meet the aim of the issue by detecting and alerting building management to major leaks.

Evidence

Criteria	Interim design stage	Final post-construction stage
All	The relevant sections or clauses of the building specification or contract. Design drawings or metering schematics. Where available, manufacturer's product details.	Assessor's site inspection report and photographic evidence. Final construction drawings or equivalent. Manufacturer's product details.

Definitions

Clinical areas

Areas of the building in which medical functions are carried out that require specific restricted environmental conditions, affecting factors such as humidity, daylighting, temperature etc. (e.g. X-ray, operating department, delivery room etc.).

WC areas or facilities

WC areas or facilities refers to cold water supply to taps, WCs, and urinals. The water supply system must not allow the cold water to automatically switch off in the showers while the hot water is still running to avoid scalding from hot water.

Additional information

None.

Wat 04 Water efficient equipment and systems

Aim

To recognise and encourage the procurement of water efficient equipment and systems for applications other than sanitary use in new buildings to reduce water consumption in operation.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	up to 3	None	All (see ref 3.0)
Shell and core	up to 3	None	All (see ref 3.0)
Shell only	0	None	Not applicable

Assessment type specific notes

Ref	Assessment type specific note
-	None

Building type specific notes

Ref	Building type specific note
-	None

Issue specific notes

Ref	Issue specific note
3.0	This issue will be filtered out where there are no systems and equipment that use significant amounts of water for non-sanitary purposes.

Assessment criteria

Up to three credits – Water efficient equipment and systems

1 Identify systems and equipment that use significant amounts of water for non-sanitary uses that are included in the project specification (see M1).

2 Determine the ratio of in-scope non-sanitary water consumption to sanitary water consumption to determine the number of credits available, see Table 8.4 below.

Table 8.4: Credits available in Wat 04

In-scope non-sanitary water consumption / sanitary water consumption (%)	Credits available
No in-scope equipment or systems OR Water consumption of in-scope equipment and systems is not significant	0
< 20%	1
≥ 20%	2
≥ 40%	3

3 Demonstrate installed non-sanitary water-using systems and equipment are water efficient (see M2).

4 Determine the number of credits awarded based on the percentage of non-sanitary water demands that are provided by water efficient equipment, see Table 8.5 below.

Table 8.5: Credits awarded in Wat 04

Percentage of in scope non-sanitary water consumption that is provided by water efficient equipment	Percentage of available credits awarded
5–20%	20%
> 20–40%	40%
> 40–60%	60%
> 60–80%	80%
≥ 80%	100%

Methodology

M1: Scope of non-sanitary water-using systems and equipment

The scope of this issue includes water-using systems and equipment within the curtilage of the building that are not assessed under Wat 01 Water consumption.

This includes but is not limited to:

- Swimming pools
- Recreational hot tubs and hydrotherapy pools
- External planting
- Water features
- Vehicle wash stations
- Cooling towers
- Systems that use water for cooling or heating
- Other systems and water-using components with an estimated water consumption of 1000 litres per year or more.

Unless one or more of the following conditions apply:

1. They are part of an industrial process.
2. They provide temporary services.
3. They are only used when maintenance work is being carried out.
4. They are only used in an emergency.
5. There are overriding safety, security or accessibility requirements that prevent water efficiency criteria being met by any relevant compliance routes.

Water-using systems and equipment for non-sanitary water uses may be excluded from the assessment where the additional cost of procuring water efficient systems or equipment is expected to exceed the cost savings from reduced water consumption over the lifetime of the system or equipment. This is more likely to be the case for items with low annual water consumption.

M2: Estimating non-sanitary water used by in-scope systems and equipment

Water consumption estimates may be derived from engineering calculations, data for similar projects, benchmarks or other approximate estimation methods.

For example, a simple engineering calculation for a swimming pool might take account of the surface area of the pool and the evaporation rate, which will be determined by the difference between the water temperature and the air temperature and the ventilation rate.

The estimated annual water consumption for each in-scope system or type of equipment must be entered in the BREEAM Platform.

At the pre-assessment stage, the number of credits available may be estimated by entering a rough estimate of the total water consumption for all in-scope systems and equipment. This must be replaced by estimates of the water consumption for each system or item of equipment before the assessment is submitted.

M3: Determining the number of credits available

The methodology for calculating annual water consumption for in-scope non-sanitary water-using equipment and systems is described in M2.

Where predicted water consumption calculations have been undertaken, the annual sanitary water consumption should be calculated in accordance with Wat 05. Otherwise, the annual sanitary water consumption calculated for Wat 01 may be used.

The ratio of in-scope non-sanitary to sanitary water consumption is calculated as:

$$\frac{\textit{Total annual non-sanitary water consumption for all in-scope systems and equipment}}{\textit{Annual water consumption for sanitary water uses}} \times 100$$

This is used to determine the number of credits available according to Table 8.4 on page 245.

M4: Demonstrating water efficiency

There are two routes for determining whether an item of equipment or system is water efficient:

1. Where the equipment or systems are more water efficient than that of a standard version of the equipment or system (see M4.1).

   OR

2. Where the equipment or system meets specific “deemed to comply” water efficiency requirements (see M4.2).

Deemed to comply water efficiency requirements are only provided for some types of systems and equipment.

Where deemed to comply requirements exist, the water efficiency compared to a standard version of the system or equipment may be used to demonstrate compliance with this issue.

M4.1: Demonstrating water efficiency compared to a standard version of the system or equipment

The reduction in water consumption must be calculated based on the expected annual water consumption for the actual system or item of equipment compared to annual water consumption of a standard system or item of equipment. In both instances, the system or item of equipment must meet the same water service demand.

A standard item of equipment is defined as having a water efficiency that is typical for that type of equipment. This means that it has:

— Water-using components with water efficiency that is typical for the component types.

— Water efficient features and controls that are typical for the system type.

— Not been designed to optimise water consumption.

The performance of a standard version of a system or equipment type might be determined based on a non-exhaustive search for systems or products of the same type.

To demonstrate that the actual equipment or system procured is more water efficient than the standard version, show that the performance of the actual equipment or system achieves a meaningful reduction in water consumption compared to the standard version.

Where technical data on both the actual and standard version of the system is readily available, this should be used to calculate the percentage reduction in water consumption. This calculation, alongside justification for both the selection of the standard product and the acceptance of the achieved percentage reduction over the standard product as meaningful, should be provided in each case to demonstrate that a given system is water efficient.

Note: The percentage reduction in water consumption does not impact the number of credits awarded.

M4.2: Deemed to comply requirements for water-using systems and equipment

Deemed to comply requirements for specific non-sanitary water-using systems and equipment are listed in Table 8.6 on the next page.

Table 8.6: Deemed to comply requirements for non-sanitary water-using systems and equipment

Type of system or equipment	Requirements
Swimming pools	Automatic or semi-automatic pool covers, or 'liquid' pool covers with an automatic dosing system, are fitted to the entire pool surface area. AND For indoor pools: The air temperature in the pool hall can be controlled so that it is 1°C above the water temperature. OR For outdoor pools: Wind barriers, such as fencing, rocks, or shrubbery are used to reduce evaporation.
Recreational hot tubs and hydrotherapy pools	Automatic or semi-automatic pool covers, or 'liquid' pool covers with an automatic dosing system, are fitted to the entire pool surface area.
Planting and landscaping	Watering is by a controlled irrigation system that uses local weather data or soil moisture sensors. OR Reclaimed or recovered water from a rainwater collection or waste-water recovery system with appropriate storage, i.e. greywater collection from building functions or processes that use potable water, e.g. vehicle wash, sanitary facilities, irrigation etc. is used in preference to other water sources. OR External landscaping and planting that relies solely on precipitation, during all seasons of the year once the planting has been established (see CN1).
Water features such as decorative fountains	Automatic switch off during unoccupied hours. OR Wind barriers, such as fencing, rocks, or shrubbery are used to reduce evaporation.
Vehicle wash stations	Fitted with a water recycling system. OR Uses rainwater or waste-water.
Cooling towers	Automatic blowdown control which regulates when blowdown is discharged. OR Fitted with a windbreak, floating covers, or other types of enclosure.
Systems that use water for cooling or heating	Uses a closed loop water circulation system.

M5: Determining the number of credits achieved

The total annual water consumption of in-scope equipment is determined based on the estimated water data entered in the BREEAM Platform, as described in M2.

Where equipment is demonstrated to be water efficient in accordance with M4, this should be indicated in the BREEAM Platform.

The number of credits achieved is calculated in the BREEAM Platform as follows:

$$\frac{\textit{Total annual non-sanitary water consumption by in-scope systems and equipment that is water efficient}}{\textit{Total annual non-sanitary water consumption by in-scope systems and equipment}} \times \textit{number of credits available}$$

Compliance notes

Ref	Terms	Description
CN1	Temporary irrigation systems	Temporary watering arrangements set up purely to allow plant species or a green roof to establish are acceptable for plants relying on natural precipitation during all seasons of the year. Where this is the case, the ecologist's report must confirm the plant species and the expected time for recommended plant species to establish themselves i.e. time period for temporary watering arrangements.
CN2	Manual watering	Where the design team can justify that manual watering provides a reduction in

Ref	Terms	Description
		unregulated water consumption, this can be considered as an acceptable method for reducing unregulated water use.

Evidence

Criteria	Interim design stage	Final post-construction stage
1	Design drawings, relevant sections of the building specification, schedules or other documentary evidence identifying all water demands from uses other than domestic scale drinking and sanitary use components, as per M1. Where items with low annual water consumptions have been excluded from the scope due to the cost of replacement, this must be stated and justified.	Final construction drawings or equivalent, assessor site inspection report and photographic evidence or other documentary evidence to verify all water demands from uses other than domestic scale drinking and sanitary use components, as per M1, that have been installed. Where items with low annual water consumptions have been excluded from the scope due to the cost of replacement, this must be stated and justified.
2	Calculations and data sources used to demonstrate the estimated annual water consumption of systems and equipment, as per M2 and M3.	Final calculations and data sources used to demonstrate the estimated annual water consumption of installed systems and equipment, as per M2 and M3.
3	Where compliance demonstrated by comparison to a standard version of the system or equipment, acceptable evidence sources include: — Written justification for the selection and benchmarking of the standard product based on reasonable assumptions or basic market research. — Specific clauses from reports or manufacturer's literature relating to the water consumption of the actual product. — Specific clauses from reports or manufacturer's literature relating to the water consumption of the standard product. Plus: — Where available, calculations showing that the actual product is more water efficient than the standard product. Where a percentage reduction in water consumption has been accepted as signifying a meaningful reduction in water efficiency, then this should be stated and justified. Where this is demonstrated by meeting the deemed to comply requirements within Table 8.6, acceptable sources of evidence include: — Relevant sections of the building specification, systems or equipment schedules or contract clauses. — Where products are specified,	Where compliance demonstrated by comparison to a standard version of the system or equipment, acceptable evidence sources include: — Manufacturer's literature relating to the water consumption of the actual installed systems or equipment — Final construction drawings / equipment schedules or equivalent, assessor site inspection report and photographic evidence or proof of purchase to verify installed systems or equipment. Plus: — Calculations showing that the actual product has a lower water consumption than the standard product. Where a percentage reduction in water consumption has been accepted as signifying a meaningful reduction in water efficiency, then this should be stated and justified. Where compliance is demonstrated by meeting the deemed to comply requirements, acceptable evidence sources include: — Final construction drawings / equipment schedules or equivalent, assessor site inspection report and photographic evidence or proof of purchase to verify installed systems or equipment.

Criteria	Interim design stage	Final post-construction stage
	manufacturer's product details confirming they meet the deemed to comply requirements.	— Manufacturer's literature showing the equipment includes the deemed to comply requirements.

Definitions

Non-sanitary water uses

All operational water uses within the curtilage of the building **except** for:

- WCs/toilets
- Urinals
- Taps (on wash-hand basins, kitchen sinks, and waste disposal units)
- Showers
- Baths
- Dishwashers (domestic and commercial-sized)
- Washing machines (domestic and commercial sized).

Vehicle wash station

A commercial-scale automatic, semi-automatic, or manual system for washing vehicles. This includes wheel and chassis wash, fixed gantry and screen wash systems using brushes, spray or handheld jet hoses.

Additional information

None.

Wat 05 Prediction of operational water consumption

Aim

This issue encourages and rewards estimating operational water consumption in use, the setting of a water performance target and commitment to measure operational water consumption in use.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	1 + 1 exemplary	None	All
Shell and core	1 + 1 exemplary	None	All
Shell only	0	None	Not applicable

Assessment type specific notes

Ref	Assessment type specific note
-	None

Building type specific notes

Ref	Building type specific note
-	None

Assessment criteria

One credit – Predict operational water consumption

1 Estimate the annual operational water consumption for the building.

One exemplary credit – Disclosing an in-use water performance target and commitment to measure water consumption in-use

2 Achieve the credit for predicting operational water consumption.

3 Achieve maximum available credits in Wat 02 Water monitoring.

4 An in-use water performance target has been disclosed to stakeholders and been made publicly available prior to practical completion.

5 The client or building occupier commits funds to pay for in-use water consumption measurement and reporting once the building is occupied. This requires a suitably qualified individual or organisation to be appointed and to measure and report on the actual in-use operational consumption.

Methodology

M1: Estimating annual operational water consumption

The data on sanitary water-using components entered in the BREEAM Platform to calculate the number of credits awarded for Wat 01 is used to estimate sanitary water consumption for the building.

In Wat 01 standard occupancy assumptions are used to calculate the annual water consumption for sanitary water-using components. However, for this issue, the expected actual occupancy pattern for the building should be used to determine annual sanitary water consumption.

To facilitate this the following parameters must be entered into the BREEAM Platform.

- Number of occupied days per year
- Average number of occupiers per day
- Average occupancy hours per day

Where the intended occupier is known, this information should be obtained from the intended occupier, for example through structured interview.

Where no intended occupier has been identified, the occupancy patterns must be based on that of a similar project or a typical value for the building type.

The water consumption for non-sanitary water uses is estimated, identifying any systems and equipment that will need to be installed in the building when it is operational.

Like Wat 04, the scope of this issue includes water-using systems and equipment within the curtilage of the building that are not assessed under Wat 01 Water consumption.

This includes but is not limited to:

- Swimming pools
- Recreational hot tubs and hydrotherapy pools
- External planting
- Water features
- Vehicle wash stations
- Cooling towers
- Systems that use water for cooling or heating
- Other systems and water-using components with an estimated water consumption of 1,000 litres per year or more.

Unless one or more of the following conditions apply

1. They are part of an industrial process.
2. They provide temporary services.
3. They are only used when maintenance work is being carried out.
4. They are only used in an emergency.
5. There are overriding safety, security or accessibility requirements that prevent water efficiency criteria being met by any relevant compliance routes.

Unlike Wat 04, all other water-using systems and equipment should be included for this issue, even where procuring water efficient systems and equipment would not be cost effective.

The estimates of water consumption can be based on typical benchmarks, simplified engineering calculations, data from similar projects, manufacturers data, or on any other reasonable assumptions.

The predicted water consumption for sanitary water uses and non-sanitary water uses must be entered into the BREEAM Platform.

For items assessed under Wat 04, the same evidence may be used for this issue, but for other items the estimated annual water consumption for each non-sanitary water-using systems or equipment must be entered In the BREEAM Platform.

M2: Disclosing an in-use water performance target

The water target should be expressed as an annual water intensity normalised by floor area and per person.

The scope of water uses included in the target must be explicitly stated, for example, whole building or core building services and common areas only.

In all cases the floor metric must be defined, for example GIA or NIA.

This information must be provided to building stakeholders e.g., prospective owners and occupiers of the building and be accessible to members of the public.

M3: Commitment to measure in-use water consumption

The funding for in-use water consumption measurement must be sufficient to cover monitoring of water consumption for the first 12 months once the building reaches the 80% occupancy threshold. Compare these to the predicted water consumption and any water targets set for the building.

This could be demonstrated by undertaking a BREEAM In-Use assessment of water consumption under Part 2.

Compliance notes

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
Predict operational water consumption		
1	Documentation detailing all water-using components and equipment as identified in line with M1, such as specifications, design drawings or schedules. Calculations and data sources used to confirm the overall estimated annual operational water consumption for the building. Where known, manufacturer's product details.	As built documentation detailing all water-using components and equipment as identified in line with M1, such as final construction drawings or schedules. Final calculations and data sources used to confirm the overall estimated annual operational water consumption for the building including manufacturer's product details.
Disclosing and in-use water performance target		
4	Commitment from client to disclose the in-use water performance target to building stakeholders and members of the public. This should include what the target is, the scope of the water uses included and how this information will be made available.	Confirmation of the in-use water performance target, updated as required. Evidence to confirm how this has been made available to building stakeholders and members of the public, such as weblinks or other publicly accessible format.
Commitment to measure water consumption in use		
5	Confirmation from the client that funds have been committed to pay for in-use water consumption measurement and reporting.	Appointment of a suitably qualified individual or organisation, or BREEAM Assessor where BREEAM In-Use Part 2 is proposed.

Definitions

Curtilage

The land surrounding a building that a developer or owner is responsible for.

Non-sanitary water uses

All operational water uses within the curtilage of the building **except** for:

- WCs/toilets
- Urinals
- Taps (on wash-hand basins, kitchen sinks, and waste disposal units)
- Showers
- Baths

- Dishwashers (domestic and commercial-sized)
- Washing machines (domestic and commercial sized).

Occupancy threshold

This is determined based on the % floor area (GIA) that is in occupation.

Operational water consumption

This includes both sanitary and non-sanitary water uses.

Sanitary water uses

This covers water used by the following water-using components:

- WCs/toilets
- Urinals
- Taps (on wash-hand basins, kitchen sinks, and waste disposal units)
- Showers
- Baths
- Dishwashers (domestic and commercial-sized)
- Washing machines (domestic and commercial sized).

Suitably qualified individual or organisation

An individual or organisation with experience of carrying out water audits or in-use building performance assessments in accordance with legislation or voluntary measurement and reporting standards

Vehicle wash station

A commercial-scale automatic, semi-automatic, or manual system for washing vehicles. This includes wheel and chassis wash, fixed gantry and screen wash systems using brushes, spray or handheld jet hoses.

Additional information

None.

Materials

Summary

This category encourages decisions which reduce the environmental and social impact of construction products used on a project. It takes a 'whole life cycle' approach to construction product impacts, encouraging consideration of impacts during manufacture, design, procurement, installation, in-use and end-of-life. The issue focuses on construction product efficiency, environmental impact, responsible sourcing and product durability.

Assessment issues

Mat 01 Building life cycle assessment	up to 7 credits + 3 exemplary
Mat 02 Environmental product declarations	1 credit
Mat 03 Responsible sourcing of construction products	4 credits + 1 exemplary
Mat 04 Durability and resilience	1 credit
Mat 05 Material efficiency	1 credit

Mat 01 Building life cycle assessment

Aim

To optimise the use of materials and reduce the environmental burden of construction products over the life cycle of the building.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	up to 7 + 3 exemplary	Excellent, Outstanding	All (see ref 2.0)
Shell and core	up to 7 + 3 exemplary	Excellent, Outstanding	All (see ref 2.0)
Shell only	up to 5 + 2 exemplary	Excellent, Outstanding	1–6, 8–10 (see ref 1.0)
EU Taxonomy	-	-	1–9 (see M4)

Assessment type specific notes

Ref	Assessment type specific note
1.0	**Shell only** The credits for embodied carbon benchmark comparison do not apply to shell only assessments (criterion 7).

Building type specific notes

Ref	Building type specific note
2.0	**Embodied carbon benchmark** Benchmark credits apply to the following building types: — Industrial — Office — Education — Retail — Residential institution — Healthcare — Culture & Entertainment — Prisons
2.1	**Mixed use buildings (benchmark)** Where the assessed building is mixed use, the floor area for different building uses should be entered into the BREEAM Platform. This is to enable comparison with a floor area weighted benchmark.
2.2	**Part new build, part refurbishments** All criteria relevant to the building type and function apply.

Assessment criteria

Two credits – Early design LCA and embodied carbon reporting

1 Carry out an early design phase LCA calculation from the materials that the project incorporates into the building. The LCA must:

1.a Meet the requirements for tools and scope given in M1.

1.b Include relevant options appraisals, including a baseline assessment. There are no requirements to carry out a specific number of options appraisals for the project.

1.c Be used as a basis for choosing design solutions and materials with the aim of achieving a low environmental impact. If an alternative solution with a lower environmental impact has not been chosen, then this must be justified.

2 From the early design LCA results (criterion 1), report the embodied carbon emissions from materials used in the building. Results must be reported using the BREEAM Platform. To ensure consistency follow the requirements in M2.

One credit – Technical design LCA and embodied carbon reporting

3 Carry out a technical design phase LCA calculation from the materials that the project incorporates into the building. The LCA must:

3.a Meet the requirements for tools and scope given in M1.

3.b Include at least one assessment showing the evolving design and specification at technical design.

4 From the technical design LCA results (criterion 3), report the embodied carbon emissions from materials used in the building. Results must be reported using the BREEAM Platform. To ensure consistency follow the requirements in M2.

Two credits – Post-construction LCA and embodied carbon reporting

5 Carry out a post-construction phase LCA calculation from the materials that the project incorporates into the building. The LCA must:

5.a Meet the requirements for tools and scope given in M1.

5.b Include as-built specification at post-construction.

6 From the post-construction LCA results (criterion 5), report the embodied carbon emissions from materials used in the building. Results must be reported using the BREEAM Platform. To ensure consistency follow the requirements in M2.

Up to two credits (plus one exemplary credit) – Embodied carbon benchmark comparison

7 For relevant assessment and building types, compare the calculated embodied carbon emissions (modules A1-A5, B1-B5, C1-C4) against the benchmark (see Table 9.1). The comparison against the benchmark must use the latest embodied carbon calculation available:

7.a For interim design stage assessment:

7.a.i Technical design LCA

7.b For final post-construction stage assessment:

7.b.i Post-construction LCA

Table 9.1: Number of credits achieved for each benchmark band

Benchmark band	Credits
A	2 credits + 1 exemplary credit
B	2 credits
C	
D	1 credit
E	
F	0 credits
G	
Benchmark not applicable	Credits filtered out

Benchmark values in $kgCO_2e/m^2$ for each band and building type are provided in the BREEAM Platform.

One exemplary credit – Third party verification

8 A suitably qualified third party verifies the building LCA work. The suitably qualified third party must:

8.a Produce a report describing how they have checked that the building LCA work accurately represents the designs under consideration during the:

8.a.i Early design phase, and

8.a.ii Technical design phase, and

8.a.iii Post-construction phase (only relevant if criteria 5 to 6 have been targeted)

8.b Itemise in the report the checks made for each LCA option. As a minimum, this must include the quality requirements shown in Table 9.2 in M3.

8.c Include in the report details of their relevant skills and experience and a declaration of their third-party independence from the project client and design team.

9 Any recommendations in the third-party verification report must be resolved and evidenced.

One exemplary credit – Embodied carbon public data disclosure

10 For each project phase where an LCA has been conducted, submit the LCA or carbon results and data to a relevant publicly available LCA or carbon database. If suitable local or national options are not available, submit to the Built Environment Carbon Database (BECD).

Methodology

M1: LCA and embodied carbon methodology and scope

The following sets out the minimum requirements and the scope of the LCA and embodied carbon calculations. For further guidance on the information below, please refer to Guidance Note 51.

M1.1: Tools

The project must use an LCA tool recognised by BREEAM. A list of these can be found in KBCN1118. These are LCA tools that are technically evaluated and deemed suitable for carrying out building LCA for this issue. Where a project team is considering using a building LCA tool that is not yet recognised by BREEAM, the assessor shall contact BRE as soon as possible to initiate the evaluation process. This process requires time and a fee, as well as the involvement and evidence from the tool owner.

To apply for a new tool to be evaluated, please contact: breeam@bregroup.com.

M1.2: Project stages

During design stage certification, credits are awarded for completing LCA / embodied carbon calculations during the early design phase (you must complete and submit the LCA to BREEAM within 20 working days after submitting for planning application) and technical design phase. During post-construction stage certification, the LCA / embodied carbon calculations should be updated to reflect as-built data.

M1.3: Environmental indicators

Results must be submitted for all core environmental impact indicators that the tool or data permits. Indicators specified in EN 15978(90) and EN 15804(91) must be used. All BREEAM recognised LCA tools comply with EN 15978 and EN 15804 and offer a suitable range of indicators for reporting. There is no requirement for this to be submitted in a specific format as long it includes all the relevant indicators.

M1.4: Life cycle stages

The following life cycle modules must be covered (based on EN 15978):

- Modules A1–A5: Product sourcing and construction stage.
- Modules B1–B5: Use stage (excluding B6–7).
- Modules C1–C4: End-of-life stage.
- Module D: Considering benefits and loads beyond the system boundary. This is required unless EN 15804-A2 EPD data is not available for used products.

M1.5: Building elements

All building elements as set out in the BREEAM Platform that are within the scope of the assessment type must be included in any compliant LCA, whatever the project phase. The elemental breakdown structure of building elements is derived from RICS NRM 1 classification system level 2 and aligns with RICS Whole Life Carbon Assessment Standard, 2nd Edition. All BREEAM-recognised LCA tools automatically produce outputs aligned with the correct building elements.

M2: Embodied carbon reporting

To ensure consistency in reporting, embodied carbon data must be completed in the BREEAM Platform:

— Modules A1–A5, B1–B5, C1–C4 must be reported.

— Submit results in kilograms of CO_2e per square metre ($kgCO_2e/m^2$).

— For area measurements, use the Gross Internal Area (GIA) in square metres (m^2).

— Modules A1–A3 may be reported together.

— When possible, and if the tool used allows for it, report biogenic carbon from construction products (negative value) separately.

— Module D is required unless EN 15804-A2 EPD data is not available for used products.

M3: Third party verification

For each LCA option, itemise in the report the checks made by the suitably qualified third party including, as a minimum, the quality requirements shown in Table 9.2 below. Additionally, the report should include an executive summary of the third-party verification findings.

The recommended best practice would be to conduct the third-party LCA verification at the end of each project stage, however this is not mandatory. It is, for example, acceptable for these to be verified as a single exercise, following post-construction. The third-party verification exemplary credit can still be achieved if the post-construction credits are not targeted (criteria 5 to 6). In this instance, verification only needs to be done at early design and technical design phase.

Table 9.2: LCA quality requirements

Item	Early design	Technical design	Post-construction
1. Elemental construction quantities	Estimates based on elemental benchmarks or design documents at early design stage.	Calculated quantities shown in design documents at technical design stage.	As-built quantities.
2. LCA or EPD data type	Generic or manufacturer specific data if specified.	In order of preference, the selection should go like this: 1. Product EPD from the manufacturer of the specific product you are planning to use, if available. 2. Generic data.	In order of preference, the selection should go like this: 1. Product EPD from the manufacturer of the specific product you used, if available. 2. Generic data.
3. Product quantities (mass per unit of elemental construction)	Typical or generic values. Generic (non-project specific) elemental constructions may be used.	± 10% of quantities shown in design documents at technical design stage. All elemental constructions shall be created from individual products.	As built quantities.
4. Product transportation distances		Typical or generic values. Project-specific distances may be used where known.	Actual transport distances.
5. Product service lives		Typical or generic values or a reasonable estimate for the actual installation scenario.	Prediction of scenarios based on specific as-built data.
6. Site wastage	Typical or generic values.	Typical or generic values or a	Actual site wastage.

Item	Early design	Technical design	Post-construction
		reasonable estimate.	
7. Site energy/water	Typical or generic values.	Typical or generic values or a reasonable estimate.	Actual site energy and water quantities.
8. Completion	Ensure all materials captured in modelling within site red line boundary and EN 15978 / EN 15941 cut-off rules applied (missing items must not add to more than 5% of mass)		
9. Study period	50 years	50 years	50 years
10. Recommendations	Ensure that the design team has provided feedback on design options and that these are documented.		-
11. Assumptions	Ensure that assumptions are clearly documented, including any data proxies, quantity and calculation assumptions and exclusions.		
12. Comparison with benchmark	Check that the benchmark comparison seems reasonable, large deviations from the benchmarks could be a sign of modelling errors, with under or over estimations.		
13. Outputs from LCA report	Results must be reported separately for each environmental indicator included. Modules A1–A5, B1–B5, C1–C4 must be reported (modules A1–A3 may be reported together). There is no requirement for the third-party LCA verification report to be submitted in a specific format as long it includes all the relevant information.		
14. GIA	Check modelled GIA is as referenced/calculated in design documentation. For offices, net internal area (NIA) can also be used as a secondary normalisation metric.		
15. Timing	Ensure that the LCA was completed at the correct time for the relevant life cycle stage.		

M4: EU Taxonomy

In addition to criteria 1–9, to fully comply with EU Taxonomy requirements, it will need to be confirmed that the following requirement has also been addressed:

- For buildings larger than 5000 m², the life-cycle Global Warming Potential (GWP) of the building resulting from the construction has been disclosed to investors and clients on demand.

Compliance notes

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
LCA and embodied carbon reporting		
1, 3	A copy of the LCA results or output report from the tool including all the requirements specified in M1. For the early design phase: Relevant options appraisals and baseline assessment. Evidence to demonstrate how the LCA has influenced the design.	No further actions required post-construction; no additional evidence is required other than that listed for the design stage.
2, 4	In the BREEAM Platform, report and submit the embodied carbon data for the early design phase and the technical design phase.	No further actions required post-construction; no additional evidence is required other than that listed for the design stage.
5	Relevant section or clauses of the Employer's Requirements, contract documentation or a letter of commitment from the client or developer to complete a LCA on the as-built specification at post-construction.	A copy of the LCA results or output report from the tool including all the requirements specified in M1.
6	Relevant section or clauses of the Employer's Requirements, contract documentation, or a	In the BREEAM Platform, report and submit the embodied carbon data for the post-

Criteria	Interim design stage	Final post-construction stage
	letter of commitment from the client or developer to report the embodied carbon at post-construction.	construction phase.
Embodied carbon benchmark comparison		
7.a	The BREEAM Platform will calculate this automatically based on the evidence provided for criterion 4.	No further actions required post-construction; no additional evidence is required other than that listed for the design stage.
7.b	Relevant section or clauses of the Employer's Requirements, contract documentation or a letter of commitment from the client or developer to complete a benchmark comparison of the embodied carbon at post-construction.	The BREEAM Platform will calculate this automatically based on the evidence provided for criterion 6.
Third-party verification		
8, 9	Third-party report including all the requirements as per M3 with early design phase and technical design phase data. Evidence to confirm it was completed by a suitably qualified third party. Relevant section of the building specification or contract clauses or letter of commitment to carry out a third-party verification of the LCA at post-construction.	Third-party report including all the requirements as per M3 with post-construction phase data. Evidence to confirm it was completed by a suitably qualified third party.
Embodied carbon public data disclosure		
10	Confirmation of registration and data submission from the relevant database for the early design phase and the technical design phase. Relevant section or clauses of the Employer's Requirements, contract documentation or a letter of commitment from the client or developer to register and submit data for the post-construction phase.	Confirmation of registration and data submission from the relevant database for the post-construction phase.
EU Taxonomy		
M4	For buildings over 5000 m², commitment to disclose the life-cycle Global Warming Potential (GWP) of the building to investors and clients on demand.	For buildings over 5000 m², evidence to support that the life-cycle Global Warming Potential (GWP) of the building is available to be disclosed to investors and clients on demand.

Definitions

Baseline assessment

A baseline LCA provides an initial assessment for comparison with subsequent assessments, facilitating the effective tracking of the project's environmental impacts as it advances through different phases.

BREEAM embodied carbon benchmark

A BREEAM benchmark to represent the average (mean) embodied carbon impact of a given building type and used for scoring this issue. It is expressed in kilograms of CO_2e per square metre ($kgCO_2e/m^2$). It is calculated by taking a sample of buildings of a given use type, dividing each building's embodied carbon impact ($kgCO_2e$) by its functional quantity (m² of GIA), then working out the average of these results. Embodied carbon benchmarks include modules A–C (excluding B6–7).

Embodied carbon

The 'embodied carbon' emissions of an asset are the total GHG emissions and removals associated with materials and construction processes throughout the whole life cycle of an asset (Modules A1-A5, B1-B5, C1-C4).

Environmental Product Declaration (EPD)

For BREEAM compliance, an independently verified environmental label (i.e. ISO Type III label) according to the requirements of ISO 14025(92).

Options appraisals

Options appraisals or optioneering involves evaluating potential options to determine the most favourable solution, particularly during the early design phase. Partial LCAs can be conducted at this stage, focusing on major elements like structural components, to compare environmental impacts before final decisions are made. It is also important that a full project LCA is done during the early design phases to see where further improvements can be found at a strategic level while the design is still sufficiently flexible.

RICS New Rules of Measurement (NRM)

A standard set of measurement rules and guidance for the cost management of construction projects and maintenance works. For more information, visit www.rics.org.

Suitably qualified third party

For third-party verification, the verifier must demonstrate the following expertise and experience:

1. Knowledge of LCA sector including the following standards:
    a. BS EN 15978 *Sustainability of construction works. Assessment of environmental performance of buildings.*
    b. ISO 14040/14044

    This can be demonstrated by completing an appropriate training course. Examples of some available training courses are provided in Additional information below.
2. Completion or verification of five different LCAs for paying customers in the last 2 years.
3. Knowledge of LCA data and EPDs.
4. Knowledge of regulations surrounding LCA and embodied carbon.

The verifier must include a CV demonstrating their experience and knowledge against the above requirements.

Third party

"A person or body that is recognised as being independent of the parties involved, as concerns the issue in question" (BS EN 15804:2012+A1:2013).

The third-party verifier must be independent of the LCA assessor and demonstrate impartiality (for general principles, see ISO 17029). To qualify as a third party, the verifier must belong to an organisation not involved in the project and must not provide advice to the project, as this could compromise their impartiality during verification.

Additional information

Additional guidance on LCA and whole life carbon

- RICS Whole life carbon assessment (WLCA) for the built environment, 2nd Edition
- LETI Embodied Carbon Primer

Examples of relevant LCA training courses

- CIBSE Lifecycle Carbon Assessment (LCA) Foundation Training
- Circular Ecology: Life Cycle Assessment (LCA) Training Course
- One Click LCA: Construction LCA Bootcamp
- RICS: Certificate in Whole Life Carbon Assessment Training Programme

Mat 02 Environmental product declarations

Aim

To encourage availability of robust and comparable data on the impacts of construction products through the provision of environmental product declarations (EPD).

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	1	None	All
Shell and core	1	None	All
Shell only	1	None	All

Assessment type specific notes

Ref	Assessment type specific note
-	None

Building type specific notes

Ref	Building type specific note
-	None

Assessment criteria

One credit – Product specification

1 Specify construction products with EPDs that achieve a total EPD points score of at least 20, according to M1.

2 Enter the details of each EPD in the BREEAM Platform, including the material category classification. The EPD points score and the number of credits achieved will be calculated automatically.

Methodology

M1: Total EPD points score methodology

In the BREEAM Platform, the total EPD points score shall be calculated as follows:

1. For each EPD, find and select the applicable material classification for the construction product as per Table 9.4 on the next page. If a construction product comprises more than one material, select the material category classification representing most of the construction product (by volume).
2. For each EPD that is applicable to a specified construction product, select the relevant EPD type as shown in Table 9.3 on the next page.
3. The BREEAM Platform will add together the EPD points calculated for each material classification to obtain the total EPD points score. The total score is capped at 4 for each material classification.

Table 9.3: EPD points for different types of EPD

<table>
<tr><th>Recognised types of EPD</th><th>Validity</th><th>EPD points</th></tr>
<tr><td>EPD applicable to more than one product in the same product category, and more than one manufacturer.</td><td rowspan="3">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 BS EN 15804.</td><td>0.5</td></tr>
<tr><td>EPD applicable to more than one product in the same product category, and a single manufacturer.</td><td>0.75</td></tr>
<tr><td>EPD applicable to a single product*, and a single manufacturer (the product may be manufactured in more than one location)
*Or variations of a single product that only differ in terms of colour or pattern.</td><td>1.5</td></tr>
</table>

Table 9.4: Material classification

Ref	Material category	Uniclass 1.4 codes (for information)
1	Timber or timber-based products	P5
2	Concrete or cementitious	P2*
3	Metal	P4
4	Stone or aggregate	P1, P3*
5	Clay-based	P33
6	Gypsum	P232
7	Glass	P314
8	Plastic, polymer, resin, paint, chemicals and bituminous	P7, P34
9	Animal fibre or skin, cellulose fibre	P6
10	Other	P8
*Except subsets listed separately. For example, P2 generally relates to 'Concrete or cementitious' except for the subset P232 which relates to 'Gypsum'.		

Compliance notes

Ref	Terms	Description
CN1	EPD for systems of products always installed together	Where an EPD is for a system of products from the same manufacturer that are always installed together, this system of products shall be considered a single product for the purposes of assessment in BREEAM. Examples of this include: — a flooring system of products comprising of the floor finish and an adhesive. — a cladding system of products comprising panels, fixing brackets, insulation, and seals etc.
CN2	EPDs' validity	EPDs which have expired or are pending verification at the time of specification cannot score points. However, it is not necessary that they are valid at the time of the design or post-construction stage submissions. BREEAM is primarily trying to encourage designers to take EPDs into consideration when specifying products.
CN3	EPDs – Products containing multiple materials	Construction products can comprise of either a single material, or multiple materials. Where a product (with an EPD) is comprised of more than one material, the assessor should base the EPD classification on the material that represents most of the product's volume in accordance with the categories listed in Table 9.4 above. For example, if a product comprises 0.8 m³ of metal and 0.6 m³ of glass, then the classification to use for the EPD is "Metal".

Evidence

Criteria	Interim design stage	Final post-construction stage
All	Relevant section of the building specification or schedule confirming materials or products which will have EPDs. Where products are specified at design stage, copies of EPD certificates to be provided.	Updated schedule to confirm products specified with EPDs. Copies of all EPD certificates and robust post-construction evidence to confirm the specified materials have been installed. Robust post-construction evidence to verify proof of purchase for all materials with EPDs such as delivery tickets, invoices, purchase orders, confirmation from suppliers or site photographs.

Definitions

Construction product

A product with a manufacturer reference number that is specified by the designer (e.g. architect, engineer, interior designer, quantity surveyor, landscape architect etc.) or selected by the constructor (principal or sub-contractor), and installed on the project.

For further information on the definition of a 'construction product' in Mat 02, see KBCN1142.

Environmental Product Declaration (EPD)

For BREEAM compliance, an independently verified environmental label (i.e. ISO Type III label) according to the requirements of ISO 14025.

Additional information

None.

Mat 03 Responsible sourcing of construction products

Aim

To ensure construction products that end up in the completed asset minimise negative environmental, economic, and social impacts across their supply chain.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	4 + 1 exemplary	Pass	All
Shell and core	4 + 1 exemplary	Pass	All
Shell only	4 + 1 exemplary	Pass	All (see ref 1.0)

Assessment type specific notes

Ref	Assessment type specific note
1.0	**Shell only** For shell only assessments targeting the exemplary credit, core building services are out of scope of the assessment type. The credit can be awarded solely on achieving a score of ≥ 50%.

Building type specific notes

Ref	Building type specific note
-	None

Assessment criteria

Prerequisite – Legally harvested and traded timber

1 100% of timber and timber-based products used on the project are 'Legal' and 'Sustainable' as per the UK Government's Timber Procurement Policy (TPP) (see Definitions).

One credit – Enabling sustainable procurement

2 A sustainable procurement plan must be used by the design team to guide specification towards sustainable construction products. The plan must:

2.a Be in place before the end of Concept Design.

2.b Include sustainability aims, objectives, and strategic targets to guide procurement activities. Targets do not need to be achieved for the credit to be awarded at post-construction stage but justification must be provided for targets that are not achieved.

2.c Include a requirement for assessing the potential to procure construction products locally. There must be a policy to procure construction products locally where possible.

2.d Include details of procedures in place to check and verify the effective implementation of the sustainable procurement plan.

2.e The documented policy and procedure must be disseminated to all relevant internal and external personnel, and included within the construction contract to ensure that they are enforceable on the assessed project.

In addition, if the plan is applied to several sites or adopted at an organisational level it must:

2.f Identify the risks and opportunities of procurement against a broad range of social, environmental, and economic issues following the process set out in ISO 20400:2017.

Up to three credits (plus one exemplary credit) – Measuring responsible sourcing

3 In the BREEAM Platform, use the Mat 03 calculator and follow M1 to determine the number of credits achieved for the construction products. Credits are awarded in proportion to the scope of the assessment – see M2 – and the number of points achieved, as set out in Table 9.5 below.

Table 9.5: BREEAM credits available for each scope level and percentage of points achieved

<table>
<tr><th>Credits achieved</th><th>Mat 03 minimum scope level</th><th>% of available points achieved</th></tr>
<tr><td>1 credit</td><td>Superstructure (see Table 9.6)</td><td>≥ 10%</td></tr>
<tr><td>2 credits</td><td rowspan="2">As above, plus
— Internal finishes (see Table 9.7)
— Substructure and hard landscaping (see Table 9.8)</td><td>≥ 20%</td></tr>
<tr><td>3 credits</td><td>≥ 30%</td></tr>
<tr><td>3 credits + 1 exemplary credit</td><td>As above, plus core building services (see Table 9.9)</td><td>≥ 50%</td></tr>
</table>

The number of material categories assessed defines the total number of points available. There are 10 material categories listed in Table 9.11 on page 270 and each material category is worth a maximum of 10 points.

Example: If the building contains three material categories (timber, metal, and concrete), then the maximum available points is 30 points (3 × 10). The credit scoring is then based on this total:

- 1 credit = 10% of 30 points = 3 points
- 2 credits = 20% of 30 points = 6 points

Methodology

M1: Assessment process for the Mat 03 calculator

In the BREEAM Platform, the Mat 03 calculator can be completed in two ways:

- When material quantities are not available (Route 1).
- When material quantities are available (Route 2). This methodology will proportionally weight the individual material scores to give a more representative assessment.

A mixture of both routes can be used in a single assessment if material quantities are available for some material categories but not others. Only one route can be used per material category.

To assess this issue there are up to four types of data needed for each product:

- Material category.
- Responsible sourcing certification scheme (RSCS) or environmental management system (EMS) certifications. A list of BREEAM-recognised RSCS and EMS schemes and applicable point scores can be found in Guidance Note 18.
- Product or material quantities (optional, route 2 only).

To determine the number of credits that are achieved for responsible sourcing of construction products, the Mat 03 calculator must be completed with all the relevant information. Each construction product must be entered in the calculator individually (unless it is below the relevant cut-off threshold as per M6: Cut-off thresholds).

In the BREEAM Platform, the following principles apply to the Mat 03 calculator:

- The quantity of a product has not been worked out (Route 1).
- The quantity of a product has been worked out (Route 2).
- It may be the case that across an assessment there will be a combination of routes for construction products. For example, Route 1 may be used for the 'timber or timber-based' category and Route 2 for the 'metal' category.
- Only one route may be used per material category.
- Where construction products or materials are subject to a performance specification and a specific manufacturer and certificate reference cannot be provided, the missing details should be completed as 'tbc'.

The following steps outline the process to be followed to determine the number of credits achieved for responsible sourcing using the Mat 03 calculator:

1. In the BREEAM Platform, choose your target credits and scope level according to Table 9.5 on the previous page. This will define the scope of the assessment and the products that need to be included in the Mat 03 calculator.
2. Identify construction products that belong to the target Mat 03 scopes as shown in M2 and exclude any construction products that are below the cut-off thresholds (as given in M6).
3. For each product, identify the materials that you estimate make up most of the product (≈80% by volume). If the remaining 20% could contribute to the overall score you may include at your discretion. Identify which of the ten material categories listed in Table 9.11 on page 270 are included in the scope of the Mat 03 calculator and which are excluded from the assessment.
4. Obtain and identify any relevant BREEAM-recognised responsible sourcing certification scheme (RSCS) or environmental management system (EMS) certifications for each product. If there is more than one material within a product, identify all materials until you cover most of the product (≈80% by volume). A list of BREEAM recognised RSCS and EMS schemes and applicable point scores can be found in Guidance Note 18. The score is zero if a construction product has no certification, is non-compliant with broken chain requirements, or has a certification type that is not listed in Guidance Note 18.
5. When a material has been identified to be in scope, select whether the materials quantities are known or unknown.
6. For each product, enter the data into the Mat 03 calculator, including: 'Location category', 'Product name', 'Manufacturer', 'RSCS scheme' and 'Certification reference'. The Mat 03 calculator points will be added based on the RSCS scheme for each product and the quantity of each product (within material categories where all quantities are known).
7. The Mat 03 calculator collates all scores and shows the credits awarded.

Additional guidance on demonstrating compliance with the criteria in Mat 03 can be found in Guidance Note 24.

M2: Scope of assessment

The tables below indicate the New Rules of Measurement (NRM) classifications that must be included in the scope of the assessment for each of the Mat 03 scope levels. All construction products that are installed as part of one or more of these building elements are in-scope and must be included in the BREEAM Mat 03 calculator.

Table 9.6: Mat 03 scope levels for superstructure

In-scope (based on New Rules of Measurement (NRM) classification system)		
2 Superstructure	2.1 Frame	2.1.1 Steel frames
		2.1.2 Space decks
		2.1.3 Concrete casings to steel frames
		2.1.4 Concrete frames
		2.1.5 Timber frames
		2.1.6 Other frame systems
	2.2 Upper floors	2.2.1 Floors
	2.3 Roof	2.3.1 Roof structure
		2.3.2 Roof coverings
		2.3.3 Specialist roof systems
		2.3.5 Rooflights, skylights and openings
	2.4 Stairs and ramps	2.4.1 Stair or ramp structures
	2.5 External walls	2.5.1 External enclosing walls above ground floor level
		2.5.2 External enclosing walls below ground level
		2.5.3 Solar or rain screening
	2.6 Windows and external doors	2.6.1 Windows – vertical
		2.6.2 Windows – roof or horizontal
		2.6.3 External doors
	2.7 Internal walls and partitions	2.7.1 Walls and partitions

Table 9.7: Mat 03 scope levels for internal finishes

In-scope (based on New Rules of Measurement (NRM) classification system)		
2 Superstructure	2.4 Stairs and ramps	2.4.2 Stair or ramp finishes
	2.8 Internal doors	2.8.1 Internal doors
3 Internal finishes	3.1 Wall finishes	3.1.1 Finishes to walls
	3.2 Floor finishes	3.2.1 Finishes to floors
		3.2.2 Raised access floors
	3.3 Ceiling finishes	3.3.1 Finishes to ceilings
		3.3.2 False ceilings
		3.3.3 Demountable suspended ceilings

Table 9.8: Mat 03 scope levels for substructure and hard landscaping

In-scope (based on New Rules of Measurement (NRM) classification system)		
1 Substructure	1.1 Substructure	1.1.1 Standard foundations
		1.1.2 Specialist foundation systems
		1.1.3 Lowest floor construction
		1.1.4 Basement excavation
		1.1.5 Basement retaining walls
8 External works*	8.2 Roads, paths and pavings	8.2.1 Roads, paths and pavings
		8.2.2 Special surfacings and pavings
*Include hard landscaping that is installed as part of the project under assessment and: — Is within a defined curtilage of the building. — Or is clearly more associated with it (for example, an access road or car park that is intended to serve only the building under assessment or the building and, to a lesser extent, other buildings). Hard landscaping with no such distinction shall be excluded.		

Table 9.9: Mat 03 scope levels for core building services

In-scope (based on New Rules of Measurement (NRM) classification system)		
5 Services	5.5 Heat source	5.5.1 Heat source
	5.6 Space heating and air-conditioning	5.6.1 Central heating
		5.6.2 Local heating
		5.6.3 Central cooling
		5.6.4 Local cooling
		5.6.5 Central heating and cooling
		5.6.6 Local heating and cooling
		5.6.7 Central air-conditioning
		5.6.8 Local air-conditioning
	5.7 Ventilation	5.7.1 Central ventilation
		5.7.2 Local ventilation
		5.7.3 Smoke extract or control
	5.9 Fuel installations and systems	5.9.1 Fuel storage
		5.9.2 Fuel distribution systems

For each New Rules of Measurement (NRM) classification, the respective location category in the Mat 03 calculator is provided in Table 9.10 below. The calculator will automatically assign the location category based on the NRM classification chosen.

Table 9.10: BREEAM location categories

New Rules of Measurement (NRM) classification	Equivalent BREEAM location category
1.1 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

M3: Material categories

For the BREEAM Mat 03 calculator every construction product must be classified according to one of the material categories in Table 9.11 below. Where unclear, choose the closest matching category.

Table 9.11: Material categories

Ref	Material category
1	Timber or timber-based products
2	Concrete or cementitious
3	Metal
4	Stone or aggregate
5	Clay-based

Ref	Material category
6	Gypsum
7	Glass
8	Plastic, polymer, resin, paint, chemicals and bituminous
9	Animal fibre or skin, cellulose fibre
10	Other

M4: Approach to building services

BREEAM recognises that obtaining responsible sourcing information on building services can be more complicated and more difficult than with other construction products.

A simplified approach for construction products used in building services has been set out in Guidance Note 24 (GN24).

M5: Broken chain

There will be situations where a product or material specified by the design team (or chosen by the constructor) is certified at the manufacturing stage, but is supplied by one or more organisations that have no relevant certification. This is known as a broken chain. For example, this applies where a fabricator, without certification, is using material from a certified source or where a certified product or material is supplied to site by a non-certified supplier.

To recognise responsible sourcing certification where it does exist in the supply chain, while reducing the risks associated with a broken chain, it is permissible to use the upstream certification score in the Mat 03 calculator where the downstream risk to responsible sourcing is considered to be low.

Specifically, all organisations without responsible sourcing certification must show that they:

1. Only handle or transport materials, or
2. Only fabricate, assemble, or install materials, and
    a. Have a recognised quality management system that ensures there is no mixing or substitution of certified material with uncertified material.
    b. Are operating in jurisdictions that can demonstrate relatively robust and well enforced environmental, social and economic controls such as:
        i. Countries that are EU members.
        ii. States that have declared adherence to the OECD Guidelines for Multinational Enterprises.

For more guidance on broken chains, see Guidance Note 24 (GN24).

M6: Cut-off thresholds

Any construction product with a volume less than the cut-off threshold shown in Table 9.12 below is excluded from the assessment for Mat 03. The volume considered should be taken as the construction product's overall external dimensions, including any internal voids and air spaces.

Minor fixings (brackets, nails, screws, etc.), adhesives, seals and ironmongery would normally fall below these thresholds. For further guidance, see M7: Quantities precision.

Construction products that are below the cut-off volume do not need to be listed in the Mat 03 calculator.

Table 9.12: Cut-off thresholds for products and materials in Mat 03

Location category	Cut-off volume
Internal partition or internal walls (including finishes)	Any product less than 0.33 m^3 per 1000 m^2 of gross internal area (GIA)
Ceiling (including ceiling finishes)	Any product less than 0.33 m^3 per 1000 m^2 of GIA
All other location categories	Any product less than 1 m^3 per 1000 m^2 of GIA

M7: Quantities precision

The degree of tolerance accepted for estimating quantities is ±20% of the final installed quantity. This allows estimates to be made quickly and without calculations.

The assessor does not need to submit calculations to justify estimates – this applies to both in-scope construction products, and to cut-off volume estimations.

Compliance notes

Ref	Terms	Description
CN1	Limitations on using Route 2	Route 2 for a material can only be used when all the materials in that classification (e.g. all timber, all metal etc): — All have quantity information available AND — All quantity information is measured in consistent units that allow weighting (they are all by volume, or all by weight).
CN2	Scope of the issue	This issue excludes any materials used to help with construction, but do not become part of the finished building. This means the issue excludes materials that make up: — Temporary structures. — Temporary scaffolding, site hoarding, formwork etc.

Evidence

Criteria	Interim design stage	Final post-construction stage
Prerequisite – Legally harvested and traded timber		
1	Relevant section of the building specification or contract clauses.	Where certified materials were used, copies of all relevant certificates or chain of custody evidence. Robust post-construction evidence to verify proof of purchase such as delivery tickets, invoices, purchase orders, confirmation from suppliers or site photographs.
Enabling sustainable procurement		
2	A copy of the Sustainable Procurement Plan. Evidence to show the plan forms part of the construction contract. Relevant section of the building specification, contract clauses or letter of commitment to confirm how the plan will be disseminated to all relevant internal and external personnel.	Evidence demonstrating the effective implementation of the Sustainable Procurement Plan.
Measuring responsible sourcing		
3	Relevant sections of the building specification, summary or schedule confirming all materials within the project, those to be responsibly sourced and to what level. Where products are specified at design stage, copies of responsible sourcing certificates to be provided.	Updated schedule to confirm materials used within the building. Copies of responsible sourcing certificates. Robust post-construction evidence to verify proof of purchase for all materials responsibly sourced such as delivery tickets, invoices, purchase orders, confirmation from suppliers or site photographs.

Definitions

BREEAM Mat 03 calculator

An online calculator used to determine the number of BREEAM credits achieved for this issue.

BREEAM-recognised responsible sourcing certification schemes (RSCSs)

Third party schemes recognised under BREEAM. For information on how schemes are evaluated and recognised, refer to Guidance Note 18 (GN18).

Construction product certificates are used to confirm compliance to the requirements. Where a valid certificate is not available from the manufacturer, claims may be confirmed via the relevant responsible sourcing scheme provider. Many certification scheme organisations list companies and construction products that have been certified against their standards, including the scope of the certification. Some schemes will provide downloadable copies of the certificate which can be used as evidence of compliance for this issue.

Constituent product

A manufacturer-specific product (i.e., with a manufacturer reference number) that is not specified by the designer or the constructor but is used in the manufacture of another specified product.

Construction product

A manufacturer-specific construction product (i.e., with a manufacturer reference number) that is specified by the designer (e.g., architect, engineer, interior designer, quantity surveyor, landscape architect etc.) or selected by the constructor (principle or sub-contractor) and installed on the project.

Legal and sustainable timber

BREEAM follows the UK government's definition of legal and sustainable timber, as outlined in the Central Point of Timber (CPET) 5th Edition of the UK Government Timber Procurement Policy (TPP). At the time of writing, the policy requires all timber and wood-based products to be covered by at least one of the following (but the webpage below should be checked for changes):

1. Third party, independent forest certification schemes – Category A (e.g. FSC or PEFC).
2. Evidence on a case-by-case basis in line with the Framework for Evaluating Category B evidence – Category B.

For the avoidance of doubt, 100% of the timber and timber-based products must be compliant.

Further information on the UK Government's TPP and compliant responsible sourcing certification schemes is available from: www.gov.uk/guidance/timber-procurement-policy-tpp-prove-legality-and-sustainablity.

New Rules of Measurement (NRM)

A standard set of measurement rules and guidance for the cost management of construction projects and maintenance works. For more information visit: www.rics.org.

Responsible sourcing

The act of applying and managing sustainable development principles in the specification, procurement, and tracing of construction products. In BREEAM, this is demonstrated through auditable third-party certification schemes. For an up-to-date table of BREEAM-recognised RSCSs, refer to Guidance Note 18 (GN18).

Responsible sourcing certification scheme point scores

A graded scale to reflect the rigour of the RSCS. Used for awarding credits in this issue. For an up-to-date table of BREEAM-recognised RSCSs, refer to Guidance Note 18 (GN18).

Route 1

A route that does not measure the quantities of each construction product for the Mat 03 calculator. Compared to Route 2, this results in a potentially lower score. For further details, see M1.

Route 2

A route that measures the quantity of each construction product within a material category in the Mat 03 calculator. The improvement in rigour means a potentially higher score than Route 1. For further details, see M1.

Sustainable procurement plan

A plan that sets out a clear framework for the responsible sourcing of construction products to guide procurement throughout a project, for everyone involved in this process. The plan may be prepared and adopted at an organisational level or be site or project specific.

Additional information

None.

Mat 04 Durability and resilience

Aim

To reduce the need to repair and replace materials resulting from damage to exposed elements of the building and landscape.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	1	None	All
Shell and core	1	None	All
Shell only	1	None	All

Assessment type specific notes

Ref	Assessment type specific note
-	None

Building type specific notes

Ref	Building type specific note
-	None

Assessment criteria

One credit – Durability and resilience

Protecting vulnerable parts of the building from damage

1 Protection measures are incorporated into the building's design and construction to reduce damage to the building's fabric or materials in case of accidental or malicious damage occurring. These measures must provide protection against:

1.a Negative impacts of high user numbers in relevant areas of the building (e.g. corridors, lifts, stairs, doors etc.).

1.b Damage from any vehicle or trolley movements within 1 metre of the internal building fabric in storage, delivery, corridor and kitchen areas.

1.c 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.

1.d Potential malicious damage to building materials and finishes, in public and common areas where appropriate.

Protecting exposed parts of the building from material degradation

2 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:

2.a The element or product achieving an appropriate quality or durability standard or design guide, see Table 9.13 on the next page for examples. If no relevant standards or guides are listed in Table 9.13 on the next page, either use BS 7543:2015[93] as the default appropriate standard or use relevant equivalent standards.

OR

2.b A detailed assessment of the element's resilience when exposed to the applicable material degradation and environmental factors.

3 Produce an access to the roof and façade strategy for cost-effective cleaning, replacement and repair in the building's design.

4 Design the roof and façade to prevent water damage, ingress and detrimental ponding.

Methodology

M1: Examples of suitable durability measures

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

1. Bollards, barriers or raised kerbs to delivery and vehicle drop-off areas
2. Robust external wall construction, up to 2m high
3. Corridor walls specified to Severe Duty (SD) as per BS 5234-2[94] and, for Healthcare buildings, Health Technical Memorandum 56 - Partitions[95][96].
4. Protection rails to walls of corridors
5. Kick plates or impact protection (e.g. trolleys) on doors
6. Hard-wearing and easily washable floor finishes in heavily used circulation areas (i.e. main entrance, corridors, public areas etc.)
7. Door stoppers to prevent door handles damaging walls
8. Designing out the risk without the need for additional materials specification to protect vulnerable areas.

M2: Designing to prevent water damage

A common and potentially significantly damaging failure mechanism for external envelopes is water ingress or other type of water damage. The design team should demonstrate that they have carefully considered the drainage mechanisms of the façade and roof on a small and large scale to prevent staining, detrimental oxidation, ponding, rot, ingress, penetration or any other deleterious effect. This should take the form of a risk assessment, the complexity and detail of which is related to the complexity and innovative nature of the façade and roof. The final design should demonstrate that, where possible, these negative impacts have been avoided.

M3: Examples of quality and durability standards and design guides

Table 9.13 below provides examples of relevant quality and durability standards and design guides.

Table 9.13: Relevant industry durability or quality standards and design guides

Relevant industry quality or durability 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

Relevant industry quality or durability standards and design guides
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; 2016
SPRA: 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; 2016
BRE Good Practice guidance documents

Compliance notes

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
Protecting vulnerable parts of the building from damage		
1	Design drawings illustrating vulnerable areas or parts of the building. Design drawings or specification confirming the durability of the measures specified.	Assessor's site inspection, and photographic evidence confirming compliance. OR Final construction drawings or equivalent.
Protecting exposed parts of the building from material degradation		
2	Design drawings confirming the applicable elements. Documentary evidence for the environmental factors and material degradation effects considered relevant to the building. Design and specification measures in place to limit degradation effects. Where relevant, manufacturer's technical	Final construction drawings or equivalent or assessor site inspection reports and photographic evidence to confirm measures were implemented within the final build. Manufacturer's product literature where required to confirm material specifications.

Criteria	Interim design stage	Final post-construction stage
	details confirming the material degradation effect mitigated by the specified product.	
3	Roof and façade access strategy.	Roof and façade access strategy, updated as required.
4	Design drawings and specification showing measures to prevent water damage, ingress and ponding.	Final construction or equivalent drawings showing measures implemented to prevent water damage, ingress and ponding.

Definitions

Appropriate industry quality or durability standard

An established industry quality standard, certification or mark with testing procedures which demonstrate the quality and durability of the product or element. Examples of relevant standards for various element types are provided in Table 9.13 on page 276. The use of relevant standards outside of the examples provided is also a compliant route providing the standard is relevant for the element. It is the responsibility of the assessor to confirm that the standard used is appropriate for the element or product it is applied to and increases its durability.

Convenient access

Access to the roof and façade is safe and convenient for routine maintenance, cleaning and repair. A façade access strategy designed in line with CIRIA guide C686 would be considered compliant. If access to the majority of the façade requires contracting on a one-off basis an external firm with specialist equipment, or specialist access professionals it would not generally be considered to be convenient.

Durability

Ability of a building and its parts to perform its required function over a period of time and under the influence of degrading agents, without undue maintenance, repair, replacement or refurbishment.

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.

Key exposed building element

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

Malicious damage

For BREEAM purposes this is damage occurring due to intentional or irresponsible actions by users of the building or the public.

BREEAM has not set specific examples, but the architect should use their professional judgment to define vulnerable areas that need to be considered for criterion 1.d on page 275.

Material degradation

BS 15686-2:2012[97] defines this as; 'the process whereby an action on an item causes a deterioration of one or more properties'. Note: Properties affected can be, for example, physical, mechanical or electrical.

New Rules of Measurement (NRM)

NRM provides a standard set of measurement rules and essential guidance for the cost management of construction projects and maintenance works. For more information visit: www.rics.org.

Relevant industry durability design guide

An established industry design guide with the objective of improving the durability of the element. Examples of relevant standards or guides for various element types are provided in Table 9.13 on page 276. The use of relevant guides outside of the examples provided is also a compliant route providing the guide is relevant for the element. It is the responsibility of the assessor to confirm that the guide used is appropriate for the element or product it is applied to and increases its durability.

Additional information

BS 7543:2015 Guide to durability of buildings and building elements, products and components

BS 7543 gives a useful overview of the field of durability and provides a process for predicting a material's service life. It provides useful guidance on the methodology for assessing and measuring durability and identifies common durability failures for typical construction materials. In addition, it lists some example predicted service lives for typical materials.

Mat 05 Material efficiency

Aim

To avoid unnecessary materials use arising from over specification without compromising structural stability, durability or the service life of the building.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	1	None	All
Shell and core	1	None	All
Shell only	1	None	All

Assessment type specific notes

Ref	Assessment type specific note
-	None

Building type specific notes

Ref	Building type specific note
-	None

Assessment criteria

One credit – Material efficiency

1 At the Preparation and Brief and Concept Design stages, set targets and report on opportunities and methods to optimise the use of materials. This must be done for each of the following stages (see Table 9.14 on the next page):

- 1.a Preparation and Brief
- 1.b Concept Design
- 1.c Developed Design
- 1.d Technical Design
- 1.e Construction.

2 Develop and record the implementation of material efficiency, see Table 9.14 on the next page, during:

- 2.a Developed Design
- 2.b Technical Design
- 2.c Construction.

3 Report the targets and actual material efficiencies achieved.

Methodology

M1: Material efficiencies

Examples of how material efficiency can be considered at each work stage are provided in Table 9.14 below. This table is based on the principles set out in Parts 1 and 2 of the BS 8895 series of standards.[98], [99] As a minimum, the measures listed in the 'evidence' rows must be met to show compliance with the issue.

Table 9.14: Material efficiency strategy

Work stages and efficiencies	
Preparation and Brief	
Objective	To set requirements that inform decisions throughout the design and construction of the project.
Participants	Client or client's agent with input from the design team if appointed.
Action	Assess the site, the likely project scale, and the client's functional and aesthetic requirements to set material efficiency objectives for the project.
Evidence	Dedicated report that sets out a clear framework to guide material efficiency activities throughout the design and construction of the project. The report should set out aims, objectives, targets, performance indicators, opportunities, constraints and responsibilities to guide material efficiency activities.
Concept Design	
Objective	Develop strategies to implement or action the materials efficiency requirements set under the Preparation and Brief stage.
Participants	Design team including at least: — Architect — Structural Engineer — Building Services Engineer
Action	Hold workshops with the project team to identify design opportunities to reduce or optimise materials use through design, specification, construction techniques etc.
Evidence	Minutes of the workshops held. Documentation demonstrating how the feedback from the workshop has been incorporated in the concept design of the project, for example: outline specification for materials selection, report on approximate predicted reductions in material quantities.
Developed Design and Technical Design	
Objective	Develop design proposals based on learning from the concept design.
Participants	All relevant members of the design team.
Action	Incorporate material efficiency measures and strategies identified in concept design into architectural, structural and building services design as appropriate. Review performance against previous stages and identify deviations.
Evidence	Report on deviations from previous stages and additional actions to be taken. Documentation demonstrating the incorporation of the outcomes from the concept stage and additional actions, for example: design drawings or specifications demonstrating materials efficiency measures undertaken.
Construction	
Objective	Implement material efficiency measures in construction.
Participants	Principal contractor.
Action	Implement material efficiency measures and strategies identified in previous stages in building construction and identify deviations. Identify further efficiencies as appropriate for this stage.
Evidence	Report on deviations from previous stages. Documented evidence of activity to further identify efficiencies at this stage, for example: meeting minutes, training events, waste reduction documentation etc.

Compliance notes

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
All	For design stage: The evidence required to demonstrate compliance will vary according to the work stage. Examples of how material efficiency could be considered together with the minimum evidence requirements to be provided, at each project stage, are set out within in Table 9.14. For post-construction: Relevant section of the building specification or contract clauses or letter of commitment to report material efficiencies at post-construction.	Examples of how material efficiency could be considered together with the minimum evidence requirements to be provided at post-construction are set out Table 9.14.

Definitions

Appropriate and effective opportunities

Material efficiency measures which do not compromise the aesthetics, structural stability, durability or service life of the building. The measures should also be implementable in practice and cost-effective.

Material efficiency

The process of designing a building to achieve its stated performance standards while reducing its embodied impact by reducing the quantity of materials required to do so. This includes using fewer materials, reusing existing demolition and 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 and construction that result in lower materials usage and lower wastage levels including off-site manufacturer or use of pre-assembled service pods.

Additional information

Examples of material efficiency opportunities

Examples of suitable material efficiency design measures can include:

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

BS 8895 Designing for material efficiency in building projects

BS 8895 outlines specific material efficiency processes, key tasks, team members and their responsibilities, and outputs specific to each work stage, along with supporting guidance and tools. This serves as a useful tool to assist the design team in developing and implementing material efficiency strategies for their developments.

The standard comprises the following parts:

- Part 1: Code of practice for Strategic Definition and Preparation and Brief
- Part 2: Code of practice for concept and developed design
- Part 3: Code of practice for technical design[100]

Waste

Summary

This section encourages the reduction of waste from construction and throughout the lifetime of the building. It rewards sustainable waste management, as well as waste reporting, reduction and diversion from landfill during construction, but also encourages sustainable practices during the building operation. Finally, this section encourages waste minimisation through optimised design methods, which consider current and future needs, and respond to functional requirements and climate change adaptation. It includes recognition of measures to reduce future waste as a result of the need to alter the building in the light of future changes to climate.

Assessment issues

Wst 01 Construction waste management	5 credits + 1 exemplary
Wst 02 Use of recycled and sustainably sourced aggregates	1 credit + 1 exemplary
Wst 03 Operational waste	1 credit
Wst 04 Speculative finishes (Offices only)	1 credit
Wst 05 Adapting to climate change	1 credit + 1 exemplary
Wst 06 Disassembly and adaptability	2 credits

Wst 01 Construction waste management

Aim

To reduce construction waste by encouraging reuse, recovery and best practice waste management practices to minimise waste going to landfill.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	5 + 1 exemplary	Outstanding	All (see ref 1.0)
Shell and core	5 + 1 exemplary	Outstanding	All (see ref 1.0)
Shell only	5 + 1 exemplary	Outstanding	All (see ref 1.0)
EU Taxonomy	-	-	All (see M4)

Assessment type specific notes

Ref	Assessment type specific note
1.0	Where, under the developer's ownership, no demolition will be undertaken to enable the assessed development, the pre-demolition audit credit is not applicable and therefore filtered out of the assessment.

Building type specific notes

Ref	Building type specific note
-	None

Assessment criteria

One credit – Pre-demolition audit

1 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 M1: Pre-demolition audit scope on the next page and:

- 1.a Be carried out at Concept Design stage by a competent person prior to strip-out or demolition works
- 1.b Guide the design, consider materials for reuse and set targets for waste management
- 1.c Engage all contractors in the process of maximising high-grade reuse and recycling opportunities

2 Make reference to the audit in the resource management plan (RMP).

3 Compare actual waste arisings and waste management routes used with those forecast and investigate significant deviations from planned targets.

Up to three credits – Construction resource efficiency

4 Prepare a compliant Resource Management Plan (RMP) covering:

4.a Non-hazardous waste materials (from on-site construction and dedicated off-site manufacture or fabrication), including demolition and excavation waste.

4.b Accurate data records on waste arisings and waste management routes.

5 Meet or improve upon the benchmarks in Table 10.1 for non-hazardous construction waste, excluding demolition and excavation waste.

Table 10.1: Construction waste resource efficiency benchmarks

BREEAM credits	Amount of waste generated per 100 m² (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 level	≤ 1.6	≤ 1.9

One credit – Diversion from landfill

6 Meet, where applicable, the diversion from landfill benchmarks in Table 10.2 for non-hazardous construction waste and demolition and excavation waste generated.

7 Sort waste materials into separate key waste groups as per Table 10.3 on page 291, either on-site or through a licensed contractor for recovery.

Table 10.2: Diversion from landfill benchmarks

BREEAM credits	Type of waste	Amount of waste diverted from landfill	
		Volume	Weight (Tonnage)
One credit	Construction	70%	80%
	Demolition	80%	90%
	Excavation	N/A	N/A
Exemplary level	Construction	85%	90%
	Demolition	85%	95%
	Excavation	95%	95%

One exemplary credit – Construction waste management

8 Non-hazardous construction waste generated, excluding demolition and excavation waste, is less than or equal to the exemplary level resource efficiency benchmarks (see Table 10.1).

9 The percentage of non-hazardous construction, demolition, and excavation waste (if relevant) diverted from landfill meets or exceeds the exemplary level percentage benchmarks in Table 10.2.

10 All key waste groups in Table 10.3 for diversion from landfill are covered in the RMP.

11 Waste data obtained from licensed external waste contractors is reliable and verifiable, by using data from EA/SEPA/EA Wales/NIEA Waste Return Forms or from a PAS 402:2013 compliant company.

Methodology

M1: Pre-demolition audit scope

The pre-demolition audit must cover:

1. Identification and quantification of the key materials where present on the project (see Table 10.3 on page 291)
2. Potential applications and any related issues for the reuse and recycling of the key materials in accordance with the waste hierarchy
3. Opportunities for reuse and recycling within the same development
4. Identification of local reprocessors or recyclers for recycling of materials
5. Identification of overall recycling targets where appropriate

6. Identification of reuse targets where appropriate
7. Identification of overall landfill diversion rate for all key materials.

M2: Resource management plan (RMP)

A resource management plan (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:

1. A target benchmark for resource efficiency, i.e. m^3 of waste per 100 m^2 or tonnes of waste per 100 m^2
2. Procedures and commitments to minimise non-hazardous waste in line with the target benchmark
3. Procedures to minimise hazardous waste
4. A waste-minimisation target and details of waste minimisation actions to be undertaken
5. 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 PAS 402 compliant company
6. 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
7. Procedures to sort, reuse and recycle construction waste into defined waste groups, either on site or through a licensed external contractor
8. Procedures to review and update the plan
9. The name or job title of the individual responsible for implementing the above.

M3: Resource management plan records

The project materials waste arisings and waste management routes should be recorded for construction, demolition and excavation waste.

The performance benchmarks for the award of the construction resource efficiency credits are based on non-hazardous materials and exclude hazardous waste, demolition waste, excavation waste, canteen waste, office waste and municipal waste.

M4: EU Taxonomy

In order to fully comply with EU Taxonomy requirements, it will need to be confirmed that the following requirements have also been addressed:

a. At least 70% (by weight) of the non-hazardous construction and demolition waste (excluding naturally occurring material referred to in category 17 05 04 in the European List of Waste established by Decision 2000/532/EC) generated on the construction site is prepared for reuse, recycling and other material recovery, including backfilling operations using waste to substitute other materials, in accordance with the waste hierarchy and the EU Construction and Demolition Waste Management Protocol.

b. Operators limit waste generation in processes related to construction and demolition, in accordance with the EU Construction and Demolition Waste Management Protocol and taking into account best available techniques and using selective demolition to enable removal and safe handling of hazardous substances and facilitate reuse and high-quality recycling by selective removal of materials, using available sorting systems for construction and demolition waste.

Compliance notes

Ref	Terms	Description
CN1	Extensions to existing buildings	For assessments of extensions to existing buildings, where only the extension is being assessed, it is only the extension that must comply.
CN2	Limited site space for segregation and storage	Where space on site is too limited to allow waste materials to be segregated, a waste contractor may be used to separate and process recyclable materials off-site. Similarly, manufacturers' take-back schemes could also be used. Where this is the case, sufficient documentary evidence must be produced which demonstrates that segregation of materials is carried out to the agreed levels and that materials are reused or recycled as appropriate.

Ref	Terms	Description
CN3	Waste from temporary structures	Temporary support structures, or any other materials or systems brought on site to facilitate construction of a building and that subsequently enter the waste stream (albeit for recycling), will be considered as construction waste and contribute to the construction waste generated for the development. If the support structure is reused on another site by the contractor (or another contractor) it has not entered the waste stream and, therefore, would not be included in the figures for waste generated. Reused timber formwork would be excluded in the same way.
CN4	Contractor not yet appointed at the design stage	Where the contractor has not been engaged at the design stage certification, it is acceptable to award the credits based on a commitment. This commitment must be from a suitable member of the design team and must detail the targets and criteria which must be met. Evidence must also confirm that the details in the commitment will form part of the contractual requirements. Note: This does not apply to the requirement for a pre-demolition/pre-refurbishment audit, which must be undertaken at Concept Design stage.

Evidence

Criteria	Interim design stage	Final post-construction stage
Pre-demolition audit		
1–3	Copy of compliant pre-demolition audit.	Updated pre-demolition audit, including actual waste results.
Construction resource efficiency		
4–5	Copy of compliant resource management plan (RMP) including appropriate targets for construction waste produced. Where contractor is not yet appointed, credits may be awarded based on a contract requirement or letter of commitment from the client or developer.	Records of actual waste arisings from site.
Diversion from landfill		
6	Relevant section or clauses of the building specification or contract. OR A letter of commitment from the client or developer. OR Copy of RMP which includes relevant commitments/targets and procedures to divert waste from landfill.	Records of actual waste arisings from site, amount diverted from landfill and how this has been processed i.e. recycled, reused, etc. Evidence of waste transfer station recycling rates, where applicable. Data to be separated for demolition and construction waste.
7	Confirmation of procedures in place for sorting construction waste into key waste groups.	Waste records or confirmation from waste management contractor to verify the sorting of waste intro key waste groups.
Exemplary level		
8–9	Relevant section or clauses of the building specification or contract. OR A letter of commitment from the client or developer. OR Copy of RMP which includes relevant commitments/targets for waste generated and diverted from landfill.	Records of actual waste arisings from site, amount diverted from landfill and how this has been processed i.e. recycled, reused, etc. Evidence of waste transfer station recycling rates, where applicable. Data to be separated for demolition and construction waste.

Criteria	Interim design stage	Final post-construction stage
10	Copy of RMP which includes confirmation all key waste groups which will be diverted from landfill.	Records of actual waste arisings from site, amount diverted from landfill and how this has been processed i.e. recycled, reused, etc.
11	Relevant section or clauses of the building specification or contract. OR A letter of commitment from the client or developer. OR Copy of RMP which includes relevant commitments to ensure waste data provided is reliable and verifiable.	Evidence to support that all waste data obtained from licensed external waste contractors is reliable and verifiable such as EA/SEPA/EA Wales/NIEA Waste Return Forms or to show that they are a PAS 402:2013 compliant company.
EU Taxonomy		
M4	Evidence to show how waste generation was limited in accordance with the EU Construction and Demolition Waste Management Protocol such as waste management procedures and waste records.	Evidence to show how waste generation was limited in accordance with the EU Construction and Demolition Waste Management Protocol such as waste management procedures and waste records.

Definitions

Best practice construction waste management plan

Best practice is a combination of commitments to:

1. Design out waste (materials optimisation)
2. Reduce waste generated on site
3. Develop and implement procedures to sort and reuse and recycle construction and demolition waste on site and off site (as applicable)
4. Follow guidance from relevant national waste framework directives.

Competent person – Pre-demolition audit

An individual who has appropriate knowledge of buildings, waste and options for reuse and recycling of different waste streams. Ideally this would be a demolition contractor, but could also be the main contractor.

Dedicated off-site manufacturing or fabrication

Production of a component or material carried out in an off-site manufacturing or processing facility specifically set up for the development project.

Diversion from landfill

Actions to avoid waste being disposed of in landfill include:

— Reusing the material on site (in situ or for new applications)
— Reusing the material on other sites
— Community reuse and recycling
— Salvaging or reclaiming the material for reuse
— Returning material to the supplier via a 'take-back' scheme
— Direct recycling of materials via a specialist material reprocessor or recycler
— Recovery of the material from site by an approved waste management contractor and recycled or sent for energy recovery
— Utilising waste in exempt or permitted applications (not landfill).

PAS 402:2013

PAS 402:2013 is a specification for performance reporting that can be adopted by waste management organisations. It is applicable to waste management organisations that process waste, e.g. a waste treatment facility and not those operating solely as carriers or brokers. The specification provides the framework for the demonstration of performance against key areas of delivery, including how waste management activities are conducted, landfill diversion and materials recovery, assuring potential and existing customers of the service they are procuring. It can provide clients such as government and local authorities with a framework for good practice which they can specify.

For a company to be deemed PAS 402:2013 compliant, validation of compliance with the specification has to be confirmed following inspection by a UKAS accredited body, in line with a relevant scheme, e.g. Green Compass.

Resource management plan (RMP)

A resource management plan (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.

Details of compliant resource management plans for BREEAM are given in M2.

Site waste management plan (SWMP)

Some locations may have a legal requirement, due to government requirements, to produce a site waste management plan (SWMP) containing prescribed details. An SWMP is a form of resource management plan. To achieve any of the construction waste management credits the assessed development, regardless of value or locality, must have a BREEAM compliant resource management plan that should be written in line with best practice.

Waste hierarchy

The order of priority for the management of waste where waste generation could or does occur. This is listed in descending order of environmental preference in The Waste (England and Wales) Regulation 2011[101] as:

— Prevention: using material in design and manufacture, keeping products for longer, reuse, using less hazardous materials
— Preparing for reuse: checking, cleaning, repairing, refurbishment, whole items or spare parts
— Recycling: turning waste into a new substance or produce. It includes composting if it meets quality protocols
— Other recovery: includes anaerobic digestions, incineration with energy recovery, gasification and pyrolysis, which produce energy (fuels, heat and power) and materials from waste
— Disposal landfill and incineration without energy recovery.

Waste management routes

Description of how waste will be managed according to the waste hierarchy, e.g. reused, recycled, recovered and disposed.

Waste minimisation

This term encompasses two elements of the waste hierarchy:

— Waste reduction or prevention = using less material in design, manufacture and installation, keeping products for longer, using no hazardous materials
— Reuse = using products again for the purpose for which they were conceived, which may require checking, cleaning, or repairing (preparing for reuse)

Types of waste minimisation actions include:

1. Set and report against waste reduction targets
2. Design for standardisation of components
3. Avoid waste from excavation or groundworks and consider opportunities for zero cut and fill
4. Return packaging for reuse
5. Consider community reuse of surplus or offcuts
6. Include waste minimisation initiatives and targets in tenders or contracts and engage with the supply chain
7. Consider use of BIM (Building Information Modelling)
8. Design for off-site or modular build
9. Design for flexibility, adaptability and future deconstruction
10. Design to use fewer materials
11. Use of reusable temporary elements such as shuttering and protection.

This list is not exhaustive and other waste minimisation actions can be taken.

Additional information

Construction waste groups

Table 10.3: Construction waste groups

European Waste Catalogue	Key group	Examples
170102	Bricks	Bricks
170101	Concrete	Pipes, kerb stones, paving slabs, concrete rubble, precast and in situ
170604	Insulation	Glass fibre, mineral wool, foamed plastic
1501	Packaging	Paint pots, pallets, cardboard, cable drums, wrapping bands, polythene sheets
170201	Timber	Softwood, hardwood, board products such as plywood, chipboard, medium density fibreboard (MDF)
1602	Electrical and electronic equipment	Electrical and electronic TVs, fridges, air-conditioning units, lamps equipment
1301	Oils	Hydraulic oil, engine oil, lubricating oil
1703	Asphalt and tar	Bitumen, coal tars, asphalt
170103	Tiles and ceramics	Ceramic tiles, clay roof tiles, ceramic, sanitary ware
1701	Inert	Mixed rubble or excavation material, glass
1704	Metals	Radiators, cables, wires, bars, sheet
170802	Gypsum	Plasterboard, plaster, fibre cement sheets
170101	Binders	Render, cement, mortar
170203	Plastics	Pipes, cladding, frames, non-packaging sheet
1705	Soils	Soils, clays, sand, gravel, natural stone
Most relevant EWC	Liquids	Non-hazardous paints, thinners, timber treatments
Most relevant EWC	Hazardous	Defined in the Hazardous Waste List (HWL) of the European Waste Catalogue (EWC)
Most relevant EWC	Floor coverings (soft)	Carpets, vinyl flooring
Most relevant EWC	Architectural features	Roof tiles, reclaimed bricks, fireplaces
170904 (Mixed)	Mixed or other	Efforts should be made to categorise waste into the above categories wherever possible.

BREEAM construction resource efficiency benchmarks

The resource efficiency benchmarks used in BREEAM have been derived using data collected from hundreds of real life projects using BRE's SmartWaste system, from July 2008 to July 2016. The BREEAM credits are aligned to the benchmarks as follows:

1. One credit: Performance in the top 50% of projects (better than standard practice)
2. Two credits: Performance in the top 25% of projects (good practice)
3. Three credits: Performance in the top 10% of projects (best practice)
4. Exemplary level: Performance in the top 5% of projects (exemplary practice).

For more information see www.smartwaste.co.uk.

Why does BREEAM exclude demolition and excavation waste from the resource efficiency benchmarks?

BREEAM does not include demolition and excavation (D&E) waste in its resource efficiency benchmark, despite it often being the largest tonnage of waste on-site, because the amount of D&E waste produced is site-dependent. Furthermore, it is not necessarily possible to reduce the amount of demolition waste (unless a decision is taken not to demolish in the first place).

Including D&E waste in an overall construction resource efficiency benchmark would:

1. Not encourage sites with unavoidably large amounts of D&E waste to focus on reducing waste arising from construction materials (which would have further knock-on environmental impacts); and
2. Make compliance with the benchmark more straightforward for sites with little or no D&E waste, which would weaken the drivers for reducing construction waste resulting from the specification and use of new building materials.

BREEAM aims to ensure that, where D&E waste is generated, it is diverted from landfill and where possible reused for high grade use on site to reduce the volume of new materials produced or required in the supply chain (which themselves may go on to generate additional waste). One credit and an exemplary level credit are available where it can be demonstrated that D&E waste has been diverted from landfill.

Tools for preparing, implementing and reviewing a RMP

SmartWaste is a web-based membership tool allowing users to measure and monitor construction site impacts.

The tool can be used for:

- Preparing, implementing and reviewing SWMPs or RMPs
- Online measuring and reporting on
  - Waste (aligned to defined waste groups)
  - Site energy, fuel and water use
  - CO_2 production from energy usage
  - Procurement of certified or sustainable timber
  - Transportation impacts from materials deliveries, waste removal and staff travel to and from the site
  - Pre-demolition versus post-demolition waste data
- Industry waste benchmarks.

This membership tool is frequently updated and offers the user flexibility, reporting and support. Templates are available to meet the latest BREEAM credits and can also be downloaded. More information is available at www.smartwaste.co.uk.

Other tools for preparing, implementing and reviewing a RMP may be available.

Wst 02 Use of recycled and sustainably sourced aggregates

Aim

To encourage the use of more sustainably sourced aggregates, encourage reuse where appropriate and avoid waste and pollution arising from disposal of demolition and other forms of waste.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	1 + 1 exemplary	None	All
Shell and core	1 + 1 exemplary	None	All
Shell only	1 + 1 exemplary	None	All

Assessment type specific notes

Ref	Assessment type specific note
-	None

Building type specific notes

Ref	Building type specific note
-	None

Assessment criteria

Prerequisite – Pre-demolition audit

1 If demolition occurs on site, to encourage the reuse of site-won material on site, complete a pre-demolition audit of any existing buildings, structures or hard surfaces in accordance with Wst 01 Construction waste management - Criterion 1 on page 285 and Wst 01 Construction waste management - Criterion 2 on page 285.

One credit – Project sustainable aggregate points

2 Identify all aggregate uses and types on the project (see Table 10.5 on the next page and Table 10.6 on page 295).

3 Determine the quantity in tonnes for each identified use and aggregate type.

4 Identify the region in which the aggregate source is located.

5 Calculate the distance in kilometres travelled by all aggregates by transport type.

6 Enter the information into the BREEAM Platform to calculate the Project Sustainable Aggregate Points. The corresponding number of BREEAM credits will be awarded as shown in Table 10.4

Table 10.4: Credits available relating to the Project Sustainable Aggregate Points

BREEAM credits	Project Sustainable Aggregate Points
1 credit	3.5–6
1 exemplary credit	> 6

One exemplary credit – Project sustainable aggregate points

7 The Project Sustainable Aggregate Points score meets or exceeds the exemplary level performance benchmark in Table 10.4 on the previous page.

Methodology

M1: Data requirements

Information on the quantity, source and use of each type of aggregate used must be obtained and entered into the BREEAM Platform. This generates the Project Sustainable Aggregate Point score, which determines the number of credits awarded.

The information required to calculate the Project Sustainable Aggregate Point score is specified below:

1. Identify all aggregate uses on the project (Table 10.5) and the aggregate type (Table 10.6 on the next page).

Table 10.5: Aggregate uses

Aggregate use	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	Assume 1 m^3 of engineered fill is approximately 2.0 tonnes	Backfill to basement walls; Sub-base and base courses for hard landscape and local roads
Concrete coarse aggregate	4 mm to 20 mm aggregate produced in accordance with EN 12620 Aggregates for concrete(102) OR EN 13055 Lightweight aggregates Part 1(103)	Assume 1 m^3 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	0 mm to 4 mm aggregate produced in accordance with EN 12620 Aggregates for concrete	Assume 1 m^3 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(104)	Assume 1 m^3 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(105)	Assume 1 m^3 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 1 m^3 of hard landscaping is approximately 2.0 tonnes	Bedding for concrete paving stones, natural stone or concrete blocks in external circulation areas
Hydraulically 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 1 m^3 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

Table 10.6: Aggregate types

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

2. Determine the quantity in tonnes for each identified use and aggregate type. Include all aggregates that represent at least 5% of the overall aggregate demand for the project. The conversions in Table 10.5 on the previous page can be applied at the design stage where exact details of concrete mix designs and aggregate specifications are not yet known. Exact values must be reported at the post-construction stage.
3. Identify the region in which the aggregate source is located, according to the categories in Table 10.7 below
4. Identify the distance in kilometres travelled by all aggregates by transport type from 'aggregate gate' to site.
5. Based on the above data inserted for all aggregates, the BREEAM Platform will determine:
    a. Mineral resource depletion (kgSbeq)
    b. Social cost of transport (pence/tonne)
    c. Carbon footprint (kgCO_2e/tonne)
    d. The corresponding Sustainable Aggregates Points per tonne
    e. The number of credits achieved, as per Table 10.4 on page 293

On site recycled aggregates (see Recycled aggregates on page 297) are those that come from materials from the same construction site. To recognise the environmental benefits of on-site aggregate sourcing, this type of aggregate will gain maximum ASP per tonne in this issue.

M2: Off-site recycled aggregates

Where off-site recycled aggregates from construction, demolition and excavation waste are used, they shall be produced according to the relevant quality protocol[106] or comply with the relevant BS or EN standards for aggregates in order to contribute to the Project Sustainable Aggregate Point score.

M3: Aggregates in off-site manufactured applications

Where any of the listed applications have been manufactured off site, any aggregate present shall be included in the assessment of this issue.

M4: Transport distance calculation

Where distribution is undertaken by road from the quarry or wharf, determine the likely road kilometres undertaken on strategic motorways, other motorways, main roads and secondary roads. For rail or water distribution, estimates can be made based on the equivalent distance that would be made by road. For asphalt and concrete, onward distribution from the batching facility must also be included.

Table 10.7: Region of source (quarry or marine dredge site)

Region of source	
North East	South East
Yorkshire and Humber	South West
North West	North Wales
East Midlands	South Wales
West Midlands	Northern Ireland
East of England	Scotland
London	

Compliance notes

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
Prerequisite		
1	Copy of pre-demolition audit which identifies aggregates available within existing buildings, structures or hard landscaping.	Post demolition waste records confirming amount of aggregates where reused on-site.
Project sustainable aggregate points		
2–7	Where contractor not yet appointed, relevant section and clauses of the building specification or contract or letter of commitment to achieve project sustainable aggregate points. OR, where available: Schedule summarising amounts, source and types of aggregates used on the project. Additional requirements listed against specific credits below.	Updated schedule summarising the amounts, source and types of aggregates that were used on the project. Additional requirements listed against specific credits below.
2	Confirmation from the design team of all aggregates used in line with the uses and types defined in Table 10.5 and Table 10.6. For aggregates recycled on site: Evidence from engineer to confirm that the waste will be suitable for re-use.	Evidence to support that aggregates used were recycled or secondary where applicable.
3	Calculations to confirm the amount of each aggregate likely to be used. For aggregates recycled on-site this should include estimated amounts of material available.	Updated data for the amount of aggregates used based on as-built data and evidence to support this such as purchase orders, invoices, delivery tickets or written evidence from the supplier. For aggregates recycled on-site: confirmation from contractor of the amount re-used and any evidence to support this.
4	Confirmation from the design team of the likely source of the aggregates. Where supplied or manufactured by another party, this company should confirm the source of their aggregate.	Confirmation of the sources of all aggregates used on the project and evidence to support this such as purchase orders, invoices, delivery tickets or written evidence from the supplier.
5	Evidence to support the distance and routes likely travelled. For quarried or marine dredged: The distance from the quarry or wharf to the site gate. Where from a supplier/manufacturer: quarry/wharf – batching facility/supplier – site gate.	Confirmation that there have been no changes since design stage or updated evidence using as-built information.

Definitions

Air-cooled blast furnace slag (see secondary aggregates definition)

Air-cooled blast furnace slag is classified as a byproduct (rather than a waste) and can therefore be used as an aggregate without the need for a quality protocol. The slag used must meet the requirements of the European and BS Aggregates Standards that apply to the end-use application (e.g. bitumen bound, unbound etc.)

Aggregate gate source

Consider the 'gate' as following:

- Marine dredged aggregates: the wharf at which the aggregate is first landed;
- Land-based resources: the quarry or recycling facility.

Main roads and secondary roads

Main roads refer to A-roads. Secondary roads should include all B-roads and other local roads.

Quality Protocol

The purpose of a Quality Protocol is to provide a uniform control process for producers, from which they can reasonably state and demonstrate that their product has been fully recovered and is no longer a waste. It also provides purchasers with a product quality managed to common standards, which increases confidence in performance. Aggregates that do not meet the requirements of a Quality Protocol or relevant aggregate standards will still be considered waste. Protocols exists for:

- Aggregates produced from inert waste
- Use of pulverised fuel ash (PFA) and furnace bottom ash (FBA) in bound applications.

Recycled aggregates

Recycled aggregates are those derived from reprocessing materials previously used in construction, e.g. crushed concrete or masonry from construction and demolition waste material and recycled glass bottles.

Secondary aggregates

Byproducts of industrial processes that can be processed to produce secondary aggregates. Secondary aggregates are subdivided into manufactured and natural, depending on their source. Recognised non-construction post-consumer or post-industrial byproducts include:

1. China clay waste (also known as Cornish granite, or stent)
2. Byproducts of dredging for all purposes
3. Slate overburden
4. Lightweight aggregate manufactured from PFA
5. Ground granulated blast furnace slag (ggbfs)
6. Air-cooled blast furnace slag
7. Steel slag
8. Quarry overburden, or other material not subject to the Aggregates Levy
9. Furnace bottom ash (FBA)
10. Incinerator bottom ash
11. Foundry sands
12. Recycled glass
13. Recycled plastic
14. Spent oil shale
15. Colliery spoil
16. Municipal solid waste treatment residues.

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

Strategic motorways

In the UK these are:
M60, M25, M3 in Hampshire (junctions 9 to 14), M6 in the vicinity of Birmingham (junctions 4 to 10a), M6 in the vicinity of Manchester (and junctions 15 to 21a), M62 in the vicinity of Rochdale (junctions 18 to 21), M62 in the vicinity of Leeds (junctions 26

to 30), M42 in the vicinity of Solihull (junctions 3a to 7), M1 in the vicinity of Northampton and Rugby (junctions 15 to 17), M1 in the vicinity of Nottingham and Sheffield (junctions 28 to 35a), M4 in the vicinity of Slough (junction 4b to 7), M4 in the vicinity of Cardiff (junctions 30 to 33).

Additional information

Wst 02 calculator (now integrated into the BREEAM Platform)

The Wst 02 calculator combines scores for regional mineral depletion, social cost of transport and carbon footprint. Each of these metrics has an equal weighting in the calculator, with a maximum score of 3 for each metric, giving a maximum Sustainable Aggregate Point score of 9.

- The regional mineral depletion is measured using the Abiotic Depletion Potential, which is determined by the aggregate type and the region where it is sourced.
- The social cost of transport reflects expenses to society that arise from additional congestion, respiratory disorders, accidents, noise, taxation and infrastructure maintenance associated with transport.
- The carbon footprint score is determined by the aggregate type, the transport mode and the distance travelled.

The data used to build the Wst 02 calculator is based on extensive analysis of existing dataset and reference sources including: the Crown Estate, British Marine Aggregates Producers Association, Mineral Products Association, Department of the Environment, Food and Rural Affairs, WRAP, BRE, Environment Agency and Industry data from rail, aggregate and concrete industries.

Table 10.8, Table 10.9 on the next page and Table 10.10 on the next page summarise the datasets used by the Wst 02 calculator.

Table 10.8: Aggregate regional abiotic depletion potential

Region	Regional abiotic depletion potential			
	Rock	Land-based sand and gravel	Marine sand and gravel	Secondary and recycled materials
England				
North East	8.9×10^{-6}	8.9×10^{-3}	3.2×10^{-6}	0
Yorkshire and Humber	9.2×10^{-9}	0	6.4×10^{-5}	0
North West	2.4×10^{-4}	0.017	2.1×10^{-5}	0
East Midlands	1.7×10^{-5}	4.0×10^{-4}	1.0	0
West Midlands	4.9×10^{-5}	2.5×10^{-4}	1.0	0
East of England	0.35	2.0×10^{-3}	5.2×10^{-6}	0
London	1	2.7×10^{-3}	2.0×10^{-7}	0
South East	1.7×10^{-4}	0.015	2.6×10^{-7}	0
South West	6.3×10^{-6}	0	0.014	0
Wales				
North Wales	5.2×10^{-4}	6.3×10^{-3}	0.17	0
South Wales	0	0	3.5×10^{-6}	0
Scotland				
Argyll and Bute, West Central A and B, South *	7.7×10^{-4}	9.3×10^{-2}	0	0
Forth Valley and SES plan *	0	0		0
Highlands and Moray *	0	2.8×10^{-2}		0
North East Scotland *	0	0		0
Orkney and Shetland *	0.33	1 minimal resource available		0
TAY plan *	3.0×10^{-3}	0		0
Western Isles *	0	0		0
Northern Ireland				
Northern Ireland	8.9×10^{-4}	0	1	0

*The following clarifies which local authorities are assumed to lie within each mineral planning zone for Scotland:
Argyll and Bute, West Central A and B, South: Argyll and Bute; North, South and East Ayrshire; North and South

Region	Regional abiotic depletion potential			
	Rock	Land-based sand and gravel	Marine sand and gravel	Secondary and recycled materials
Lanarkshire; East and West Dunbartonshire; Glasgow City; East Renfrewshire; Renfrewshire; Inverclyde and Dumfries and Galloway. **Forth Valley and SES plan:** Stirling; Falkirk; Fife (south); Clackmannanshire; City of Edinburgh; West, Mid-and East Lothian and Scottish borders. **Highlands and Moray North East Scotland:** Aberdeenshire and Aberdeen City. **Orkney and Shetland** **TAY plan:** Perth and Kinross; Angus and Fife (north) **Western Isles**				

The calculator uses an ADP value of '0' when the resource is not currently depleting and a value of '1' when no reserves are available or are available but not currently utilised.

Table 10.9: Social cost of transport

Social cost (pence per tonne/km)	
Motorway (strategic)	3.9
Motorway (other)	0.6
A-road	3. 6
Other road	10.2
Rail or water	0.2

UK quarries, concrete batching plants, precast concrete suppliers and asphalt plants that hold BES 6001 certification can be found through GreenBookLive.

Table 10.10: Carbon footprint

Aggregate type	Region	$kgCO_2e$/tonne
Quarried stone	All	3.63
Sand and gravel	All	3.43
Recycled aggregates	All	4.65
Secondary aggregates	All	3.82
Marine dredged long haul	Yorkshire and Humber North East East of England East Midlands	9.11 8.93 7.72 9.11
Marine dredged sand or gravel	London South East North West South West North Wales South Wales West Midlands All Scottish regions Northern Ireland	8.43 7.21 5.8 5.8 5.8 5.8 9.11 N/A N/A
Distribution method		
Road		0.07
Rail		0.011
Barge		0.008
Other aspects		
Intermodal handling		0.15
Carbon penalty where recycled or secondary aggregates are used in ready-mix concrete		11.2

This does not represent the total carbon footprint of the concrete or asphalt product and should not be referenced as such.

Further guidance

The Environment Agency publishes and updates Quality Protocols at www.environment-agency.gov.uk

Current guidance

- The Quality Protocol for production of aggregates from inert waste, www.gov.uk/government/publications/quality-protocol-production-of-aggregates-from-inert-waste.
- Steel slag, incinerator bottom ash aggregates and furnace bottom ash (from coal-fired power generation) are not covered by the above Quality Protocol but are or will be covered by their own quality protocols.
- BS EN 12620:2013. Aggregates for concrete. BSI; 2013.
- BS EN 13139:2013. Aggregates for mortar. BSI; 2013.
- BS EN 13450:2013. Aggregates for railway ballast. BSI; 2013.
- BS EN 13242:2013. Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction. BSI; 2013.
- BS EN 13383-1:2013. Armourstone. Specification. BSI; 2013.(107)
- BS EN 13108-1-8:2016. Bituminous mixtures. Material specifications. Asphalt concrete. BSI; 2006.(108)
- BS EN 450-1:2012. Fly ash for concrete. Definition, specifications and conformity criteria. BSI; 2012.(109)
- BS EN 14227-3-4:2013. Hydraulically bound mixtures. Specifications. Fly ash bound granular mixtures. BSI; 2013.(110)
- BS EN 13055:2016. Lightweight aggregates. BSI; 2016.
- BS EN 13285:2010. Unbound mixtures. Specifications. BSI; 2010.(111)
- Highways Agency. Specification for Highway Works - series 600. 2016.(112)

Wst 03 Operational waste

Aim

To encourage the recycling of operational waste through the provision of dedicated storage facilities and space.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	1	Excellent	All
Shell and core	1	Excellent	1–3
Shell only	1	Excellent	1–3

Assessment type specific notes

Ref	Assessment type specific note
-	None

Building type specific notes

Ref	Building type specific note
2.0	**Small industrial units** For an industrial building or development site consisting of a number of smaller units, each ≤ 200m² floor area, shared facilities that meet the criteria for the building or site as a whole are sufficient to achieve this credit.
2.1	**Shopping centres and retail parks** For shopping centres and retail parks there must be adequate space to cater for each tenant and their potential recyclable waste volumes. Tenants that occupy a large proportion of the centre, i.e. 'flagship tenants', must have their own dedicated compliant facilities. For smaller non-flagship tenant units, compliant central or common facilities on site or dedicated spaces for individual units will meet the assessment criteria for this BREEAM issue.
2.2	**Residential institution (long-term stay) – Home composting information leaflet** The leaflet must provide information on: — How composting works and why it is important — The materials that can be composted (e.g. raw vegetable peelings and fruit, shredded paper, tea bags, etc.) — Details of the operation and management plan for the communal composting scheme. Where a green or kitchen waste collection scheme is in operation, the information leaflet provided by the local authority is sufficient to meet the information leaflet criteria.
2.3	**Multi-residential – Supported living facility** Where it is not possible to locate the recycling bins within a communal area accessible to residents for safety reasons (e.g. where the residents have mental health problems and free access to these facilities would pose significant risk of self-harm or harm to others), it is acceptable to locate them within a dedicated non-obtrusive position accessible to staff only, but in close proximity to the areas where recyclable waste material is generated.
2.4	**Healthcare buildings and country-specific guidance** In addition to the standard criteria, the waste facilities are compliant with the relevant NHS guidelines for that part of the UK. **England** Use HTM 07-01 (England version) where the criterion refers to the use of relevant NHS guidelines for the country. **Northern Ireland**

Ref	Building type specific note
	Use HTM 07-01 (Northern Ireland version) where the criterion refers to the use of relevant NHS guidelines for the country. **Scotland** Use SHTN3 NHS Scotland Waste Management guidance Part A-Best Practice Overview and Part B Waste Management Policy template where the criterion refers to the use of relevant NHS guidelines for the country. **Wales** Use WHTM07-01 Safe management of healthcare (Wales) where the criterion refers to the use of relevant NHS guidelines for the country.

Assessment criteria

One credit – Operational waste

1 Provide a dedicated space, identified by clear signage, for the segregation and storage of operational recyclable waste (see M1, M2, and M3). The space is:

1.a Clearly labelled for long-term durability, to assist with segregation, storage and collection of the recyclable waste streams.

1.b Accessible to building occupants or facilities operators for the deposit of materials and collections by waste management contractors.

1.c 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.

2 For consistent and large amounts of operational waste generated, provide:

2.a Static waste compactors or balers; situated in a service area or dedicated waste management space.

2.b 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.

2.c 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

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

Additionally for residential institutions (long-term stay) with self-contained dwellings or bedsits only

4 Provide three internal storage containers for each dwelling or bedsit with:

4.a A minimum total capacity of 30 litres

4.b No individual container smaller than 7 litres

4.c All containers in a dedicated non-obstructive position

4.d Storage containers for recycling in addition to non-recyclable waste storage.

5 Provide home composting facilities (see M4) and a home composting information leaflet within the kitchen area or communal space for each self-contained dwelling or bedsit.

Additionally for residential institutions (long-term stay) with individual bedrooms and communal facilities only

6 Meet criteria 4.a and 4.b for self-contained dwellings or bedsits for every six bedrooms.

7 Locate recyclable storage in a dedicated non-obstructive position in communal kitchens or other appropriate communal space.

8 Provide home composting facilities (see M4) and a home composting information leaflet within the kitchen area or communal space.

9 Provide a minimum of 10 litres of internal storage for compostable waste.

Methodology

M1: Determining if the dedicated space complies

See criteria 1 and 2

The design team demonstrates that the provision of waste management facilities for the assessed building is adequate given the building type, occupier (if known), operational function and likely waste streams and volumes to be generated.

Where it is not possible to determine what provision should be made, the following guide for minimum storage space provision should be used:

Buildings < 5000 m²

— At least 2 m² per 1000 m² of net floor area

OR

— 4 m² per 1000 m² of net floor area where commercial-scale catering is provided

Buildings ≥ 5000 m²

— A minimum of total of 10 m²

OR

— 20 m² where commercial-scale catering is provided

The net floor area should be rounded up to the nearest 1000 m².

M2: General waste

The storage area for recyclable materials must be in addition to areas and facilities provided for dealing with general waste and other waste management facilities, e.g. compactors, balers and composters.

M3: Internal storage areas

Where the facilities are situated internally, vehicular gate heights and widths, manoeuvring and loading space must be sized to ensure ease of access for vehicles collecting recyclable materials.

M4: Home composting facilities

Home composting facilities are individual composting containers placed within the kitchen area or communal space for each self-contained dwelling, bedsit or communal kitchen.

These containers are either emptied into local on-site communal facilities or are collected by composting collection services run by the waste collection authority.

Individual composting containers should be:

1. Located in a dedicated, non-obstructive position.
2. Easily accessible to all users.
3. Durable, low maintenance and cleanable.
4. Enclosed to manage odour and pest issues.

Compliance notes

Ref	Terms	Description
CN1	Extensions to existing buildings	Where there are facilities within the existing building, these can be used to assess compliance. The scope of these facilities must be adequate to cater for the total volume of predicted recyclable waste arising from the new and existing buildings.

Ref	Terms	Description
CN2	Multiple building assessments and buildings that form part of a wider estate	Where the assessment applies to one or more buildings or units that are part of a wider estate or campus, the design team can choose to demonstrate compliance through the provision of dedicated centralised storage space and waste management facilities with the capacity to accommodate the recyclable waste material generated from all buildings and their activities.
CN3	Limited space or vehicle access for a compactor or baler	For sites that have limited space for static installations, compliance can be assessed on the basis of the provision of adequate space for a smaller portable compactor or baler.
CN4	Automated waste collection systems	These are accepted as a form of compliance as long as a management plan is in place, which can either be public (local authority) or private and requirements for separation are met.
CN5	Labelling and signage where provision of waste bins is out of scope	Where the provision of waste bins is outside the scope of the developer, it is clearly not possible to label the bins. In this situation, the following compliance options are available: 1. Provide compliant signage to the storage area and label bin spaces within the storage area according to the relevant waste streams. 2. Where future waste streams are unknown, provide compliant signage to the storage area and a written commitment from the developer to ensure that the bins and/or bin spaces are labelled. It is recognised that the bins may be provided by the tenant, local authority or waste management company after the time of certification.
CN6	Signage for the recycling area	Labelling of the recycling areas is required to alert building users and collection agencies to the location of the recycling facility.

Evidence

Criteria	Interim design stage	Final post-construction stage
Operational waste		
1	Design drawings or relevant section of the building specification or contract clauses to confirm the provision of compliant dedicated facilities for the storage and segregation of recyclable waste, in addition to provisions for general waste. Confirmation from end user or design team of predicted waste streams and indicative volumes. OR Where not known, calculations used to confirm the minimum space required.	Final construction drawings or equivalent to confirm the location and size of the waste storage areas provided. Assessor site inspection report with photographic evidence to verify the installation of compliant waste storage facilities which are clearly labelled.
2	Where applicable to the building, design drawings or relevant section of the building specification or contract clauses to confirm the provision of compactors or balers or compliant organic waste storage where relevant.	Final construction drawings or equivalent and assessor site inspection report with photographic evidence to verify the installation of compliant compactors, balers or organic waste storage facilities where required.
3	Design drawings or relevant section of the building specification or contract clauses or statement from the project team to demonstrate how the facilities are compliant with relevant NHS guidelines.	Final construction drawings or equivalent and assessor site inspection report with photographic evidence to confirm the installed waste facilities meet relevant NHS guidelines.
Additionally for Residential institutions (long-term stay)		
4–9	Design drawings or relevant section of the	Final construction drawings or equivalent to confirm the location of the storage to each

Criteria	Interim design stage	Final post-construction stage
	building specification or contract clauses to confirm the provision of compliant internal recyclable waste storage and home composting facilities. Commitment to provide home composting information leaflets.	home or kitchen type. Assessor site inspection report with photographic evidence or proof of purchase such as purchase orders to confirm that the compliant internal recyclable waste storage is provided. Manufacturer's product data to confirm the size of the containers provided. Copy of home composting information leaflet and confirmation to show these have been issued as required.

Definitions

Accessible space

Accessible space is typically within 20 m of a building entrance. Depending on the size of the building, site restrictions or tenancy arrangements, it may not be possible for the facilities to be within 20 m of a building entrance. In such circumstances, judgement on whether the space is 'accessible' to the building occupants and vehicle collection must be made.

Clinical waste

Waste-derived from medical practices and defined as bodily fluids and wastes, drugs and medical equipment, and other waste which, unless rendered safe, may prove hazardous or infectious to persons coming into contact with it.

Dedicated non-obstructive position

An easily accessible cupboard under the sink or any other cupboard in the kitchen, next to the storage or likely area for storing non-recyclable waste, where practical. Where a kitchen cupboard location is not possible, the bins can be located near to the kitchen, in a utility room or connected garage, for example.

Flagship or anchor tenant

The largest and primary tenant within a retail development, typically department store-type retailers.

Waste compactor or baler

A machine that is designed to compress waste streams in order to improve storage and transport efficiency.

Additional information

Recyclable storage space

The following footprint dimensions (informed by the Metric handbook: Planning and design data(113)) can act as a guide when determining size and accessibility criteria for the recyclable storage space:

1. Compactor dimensions: about the size of one car parking bay, 4.8 m × 2.4 m
2. Skip: the footprint of an 8 and 12 cubic yard skip measures 3.4 m × 1.8 m, therefore allow a minimum of 2.0 m width and 4.0 m length or 8 m² area for the storage and access of such containers
3. Wheeled bins:
    a. 360 litre = 0.86 m × 0.62 m
    b. 660 litre = 1.2 m × 0.7 m
    c. 1100 litre = 1.28 m × 0.98 m
4. Roll-on-roll-off containers: allow a minimum of 6.1 m × 2.4 m
5. Vehicle access: the following are dimensions for lorry types that are typically used to collect waste. Therefore gate height and widths should not be smaller than these measurements:
    a. Dustcart (medium capacity): length = 7.4 m, height = 4 m, width 3.1 m
    b. Skip lorry: length = 7 m, height = 3.35 m, width 3.1 m

Consideration must also be given to any other types of vehicle requiring access to this area, e.g. lorries for roll-on roll-off containers.

Wst 04 Speculative finishes (Offices only)

Aim

To minimise the wastage associated with the installation of floor and ceiling finishes in lettable areas in speculative buildings where tenants have not been involved in their selection.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	1	None	All (see ref 1.0)
Shell and core	0	None	Not applicable
Shell only	0	None	Not applicable

Assessment type specific notes

Ref	Assessment type specific note
-	None

Building type specific notes

Ref	Building type specific note
-	None

Assessment criteria

One credit – Speculative floor and ceiling finishes

Office building types only

1 For tenanted areas, where the future occupant is not known and carpets or other floor or ceiling finishes are installed, these must be limited to a show area only.

2 Only install floor and ceiling finishes selected by the known occupant of a development. Alternatively, where the occupant is not known and only ceiling finishes and no carpets are installed, the building owner confirms that the first tenants will not be permitted to make substantial alterations to the ceiling finishes.

Methodology

None.

Compliance notes

Ref	Terms	Description
CN1	Designed-out or integrated finishes	The requirements for this credit are met when either: — No finishes within the scope of the issue have been specified, or — Finishes are integrated into the asset and designed in a way that the finish cannot be removed.

Ref	Terms	Description
		For instance, a self-finished timber floor or exposed soffit which cannot be removed and does not require additional finishes when installed.

Evidence

Criteria	Interim design stage	Final post-construction stage
1	Design drawings, finishes schedules relevant sections of the building specifications or contract clauses or letter from the client or developer to confirm that either no finishes will be installed, or these will be limited to a show area only.	Final construction drawings or equivalent and assessor site inspection report with photographic evidence to confirm that either no finishes will be installed, or these will be limited to a show area only.
2	Design drawings, finishes schedules or relevant sections of the building specifications confirming specified finishes and evidence to demonstrate these have been selected by the occupant. OR Letter of commitment from the client or project team to confirm that floor and ceiling finishes will be selected by the known occupant. Where the occupant is not known and ceilings are installed, contract clauses or letter from the client or developer to confirm that the tenant will not be able to make substantial alterations to the ceiling.	Final construction drawings or equivalent or finishes schedules confirming the floor and ceiling finishes and that these have been selected by the occupant. Assessor site inspection report with photographic evidence to verify that the ceiling and floor finishes have been installed in line with the occupant's selection. Where the occupant is not known and ceilings are installed, tenancy agreement confirming that the tenant is not allowed to make substantial alterations to the ceiling.

Definitions

Show area

A show area can be either a floor plate or an individual office but must be less than 25% of the net lettable floor area to award the credit.

Speculative project

This is a project developed by a speculative builder. For example, a contractor who develops, constructs, and then sells (or leases) a property.

Substantial alterations

Substantial alterations refer to any changes to the ceiling finishes that significantly impact their original appearance, structural integrity, or functional characteristics. This includes, but is not limited to, the removal, replacement, or significant modification of the materials or design.

Routine maintenance, minor touch-ups, and aesthetic adjustments that do not alter the primary function or structural properties of the ceiling finish are not considered substantial.

Additional information

None.

Wst 05 Adapting to climate change

Aim

To recognise and encourage measures taken to mitigate the impact of extreme weather conditions arising from climate change over the lifespan of the building.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	1 + 1 exemplary	None	All
Shell and core	1 + 1 exemplary	None	All
Shell only	1	None	1–3
EU Taxonomy	-	-	1–3

Assessment type specific notes

Ref	Assessment type specific note
-	None

Building type specific notes

Ref	Building type specific note
-	None

Assessment criteria

One credit – Resilience of structure, fabric, building services and renewables installation

1 Conduct a climate change adaptation strategy appraisal using:

1.a A systematic risk assessment to identify the impact of expected extreme weather conditions arising from physical climate risks and climate change on the building and vulnerabilities over its projected life cycle. The assessment covers the installation of building services and renewable systems, as well as structural and fabric resilience aspects and includes (see M1):

1.a.i Hazard identification

1.a.ii Hazard assessment

1.a.iii Risk estimation

1.a.iv Risk evaluation

1.a.v Risk management.

2 Develop recommendations or solutions based on the climate change adaptation strategy appraisal, before or during Concept Design, that aim to mitigate the identified impact.

> The adaptation solutions implemented should not adversely affect the adaptation efforts or the level of resilience to physical climate risks of other people, of nature, of cultural heritage, of assets and of other economic activities. The adaptation solutions should favour nature-based solutions or rely on blue or green infrastructure to the extent possible, and be consistent with local, sectoral,

regional or national adaptation strategies and plans. The effectiveness of these solutions must be monitored and measured against pre-defined indicators, with remedial action taken where those indicators are not met. Where the implemented solution is physical and consists of an activity with defined environmental impact criteria, the solution must demonstrate that it causes no significant harm to environmental objectives, in alignment with relevant regional frameworks including EU taxonomy technical screening criteria where applicable.

3 Provide an update during Technical Design demonstrating how the recommendations or solutions proposed at Concept Design have been implemented where practical and cost effective. Omissions have been justified in writing by the assessor.

One exemplary credit – Responding to climate change

4 Achieve criteria 1 to 3 above.

5 Achieve the criteria or credits given in Table 10.11 below.

Table 10.11: Criterion 5 requirements

Issue	Requirements	Link to Wst 05 issue
Hea 05 Thermal comfort	One credit – Thermal modelling – Future climate	Prevent increasing risks of overheating.
Ene 01 Energy and carbon performance for regulated energy uses	A minimum of six credits	Maximise energy efficiency to tackle likely energy demand and minimise resultant carbon emissions.
Wat 01 Water consumption	A minimum of three credits	Minimise water demand in periods of drought.
Mat 04 Durability and resilience	Criteria 2–4	Avoid increased risks of deterioration and higher maintenance demands.
Pol 03 Flood and surface water management	Flood resilience: a minimum of one credit Surface water run-off: two credits	Minimise the risks of increased flood risk and surface water run-off affecting the site or others.

Methodology

M1: Climate change adaptation strategy appraisal

As a minimum, follow these steps when completing the climate change adaptation strategy appraisal (see criterion 1).

M1.1: Responsible individual

1. Nominate an individual to coordinate the necessary work and to be responsible for the final report. For example, this could be a BREEAM AP if appointed.

M1.2: Hazard identification

1. Review state-of-the-art climate project scenarios to determine risk, using evidence and information from relevant bodies and resources (see Additional information) to identify and understand the expected impacts of increased extreme weather events and climate change on the building. Relevant bodies include, but are not limited to, the following:
    a. Local authorities
    b. Statutory bodies, e.g. Defra, Environment Agency, Northern Ireland Environment Agency (NIEA), Scottish Environment Protection Agency (SEPA) etc.
    c. Technical bodies, e.g. CIBSE, UK Climate Impacts Programme (UKCIP).
2. As a guide, all adaptation plans should consider the following impacts of climate change and extreme weather events and describe how the design mitigates against them, where appropriate:
    a. Flooding
    b. Storms (including high winds)

   c. Cold events
   d. Heat waves (including temperature increases)
   e. Drought (including reduced summer rainfall)
   f. Milder winters
   g. Wetter winters (including increased moisture and driving rain)
   h. Warmer summers and increased solar radiation
   i. Temperature variation
   j. Precipitation, e.g. rain and snow
   k. Subsidence or ground movement.
3. Identify likely hazards.

M1.3: Hazard assessment

1. Identify the likelihood and the magnitude or scale of the hazards identified.

This includes state-of-the-art climate change scenarios and their potential impact throughout the lifetime of different building elements and the vulnerability of the performance of the economic activity during its expected lifetime.

The climate risk and vulnerability assessment is proportionate to the scale of the activity and its expected lifespan, such that:

1. For activities with an expected lifespan of less than 10 years, the assessment is performed, at least by using climate projections at the smallest appropriate scale.
2. For all other activities, the assessment is performed using the highest available resolution, state-of-the-art climate projections across the existing range of future scenarios consistent with the expected lifetime of the activity, including, at least, 10-to-30-year climate projections scenarios for major investments.

M1.4: Risk estimation

1. Identify the risk presented by these hazards to the building and the likely impact of the hazards taking into account the following aspects as a minimum:
   a. Structural stability
   b. Structural robustness
   c. Weather proofing and detailing
   d. Material durability
   e. Health and safety of building occupants and others
   f. Impacts on building contents and business continuity.

M1.5: Risk evaluation

1. Evaluate the potential impact of these risks on the building.
2. Determine the tolerable risk threshold.
3. Check the sensitivity of the risk assessment.
4. Identify areas where the risks are unacceptable to health and safety, life cycle assessment and financial terms.

M1.6: Risk management

1. Identify risk reduction measures.
2. Mitigate the hazards as far as is practically feasible.
3. Adapt the design and specification to incorporate the measures identified by the risk assessment in the final design.

Compliance notes

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
All	Copy of a compliant climate change adaptation strategy appraisal. Documentation such as specification clauses and/or design drawings to show that all	Final construction or equivalent drawings and assessor site inspection report with photographic evidence confirming that specified mitigation measures have been

Criteria	Interim design stage	Final post-construction stage
	identified mitigation measures have been adopted within the final design. Omissions must be justified in writing.	implemented.

Definitions

Blue-green infrastructure (BGI)

The European Commission defines BGI as a 'strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem service'. Blue elements include areas of water and wetlands. Green elements include parks, gardens, trees and bushes. This can benefit nature, the environment, climate resilience, health and wellbeing and local communities.

Durability

The ability to withstand wear, pressure or damage.

Hazard

A hazard is a situation or event which has the potential to cause harm. It may be an accidental or a malicious action, insufficient strength or resistance, or excessive deviation from intended limits.

Resilience

Infrastructure resilience is the ability to reduce the magnitude and/or duration of disruptive events. The effectiveness of a resilient infrastructure or enterprise depends upon its ability to anticipate, absorb, adapt to, and/or rapidly recover from a potentially disruptive event.[114]

Sensitivity of the risk assessment

Sensitivity analysis is a technique used to determine how changing the values of a variable will alter a dependent variable under a given set of assumptions. Where several values could be changed to affect a dependent variable, changes need to be made one at a time. For example, the use of different climate change scenarios would alter the hazards of the development.

Structural and fabric resilience

The ability of a structure to withstand an increased burden of weather, increased pressure or hazards associated with climate change.

Examples of increased pressures or hazards to be considered include the impacts of climate change and extreme weather events described in M1.2: Hazard identification on page 310.

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.

Additional information

Example climate change adaptation strategy appraisal

Table 10.12 on the next page is an example of a climate change adaptation strategy appraisal for a selection of building elements and climate change impacts. This example is not a complete appraisal, but illustrates some of the content that should be included in the appraisal.

Table 10.12: Climate change adaptation strategy appraisal examples

Appraisal examples		
Hazard		
Climate change hazard	Flooding	Cold events
Hazard assessment		
Hazard scale	High	High
Building element	Ground floor flooring material	Façade finishing materials
Building element lifetime	10–15 years	10 years
Hazard likelihood	High	High
Impact magnitude	Medium	Medium
Risk		
Risk estimation	Flooring material becomes unusable and needs to be changed. Health risks associated with dampness; potential impact on business continuity	Façade finishing materials are not affected by cold, but are affected by snow, strong winds and rain
Risk evaluation	Risk assessment sensitivity: flooding has a high likelihood under all scenarios. Health risks are beyond the tolerable risk threshold	Risk assessment sensitivity: flooding has a high likelihood under all scenarios. No health risks identified
Risk reduction measure	Select a flood-resistant flooring material	None

Guidance on climate change scenarios and adaptation strategies

The following resources for climate change scenarios and impacts are available:

1. Relevant Intergovernmental Panel on Climate Change (IPCC) report on Impacts of climate change and adaptation.[115]
2. UK climate change risk assessment.[116]
3. Climate change impacts (www.climatejust.org.uk)
4. Developing H++ climate change scenarios for heat waves, droughts, floods, windstorms and cold snaps.[117]
   The following resources for best practice design guidance are available:
5. The environmental design pocketbook[118]
6. Adaptation resources (www.climatejust.org.uk/resources)
7. Adaptation or retrofitting[119]
8. Design for climate change[120]
   The book 'Design for climate change' describes buildings and issues as part of the Design for future climate, adapting buildings programme, the largest programme focusing on the climate change adaptation of buildings in the UK. This programme from the Technology Strategy Board (TSB) aims to improve the climate resilience of building projects. The book has guidance on construction, including structural stability.
9. The UKCIP Adaptation Wizard v 4.0 2013 (www.ukcip.org.uk/wizard/about-the-wizard/)
10. Potential costs and benefits of adaptation options: A review of existing literature.[121] This is a technical paper by the United Nations Framework Convention on Climate Change (UNFCCC), which reviews methods of costing adaptation options and assessing their benefits
11. National Adaptation Programme 2013.[122]

The National Adaptation Programme report has been drawn up by the UK Government, industry and other non-government organisations working together. It contains a mix of policies and actions to help the UK to adapt successfully to future weather conditions, by dealing with the risks and making the most of the opportunities.

12. Potential implications of climate change in the built environment.[123]

The BRE report 'Potential implications of climate change in the built environment', discusses climate change adaptation strategies, including some for structural resilience.

Wst 06 Disassembly and adaptability

Aim

To minimize costs and use of materials due to future adaptations and to promote circular economy principles.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	2	None	All
Shell and core	2	None	All
Shell only	2	None	All
EU Taxonomy	-	-	1–5

Assessment type specific notes

Ref	Assessment type specific note
-	None

Building type specific notes

Ref	Building type specific note
-	None

Assessment criteria

One credit – Design for disassembly and adaptability – Recommendations

1 By the end of Concept Design, conduct a study to explore the disassembly and adaptation potential of different design scenarios (see M1).

2 By the end of Concept Design, develop solutions based on the study (criterion 1) that allow disassembly and adaptability (see M1).

One credit – Design for disassembly and adaptability – Implementation

3 Achieve criteria 1 and 2.

4 During Technical Design, provide an update on the following (see M2):

4.a How the solutions proposed by Concept Design have been implemented where practical and cost effective. Omissions must be clearly justified.

4.b Changes to the recommendations and solutions during the development of the Technical Design.

5 Produce a building design for disassembly and adaptability manual (see Definitions and M2) to communicate the disassembly and adaptability principles and characteristics to prospective owners or building operators.

Methodology

M1: Design for disassembly and adaptability study

M1.1: Adaptability principles

The study and solutions must consider the following as a minimum:

1. **Versatility**: the ability of spaces to accommodate changes in use with minimal changes to maximise space utilisation. For example, a performance space that can also be used as a meeting or community space.
2. **Convertibility**: related to versatility, the potential of internal spaces to accommodate more significant changes in use without affecting building structure. For example, changing a cellular office to an open plan office through changing the internal layout and partitions.
3. **Expandability**: the ability of a design to accommodate a substantial change that supports or facilitates the addition of new space, features, capabilities, and capacities. It involves designing to allow for either vertical or horizontal additions in floor space.

For additional guidance, see Table 10.13 on page 317 and ISO 20887.

M1.2: Disassembly principles

The study and solutions must consider the following as a minimum:

1. **Ease of access to components and services**: it allows for a material, component, or connector of an assembly, especially those with the shortest anticipated life cycle, to be easily approached, with minimal damage to and impact on it and adjacent assemblies.
2. **Independence**: it allows for parts, components, modules, and systems to be removed or upgraded without affecting the performance of connected or adjacent systems.
3. **Avoidance of unnecessary treatments and finishes**: choice of finishes can limit the options for reusing or recycling, particularly if potentially hazardous substances are included. To support disassembly, finishes that can prevent components from being re-used or recycled should be avoided.
4. **Supporting re-use (circular economy) business models**: this principle is concerned with supporting the market for re-used, refurbished, remanufactured, and recycled materials and products now and in the future, in support of circular economy business models.
5. **Simplicity**: it refers to the quality of an assembly or system that is designed to be straightforward, easy to understand, and meet performance requirements with the least amount of customization.
6. **Standardization**: it is concerned with the use of common components, products, or processes to satisfy a multitude of requirements.
7. **Safety of disassembly**: it is concerned with easy access to accurate information on the original materials and assembly methods used for an asset, together with details of any subsequent major renovation.

For additional information, see Table 10.14 on page 317 and ISO 20887.

M2: Implementing design for disassembly and adaptability

The implementation will be specific to the building and scope of the project, but information should be made available to the assessor covering the implementation of all adaptability and disassembly principles as per M1.

A disassembly and adaptability manual shall be prepared and submitted, including the following information:

1. Design details: Sufficient information shall be generated documenting specific disassembly methods, material composition, recovery methods, and adaptable design features.
2. Material constituents and manufacturers: Products and materials should be traceable to a specific manufacturer or supplier, with contact details, such as product manufacturer websites, included in the construction documentation.

3. Connection detailing: Connection detailing, especially for reversible connections, should be well documented for the aspect of assembly and disassembly.

For additional information, see ISO 20887.

Compliance notes

Ref	Terms	Description
CN1	Design for disassembly and adaptability – timing	Late consideration of design for disassembly and adaptability, might reduce the study to a 'paper exercise', with minimal value to the project. However, where the assessor is satisfied that there is clear justification for the study being developed at a slightly later stage AND there is clear evidence that the strategy has achieved the intended outcomes despite the later consideration, this will be sufficient for compliance. In any case, all other requirements of the issue must be met for the credit to be awarded.

Evidence

Ref	Interim design stage	Final post-construction stage
1–2	A copy of the disassembly and adaptability study completed at Concept Design.	No further actions required post-construction. No additional evidence is required other than that listed for the design stage.
4	A copy of the design for disassembly and adaptability implementation plan report completed at Technical Design.	Final construction drawings or equivalent and assessor site inspection report with photographic evidence showing that the recommendations and solutions were implemented within the build.
5	Relevant section of the building specification, contract clauses or letter of commitment to produce a building design for disassembly and adaptability manual.	A copy of the building design for disassembly and adaptability manual.

BRE has avoided being overly prescriptive for this issue, recognising that this is a complex environmental and design issue where solutions and approaches are largely influenced by building specific factors. The evidence required to demonstrate compliance will vary according to the relevant stage. Some examples are:

- Concept Design: reports outlining the activity relating to functional adaptability and disassembly - ideas discussed, analysis and decisions taken.
- Concept and Developed Design stages: drawings or building information model (BIM).
- All stages: meeting notes, construction programme, responsibilities schedule (indicating parties consulted).

BREEAM Assessors should use their judgement to determine whether the aim and intent of each credit has been met (using appropriate project information to support the decision).

Definitions

Adaptability

Ability to be changed or modified to make suitable for a particular purpose.

Building disassembly and adaptability manual

The manual can be in the form of an analogue document, or an Asset Information Model from the Building Information Model (BIM). For information on what the guide could include, see ISO 20887.

Disassembly

Non-destructive taking-apart of a construction works or constructed asset into constituent materials or components.

Additional information

Healthcare buildings

Health Technical Memorandum 07-07 includes guidance on future-proofing healthcare buildings.[124]

Example design measures for adaptability

Examples of adaptability design measures that may be adopted for each assessment part when considering versatility, convertibility, and expandability are provided in Table 10.13 below.

Table 10.13: Examples of design measures allowing adaptability

Principles for adaptability	Examples of design measures and aspects to consider for specific building elements		
	Fabric and structure	Core and local services	Interior design
Versatility	A gymnasium can double as a community theatre or arts centre if it is provided with portable seating.	A pipeline that can batch various products or processes.	A dividing partition can also function as a conduit for utilities.
Convertibility	Location of structural components within the floor space.	-	Layout in standardised grids. Use of inherent finishes to allow replacement. Use of standardised material sizes.
Expandability	Provision to add extensions or alterations to increase building capacity.	Provision of capacity in infrastructure to enable future expansion and adaptation.	Identifying or recognising potential future functional requirements. Efficient use of space to allow for any increase in occupancy.

Example design measures for disassembly

Examples of considerations when designing for disassembly are provided in Table 10.14 below.

Table 10.14: Examples of design measures and aspects to consider regarding future disassembly

Principles for disassembly	Examples of design measures and aspects to consider
Ease of access to components and services	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.
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
Supporting re-use (circular economy) business models	Consideration shall be given to the re-use potential of materials, products, components, and systems. A consideration of the service life in the re-used application compared to the residual service life of the product or material in the original application shall be factored into this approach.

Principles for disassembly	Examples of design measures and aspects to consider
	Materials should be selected for which it can be anticipated that a market will exist for their re-use in the future, and for which facilities exist for any required handling or processing. The use of construction components that can be refurbished, allowing for an increase in their service life, shall be considered.
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.

Land use and ecology

Summary

This category encourages sustainable land use, protection and creation of habitats, and improvement of long-term biodiversity on-site and in the surrounding area. Issues in this section relate to the reuse of brownfield sites, protection and enhancement of ecological value, and long-term management of biodiversity.

There are two routes to demonstrate compliance with the ecology issues in this category:

- Foundation route (project team member route), which provides a basic approach to assessing and enhancing ecological value.
- Comprehensive route (ecologist route), which provides a more detailed assessment of the change in ecological value for a site.

The credits available for each issue varies dependent on the chosen route, with more credits available for following the comprehensive route.

The criteria and methodology used in the ecology issues in BREEAM recognise good and best practice processes that can help achieve the UK government and industry aspiration to meet biodiversity net gain: 'development that leaves biodiversity in a better state than before, and an approach where developers work with local governments, wildlife groups, landowners and other stakeholders in order to support their priorities for nature conservation.'[125]

Assessment issues

Lue 01 Site selection	2 credits
Lue 02 Ecological risks and opportunities	up to 2 credits + 1 exemplary
Lue 03 Managing impacts on ecology	up to 3 credits
Lue 04 Ecological change and enhancement	up to 4 credits + 1 exemplary
Lue 05 Long term ecological management	up to 2 credits

Lue 01 Site selection

Aim

To encourage the use of previously occupied or contaminated land and avoid land which has not been previously disturbed.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	2	None	All
Shell and core	2	None	All
Shell only	2	None	All
EU Taxonomy	-	-	1 and 2 (see M1)

Assessment type specific notes

Ref	Assessment type specific note
-	None

Building type specific notes

Ref	Building type specific note
2.0	**Education (schools only) – Playing fields** A playing field within the development footprint can be considered as previously occupied land, provided an equivalent area of playing field is reinstated on land of low ecological value within one year of completing the construction works.
2.1	**Prisons** All land within a secure perimeter fence on an existing prison site can be classified as previously occupied land. If the secure perimeter fence of a prison is being extended to accommodate the proposed building, or the proposed building is located on a completely new site, then the building must comply with criterion 1 below.

Assessment criteria

One credit – Previously occupied land

1 At least 75% of the proposed development is on previously occupied land.

One credit – Contaminated land

2 A contaminated land professional undertakes a site investigation, risk assessment and appraisal, using ISO 18400 or equivalent, which deems that land within the development footprint to be affected by contamination. This report identifies:

- 2.a The degree of contamination
- 2.b The contaminant sources or types
- 2.c The options for remediating sources of contamination which present an unacceptable risk.

3 The client or principal contractor confirms that a remediation strategy will be implemented, in line with the report.

Methodology

M1: EU Taxonomy

Development should not be constructed on any of the following:

a. Arable land and crop land with a moderate to high level of soil fertility and below ground biodiversity as referred to the EU LUCAS survey;

b. Greenfield land of recognised high biodiversity value and land that serves as habitat of endangered species (flora and fauna) listed on the European Red List or the IUCN Red List;

c. Land matching the definition of forest as set out in national law used in the national greenhouse gas inventory, or where not available, is in accordance with the FAO definition of forest.

Compliance notes

Ref	Terms	Description
Previously occupied land		
CN1	Infill sites	When assessing new buildings developed within the boundary of an existing site, they do not automatically comply with the reuse of land criteria. At least 75% of the land on which the new building will be sited must meet the definition of 'previously occupied' (for prisons, refer to Scope of BREEAM New Construction on page 20).
CN1.1	Temporary structures	The presence of concrete and hardstanding areas established as temporary structures for enabling works are not considered to be previously developed land on a site.
CN1.2	Fixed surface infrastructure	Car parks and other hard-landscaped areas often incorporate small pockets of soft landscaping. Where these are integral to the hard landscaping and constitute a small proportion of the total area, these areas can be considered as part of the fixed surface infrastructure.
Contaminated land		
CN2	Scope	The credit for use of contaminated land can only be awarded where remediation has taken place to enable development of the site for the assessed building, or a larger phased development that includes the assessed building. Land that has been decontaminated solely for health and safety reasons, or for historic remediation, is not within scope. The credit is only awarded for remediating the land specifically to develop this project or wider development.
CN2.1	Prior decontamination	The credit for use of contaminated land can only be awarded where remediation has taken place to enable development of the site for the assessed building, or a larger phased development that includes the assessed building. The credit is not achievable for instances where historical remediation and development of the site has occurred outside the scope of the current development proposals.
CN2.2	Health and safety related decontamination	Contaminated land that has been decontaminated solely for health and safety reasons (rather than for the specific purpose of redevelopment) does not comply.
CN2.3	Large sites split into smaller plots	Where contamination of a large site has been remediated and has then been packaged up into smaller plots of land for individual buildings (possibly as part of a phased development strategy), the credit can be awarded regardless of the plot location of the assessed building within the wider development plan. This is on the condition that the site could not have been developed without remediation work taking place.
CN2.4	Presence of radon gas	Naturally occurring radon is not considered as contamination in relation to BREEAM. However, where radioactive substances have been introduced as a consequence of human activities, that land would then be considered to be 'contaminated with radioactivity' and remediation of such contamination would fall under the scope of the

Ref	Terms	Description
		relevant BREEAM issue.
CN2.5	Equivalent standards	The contaminated land professional should determine whether or not a standard is equivalent to ISO 18400.

Evidence

Criteria	Interim design stage	Final post-construction stage
Previously occupied land		
1	Design drawings (including existing and proposed site plans), site photographs or report that confirm the previous land use and clearly identify the percentage area of the site previously developed.	As-built evidence such as assessor's site inspection report and photographic evidence or final construction site plan or equivalent to confirm the footprint of the development has not changed. Where alteration has occurred, the percentage must be recalculated using the final construction site plans.
Contaminated land		
2	A copy of the contaminated-land professional's report which confirms the degree and type of contamination present and remediation strategy, with evidence to show the investigation followed ISO 18400 or equivalent. Evidence to confirm the author meets the definition of a contaminated land professional. Existing site plans showing contaminated areas to be remediated in relation to any proposed development.	No further actions required post-construction. No additional evidence is required other than that listed for the design stage.
3	A letter from the principal contractor or remediation contractor confirming: — The remediation strategy for the site — Summary details of the implementation plan. If a contractor has not yet been appointed, a letter from the client or their representative confirming that the appointed contractor will undertake necessary remediation works to mitigate the risks identified in the report.	Verification report, records, or other evidence to demonstrate that the remediation strategy was implemented.
EU Taxonomy		
1–2	Evidence, such as existing site plans, site photographs and reports, showing that the land on which the development has been built is not one of the categories a, b or c in the EU Taxonomy criteria as listed in M1: EU Taxonomy on the previous page.	No further actions required post-construction. No additional evidence is required other than that listed for the design stage.

Definitions

Contaminated land professional

An individual that holds a degree or equivalent qualification in chemistry, environmental science or management, earth sciences, civil engineering, or a related subject, and has a minimum of three years relevant experience (within the last five years) in site investigation, risk assessment and appraisal. Such experience must clearly demonstrate a practical knowledge of site investigation methodologies and understanding of remediation techniques and national legislation on the subject; as well as acting in an advisory capacity to provide recommendations for remediation.

Land affected by contamination

Land that could not be legally or safely developed or built on to the proposed end use without the remediation of the contamination. Contamination is defined as any substance or agent in, or on the ground within the development footprint, which presents an unacceptable risk to human health, property, or the environment. For the purposes of BREEAM, substances or agents that could present unacceptable contamination risks are defined as those that act as a barrier to the development of land, which could include certain plant species such as, but not limited to, Japanese knotweed and giant hogweed.

Where asbestos is found to be present in the ground this is classed as contamination for the purposes of this issue. If asbestos is present in existing building fabric, the site cannot be classified as contaminated land.

Previously occupied land

For the purposes of this issue BREEAM defines previously occupied land as that which is or was occupied by a permanent structure, including any associated fixed surface infrastructure. The definition is based on the National Planning Policy Framework definition of previously developed land,(126) with some further clarifications for items 3 and 4. The definition excludes:

1. Land that is or has been occupied by agricultural or forestry buildings.
2. Land that has been developed for minerals extraction or waste disposal by landfill purposes where provision for restoration has been made through development control procedures.
3. Land in built-up areas such as parks, recreation grounds and allotments which – although they may feature paths, pavilions, and other buildings – have not been previously occupied.
4. Land that was previously occupied but where the remains of the permanent structure or fixed surface structure have blended into the landscape in the process of time (to the extent that it can reasonably be considered as part of the natural surroundings), typically over a period of more than fifty years.

Proposed development

Any development (building, hard landscaping, car park and access roads) that falls within the boundary of the assessed site.

Remediation

Any activity undertaken to prevent, minimise, remedy, or mitigate the risk caused by contaminated land to human health, the environment, or local resources such as sources of potable water.

Additional information

None.

Lue 02 Ecological risks and opportunities

Aim

To determine the existing ecological value associated with the site, including surrounding areas, and the risks and opportunities for ecological protection and enhancement as part of the project.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	up to 2 + 1 exemplary	None	All
Shell and core	up to 2 + 1 exemplary	None	All
Shell only	up to 2 + 1 exemplary	None	All
EU Taxonomy	-	-	All (see M5)

Assessment type specific notes

Ref	Assessment type specific note
-	None

Building type specific notes

Ref	Building type specific note
-	None

Assessment criteria

Assessment route

There are two routes available dependent on the nature of the site under development. The credits available and the criteria are different depending on the assessment route that is being used. The foundation route is only available on sites of low ecological risk due to the nature of ecology present prior to site works including site clearance and preparation activities. The comprehensive route is available for all sites.

IMPORTANT: Please refer to the Methodology and Definitions to ensure the criteria are being fully met and for helpful guidance.

Table 11.1: Credits by assessment route (Lue 02)

Assessment criteria	Foundation route	Comprehensive route
Survey and evaluation	1 credit	1 credit
Determining ecological outcomes		1 credit
Exemplary level: Wider site sustainability	1 exemplary credit	1 exemplary credit

Survey and evaluation

Foundation route

1 The site is evaluated using the BREEAM Ecological Risk Evaluation Checklist (Guidance Note 34) confirming that the foundation route can be used (see M1).

Comprehensive route

2 A suitably qualified ecologist (SQE) carries out a survey and evaluation (see M3.1) for the site early enough to influence site preparation works, layout and, where necessary, strategic planning decisions (typically Preparation and Brief stage).

3 The SQE's survey and evaluation determines the site's ecological baseline, including:

3.a Current and potential ecological value and condition of the site and related areas within the zone of influence.

3.b Direct and indirect risks to current ecological value from the project.

3.c Capacity and feasibility for enhancement of the site's ecological value and, where relevant, areas within the zone of influence.

Determining ecological outcomes

Foundation route

4 Achieve criterion 1.

5 Relevant members of the project team liaise and collaborate, and where appropriate with representative stakeholders (see M2.1) early enough to influence key planning decisions (typically Concept Design stage), to:

5.a Identify the optimal ecological outcomes for the site.

5.b Select measures to meet the optimal ecological outcomes for the site (criterion 5.a), in line with the mitigation hierarchy for the foundation route:

5.b.i Avoidance

5.b.ii Protection

Comprehensive route

6 Achieve criteria 2 and 3.

7 The ecologist collaborates with appropriate project team members (e.g. landscape architect, architect etc.), sharing relevant information and recommendations from the survey and evaluation to influence the project design as well as decisions regarding site preparation and construction works (see M3.2).

8 The ecologist, with full support from the project team, collaborates with representative stakeholders (see M3.2) early enough to influence key planning decisions (typically Concept Design stage).

9 The ecologist identifies the optimal ecological outcomes for the site, and identifies measures to achieve these outcomes in line with:

9.a The collaborations undertaken as part of criteria 7 and 8.

9.b The mitigation hierarchy for the comprehensive route:

9.b.i Avoidance

9.b.ii Protection

9.b.iii Reduction or limitation of negative impacts

9.b.iv On-site compensation

9.b.v Enhancement, considering the capacity and feasibility within the site, or where this is not viable, off-site.

One exemplary credit – Wider site sustainability

10 Achieve criteria 4 to 5 (foundation route) or 6 to 9 (comprehensive route).

11 When determining the optimal ecological outcome for the site consider the wider site sustainability-related activities and the potential for ecosystem service-related benefits. For a list of the minimum areas for consideration, see M4.

12 Incorporate at least one measure into the design that would demonstrate an ecosystem service related benefit.

Methodology

M1: Assessment route selection

There are two assessment routes that can be used in the ecology issues (Lue 02 to Lue 05):

- Foundation route
- Comprehensive route

The route followed determines the criteria that need to be met for each issue, the Lue section weighting, and the overall number of credits that are available.

Projects eligible for the foundation route have the option to target credits using the comprehensive route instead, to open up a higher number of credits (see Figure 4).

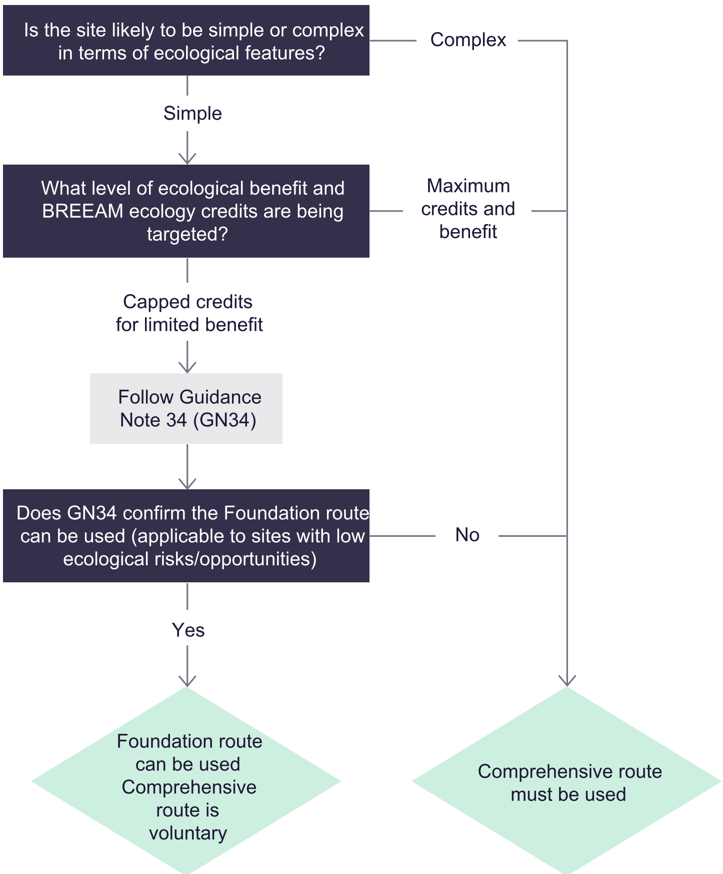

Figure 4: Decision tree for the foundation route and comprehensive route

M1.1: Selecting the foundation route (project team member)

The foundation route can only be used for sites with ecological risks that can be understood and addressed by a project team member using general observation, non-specialist knowledge, and publicly available resources. To use this route, Guidance Note 34 (GN34) must be completed (see criterion 1). There are fewer credits available, and the category weighting is reduced due to the limited ecological opportunities that are available for using this route.

M1.2: Selecting the comprehensive route (suitably qualified ecologist)

This route is primarily for sites where complex ecological systems are likely to be present or if the project team or developer choose to target higher credits for achieving better ecological outcomes compared with the foundation route. This route must be carried out by an SQE and conducted for sites identified as being of more significant ecological risk (using Guidance Note 34).

In many cases this route is likely to add insufficient value for foundation route assessment projects. Where a simpler project is willing and able to achieve additional ecological enhancement however, the comprehensive route is available.

M1.3: Targeting ecology issues using a mixture of routes

Where the foundation route is pursued initially, but later changed to the comprehensive route, the suitably qualified ecologist must review the evidence from the issues already assessed to confirm any actions already taken were appropriate.

M2: Methodology for the foundation route

M2.1: Representative stakeholders

For criterion 5, where deemed necessary, a member of the project team should consult with representative stakeholders to determine appropriate options for the site in question. This may include:

- Local government and other statutory relevant organisations.
- Local community groups or organisations or charities such as the Wildlife Trusts.
- Local, regional and or national fauna focused groups such as Buglife, RSPB, Bat Conservation Trust etc.

The nature of this consultation will vary depending on the project's type and scale.

M2.2: Determining ecological outcomes, and identifying and agreeing measures

For criterion 5, appropriate actions for the site need to optimise ecological outcomes in terms of:

1. Ecological benefit offered (pre, during and post project completion, as appropriate).
2. Protecting wildlife during site-preparation and construction.
3. Contribution of the site to local biodiversity goals taking into consideration quality, connectivity and fragmentation of local habitats.
4. Opportunities to enhance the value of existing habitats and biodiversity in the vicinity, or to restore or add new features of ecological value to local biodiversity.
5. Wider community and end user involvement benefits.

To identify, appraise and agree appropriate actions for achieving optimal ecological outcomes with stakeholders, the following need to be considered:

1. Ecological value and biodiversity, accounting for:
    a. Local priorities.
    b. Long term viability of the outcome or option.
    c. Alignment with the site's function, amenity and value.
2. Practicality, including consideration of:
    a. Timing and duration of implementing and realising the outcome.
    b. Long term management and maintenance implications, and outline costs.
    c. Opportunities and barriers arising from management structures and procurement processes.
    d. Availability of appropriate skills, budgets and other resources at all stages.

M2.4: Wider site sustainability

For criterion 11, the methodology is the same as it is for the comprehensive route.

M3: Methodology for the comprehensive route

M3.1: Survey and evaluation

For criterion 2, the SQE can use their discretion to confirm if their survey is early enough to understand the ecological features that are present before works commence and in time to influence site clearance, preparation and layout.

For criteria 2 and 3, the survey and evaluation approach used should be appropriate to the scope and scale of the project, as determined by the ecologist.

M3.2: Collaboration to determine ecological outcomes

For criterion 9, collaboration (as per criteria 7 and 8) needs to happen early in the project to determine ecological outcomes and continue throughout the project whenever key decisions are being made that could impact ecological outcomes. Evidence must include a confirmation from the ecologist that they were allowed to undertake all collaborations with project team members and stakeholders (where appropriate) that they deemed necessary to fulfil the project's optimal ecological outcomes.

For criterion 8, where deemed necessary by the ecologist, the ecologist and/or project team should consult with representative stakeholders to determine appropriate options for the site in question. This may include:

- Local government and other statutory relevant organisations.
- Local community groups or organisations or charities such as the Wildlife Trusts.
- Local, regional and or national fauna focused groups such as Buglife, RSPB, Bat Conservation Trust etc.

The nature of this consultation will vary depending on the project's type and scale and the sensitivity of the site, and should be guided by the ecologist.

M4: Wider site sustainability

For criterion 11, the following opportunities for integrating ecology with wider site sustainability-related activities and ecosystem services should be considered as a minimum and where relevant:

1. Landscape
    a. Landscape design
    b. Heritage and local character
    c. Green infrastructure
2. 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
3. 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.)
4. Infrastructure
    a. Maximising the benefits of green infrastructure and optimising alignment with existing infrastructure on the site and the zone of influence.
5. Community and end user involvement

M5: EU Taxonomy

M5.1: Environmental impact assessment

An environmental impact assessment (EIA) or screening has been completed in accordance with Directive 2011/92/EU.

Where an EIA has been carried out, the required mitigation and compensation measures for protecting the environment are implemented.

It is not a requirement to do an EIA but where undertaken it could help meet requirements for criterion 3 and criteria 6 to 9.

The focus of this assessment issue is on carrying out the EIA and selecting appropriate mitigation and compensation measures. The implementation of these measures is undertaken in following assessment issues.

M5.2: Biodiversity-sensitive areas

For sites/operations located in or near biodiversity-sensitive areas (including the Natura 2000 network of protected areas, UNESCO World Heritage sites and Key Biodiversity Areas, as well as other protected areas), an appropriate assessment, where applicable, has been conducted and based on its conclusions the necessary mitigation measures are implemented.

The focus of this assessment issue is on carrying out the EIA and selecting appropriate mitigation and compensation measures. The implementation of these measures is undertaken in following assessment issues.

Compliance notes

Ref	Terms	Description
CN1	Timing of ecological	If the ecologist's site survey or report is completed at a later stage than required, the

Ref	Terms	Description
	survey or report	ecologist needs to be satisfied that it was produced early enough for the recommendations to influence the Concept Design or design brief stage and leads to a positive outcome in terms of protection and enhancement of site ecology.
CN2	Verifying ecology reports or information	If the appointed ecologist does not meet the definition of a suitably qualified ecologist (SQE), the report or information submitted to support the assessment must be verified by an individual who does. 1. The individual verifying the report must provide written confirmation that they comply with the definition of a suitably qualified ecologist. 2. The verifier must provide signed confirmation that they have checked and approved the report. This must clearly reference the report and can be in the form of a signed letter or their printed name and signature on a completed pro-forma. In doing so, they are deemed to confirm that the report: a. Represents sound industry practice. b. Is correct, truthful, and objective. c. Is appropriate given the local site conditions and scope of works proposed. d. Avoids invalid, biased, or exaggerated statements. Such confirmation from the verifier must be provided in addition to all other information required by the relevant technical manual and referenced as part of the evidence submitted to demonstrate compliance.

Evidence

Criteria	Interim design stage	Final post-construction stage
Survey and evaluation		
1 (foundation route)	Completed Guidance Note 34 *BREEAM Ecology Risk Evaluation Checklist* (GN34) and supporting evidence or documentation.	No further actions required post-construction; no additional evidence is required other than that listed for the design stage.
2–3 (comprehensive route)	A copy of the ecological survey and evaluation that meets the requirements as detailed in this issue.	No further actions required post-construction; no additional evidence is required other than that listed for the design stage.
Determining ecological outcomes		
5 (foundation route)	Statement from the project manager confirming that they collaborated with all project team members and stakeholders they deemed necessary to identify and deliver the project's optimal ecological outcomes and measures to achieve them.	No further actions required post-construction; no additional evidence is required other than that listed for the design stage.
7–9 (comprehensive route)	Statement from the ecologist confirming that they collaborated with all project team members and stakeholders they deemed necessary to identify and deliver the project's optimal ecological outcomes and measures to achieve them.	No further actions required post-construction; no additional evidence is required other than that listed for the design stage.
5, 9	A report or statement confirming the optimal ecological outcomes identified for the project, as well as the measures being implemented to achieve these outcomes (in accordance with the mitigation hierarchy).	No further actions required post-construction; no additional evidence is required other than that listed for the design stage.
Wider site sustainability		
11, 12	A report or statement confirming which ecosystem service-related benefits were considered, as well as the measure/s being incorporated into the design. This should be part	Evidence confirming ecosystem service benefit has been implemented into the as-built project.

Criteria	Interim design stage	Final post-construction stage
	of the optimal ecological outcomes document.	
EU Taxonomy		
M5	Copy of the environmental impact assessment (EIA).	No further actions required post-construction; no additional evidence is required other than that listed for the design stage

Definitions

Biodiversity net gain (BNG)

Biodiversity net gain (BNG) is a way of creating and improving natural habitats. BNG makes sure development has a measurably positive impact ('net gain') on biodiversity, compared to what was there before development.[127] This is calculated as a percentage change in pre and post development amount of biodiversity units.

Biodiversity units (BU)

The units in which relative biodiversity value of an ecological feature is measured using the Statutory Biodiversity Metric (SBM) tool. The biodiversity unit for each feature is calculated using the following components where applicable:

1. Distinctiveness
2. Condition
3. Strategic significance
4. Riparian zone encroachment
5. Watercourse encroachment

Each feature is assigned to a "module" below and the BUs are added up for each one:

1. Area habitat
2. Hedgerow habitat
3. Watercourse habitat

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.

Connectivity

The degree to which the configuration of habitats facilitates movement of species between and across resource patches.

Ecological baseline

The ecological baseline conditions are those which exist in the absence of proposed activities. It is used to compare performance after construction, to determine if it is the same or significantly changed.

Ecological feature

Examples of ecological features include habitat, ecosystems and species.

Ecological value

The importance, worth, or usefulness of a species, habitat or ecosystem in terms of its impact on other species and habitats, as well as the other environmental, social, cultural and economic value that can be delivered from species and habitats and their interactions (ecosystem services) specific to a geographical frame of reference.

Ecosystem services

Ecosystem services are the benefits people obtain from ecosystems. These include provisioning services such as food and water; regulating services such as regulation of floods, drought, land degradation, and disease; supporting services such as soil formation and nutrient cycling; economic value such as tourism, and cultural and social services such as health and wellbeing, recreational, spiritual, religious and other non-material benefits.

Enhancement

Improved management of ecological features or provision of new ecological features, resulting in a net benefit to biodiversity, which is unrelated to a negative impact or is 'over and above' that required to mitigate or compensate for an impact.

Green infrastructure

Multi-functional space, urban and rural, that can form a network or be self-contained, which can deliver a wide range of environmental and quality of life benefits for local communities. It covers both 'green' and 'blue' (water environment) features of the natural and built environments. Examples include parks, open spaces, playing fields, woodlands, wetlands, grasslands, river and canal corridors, allotments, private gardens and living (green) roofs and façades.

Mitigation hierarchy

A framework that businesses, developers, and ecologists can follow in their efforts to avoid, minimise, restore, or offset biodiversity loss. The mitigation hierarchy is as follows:

1. Avoidance
2. Protection
3. Reduction or limitation of negative impacts
4. On-site compensation
5. Enhancement, considering the capacity and feasibility within the site, or where this is not viable, off-site

Optimal ecological outcomes

The optimal ecological outcomes for a project comprise high level mission statements, for which individual mitigation and enhancement measures must be identified and implemented to achieve said outcome.

For example, the optimal ecological outcomes might include 'Ensuring the site protects and supports local bird species', and the resulting measures to deliver this could be installing bird boxes / bricks into the project and undertaking nesting bird checks prior to vegetation clearance.

Site

For the purposes of BREEAM the site is considered to be the land enclosed by the boundary of the BREEAM assessment.

Statutory Biodiversity Metric (SBM)

The Statutory Biodiversity Metric is a biodiversity accounting tool that should be used for the purposes of calculating percentage biodiversity net gain (BNG) and biodiversity units per hectare.[128]

More information is available at: www.gov.uk/government/publications/statutory-biodiversity-metric-tools-and-guides

Suitably qualified ecologist (SQE)

An individual achieving all the following items can be considered to be 'suitably qualified' for the purposes of compliance with BREEAM:

1. Holds a degree or equivalent qualification (e.g. N/SVQ level 5) in ecology or a related subject.
2. Is a practising ecologist, with a minimum of three years relevant experience (within the last five years). Such experience must clearly demonstrate a practical understanding of factors affecting ecology in relation to construction and the built environment including: acting in an advisory capacity to provide recommendations for ecological protection, enhancement and mitigation measures. Examples of relevant experience are: ecological impact assessments, Preliminary Ecological Appraisals (PEA), Phase 2 habitat and fauna surveys, and habitat creation.
3. Is covered by a professional code of conduct and subject to peer review. Full members of the following organisations, who meet the above criteria, are deemed suitably qualified ecologists for the purposes of BREEAM:
    a. Chartered Institute of Ecology and Environmental Management (CIEEM)
    b. Chartered Institution of Water and Environmental Management (CIWEM)
    c. Institute of Environmental Management and Assessment (IEMA)
    d. Institution of Environmental Sciences (IES)
    e. Landscape Institute (LI)
    f. Royal Society of Biology

Zone of influence

The area(s) over which ecological features may be affected by the biophysical changes caused by a proposed project and associated activities. For example, this can include areas of land, flight paths or water bodies that are impacted by the site being assessed. These areas can be adjacent to the site or can be areas that are impacted by the site although not physically linked, including areas downstream. Species and habitats in areas within the zone of influence might be negatively affected by changes on an assessed site but these changes may also provide opportunity to maximise the benefits of enhancement activities within the zone of influence.

Additional information

BREEAM Strategic Ecology Framework

The BREEAM Strategic Ecology Framework was developed to guide the development of ecology related assessment criteria in BREEAM.

The aims of the Strategic Ecology Framework are to:

— Understand the existing ecological value and condition of a site and its associated areas, to identify appropriate objectives.
— Identify, protect, and enhance key existing ecological features.
— Remove or limit as far as possible, existing features identified as having negative impacts on the ecological value of the site.
— Mitigate unavoidable impacts and compensate against residual impacts.
— Enhance the broader ecological value of the site and its links to associated areas through the creation and/or management of ecological features on or near the site.
— Secure ongoing management and maintenance to ensure intended outcomes are realised over the life of the site.

Wider sustainability benefits

For more information and examples of the wider sustainability benefits that can be considered, see the BREEAM Briefing Paper 'Greening the Built Environment'.

Lue 03 Managing impacts on ecology

Aim

To avoid, or limit as far as possible, negative ecological impacts on the site and its zone of influence resulting from the project.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	up to 3	None	All
Shell and core	up to 3	None	All
Shell only	up to 3	None	All
EU Taxonomy	-	-	All (see M3)

Assessment type specific notes

Ref	Assessment type specific note
-	None

Building type specific notes

Ref	Building type specific note
-	None

Assessment criteria

Assessment route

An assessment route for the project will already have been determined by the assessor for Lue 02. The two options are:

- Foundation route – only for sites of low ecological risk
- Comprehensive route – available to all sites

The credits available under Lue 03 differ depending on the assessment route used, as shown in Table 11.2 below.

Table 11.2: Credits by assessment route (Lue 03)

Assessment criteria	Foundation route	Comprehensive route
Implementation of measures on-site	2 credits	2 credits
No net loss	Not applicable	1 credit

Prerequisite – Ecological risks and opportunities

1 Whether a project is using the foundation route or the comprehensive route, the criteria in Lue 02 for 'Survey and evaluation' and 'Determining ecological outcomes' must have been met to achieve any credits in this issue.

Two credits – Implementation of measures on-site

Foundation and comprehensive route

2 For **both routes**, handover between the design and construction teams must be sufficiently structured and thorough to ensure that all planned ecological measures are communicated, understood, and adhered to throughout construction.

2.a For the **comprehensive route only**, an ecologist will have been in place throughout planning and design. If an Ecological Clerk of Works has been appointed for the construction and handover stages (RIBA Stages 5 and 6), there must be an additional handover between the two ecologists.

3 The measures required to achieve optimal ecological outcomes must be integrated with site preparation and construction processes. These must be measured and monitored throughout construction and handover (RIBA Stages 5 and 6) as follows:

3.a **Foundation route:** The contractor must nominate a biodiversity champion with authority to influence site activities and to ensure the necessary measures are implemented.

3.b **Comprehensive route:** An Ecological Clerk of Works (ECoW) will have been appointed by the contractor to monitor and advise on the protection of site ecology as agreed. If the ECoW requires the input of an additional ecological specialist at any point (for example, an expert on a particular form of wildlife), the contractor must provide for such services as required.

One credit – No net loss

Comprehensive route only

4 Criteria 2 to 3 have been achieved.

5 There is no net loss of ecological value on site caused by construction and handover activities. This must be confirmed at project handover by the ecologist.

Methodology

M1: Assessment route selection

To ensure the correct assessment route is being followed, see M1: Assessment route selection in Lue 02 Ecological risks and opportunities.

M2: Methodology for the comprehensive route

M2.1: No net loss

Where statutory designated sites, irreplaceable habitats or legally protected species have been impacted, all statutory requirements must be met and agreed with the relevant statutory bodies as necessary.

M3: EU Taxonomy

M3.1: EIA

An Environmental Impact Assessment (EIA) or screening has been completed in accordance with Directive 2011/92/EU.

Where an EIA has been carried out, the required mitigation and compensation measures for protecting the environment are implemented.

It is not a requirement to do an EIA but where undertaken it will help meet requirements for criteria 1 to 3.

For this issue, the focus is on the implementation of mitigation and compensation measures identified in assessment.

M3.2: Biodiversity-sensitive areas

For sites/operations located in or near biodiversity-sensitive areas (including the Natura 2000 network of protected areas, UNESCO World Heritage sites and Key Biodiversity Areas, as well as other protected areas), an appropriate assessment, where applicable, has been conducted and based on its conclusions the necessary mitigation measures are implemented. For this issue, the focus is on the implementation of mitigation measures identified in the assessment.

M4: Collating evidence

Guidance Note 41 *Ecology Assessment Reporting Template* (GN41) can be used to collate information and evidence for the assessment. Alternative evidence is acceptable if it demonstrates the criteria have been achieved. Any alternative reporting format must highlight clearly how all the items in GN41 have been addressed.

Please note that GN41 is a summary document and additional supporting evidence will also be required.

Compliance notes

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
Implementation of measures on-site		
2	Evidence that information about the optimal ecological outcome and the measures required to achieve it have been handed over appropriately e.g. Tender documents incorporating ecological requirements.	No additional evidence is required post construction.
2.a	If there has been a change in ecologist, the incoming ecologist must confirm they were provided with all the information they needed to understand the optimal ecological requirements and implement the measures to achieve them. Where a contractor has not been appointed at design stage, the developer must include the appointment of an ecologist, and the facilitation of handover between ecologists, in the tender documents.	If, as described (left), the contractor was not confirmed at design stage, the incoming ecologist must confirm post construction that on taking up their role they were provided with all the information they needed to fulfil it.
3	A statement from the ecologist (or biodiversity champion if the foundation route is used) covering: — All measures to be implemented to achieve optimal ecological outcomes. — How each measure should be implemented on site by the contractor. — What evidence should be provided by the contractor to demonstrate compliance at handover of the project. — The management and monitoring actions to be undertaken by the ecologist (if any). The statement must also provide the name of the contractor's appointed Biodiversity Champion, and their position on site to demonstrate they have appropriate authority to undertake this role. Where the contractor has not been appointed, this can comprise tender documents requiring this information.	Evidence in accordance with the statement provided at design stage, for example, site records, site procedures, environmental plans, toolbox talks, site programmes, drawings, site photographs and/ or sign off by the ecologist. If there have been any changes to the measures used, evidence gathered, or to management and monitoring practices, the ecologist must provide a statement explaining that the project still achieved its optimal ecological outcomes.
No net loss		
5	Statement from the ecologist confirming there will be no net loss of ecological value on-site as a result of the project. Where appropriate, the Statutory Biodiversity Metric for the site can be used to support the ecologist's statement.	Post completion, the ecologist confirms that there is no net loss of ecological value on site resulting from construction and handover activities. Where appropriate, an as-built Statutory Biodiversity Metric for the site can be used to

Criteria	Interim design stage	Final post-construction stage
		support the ecologist's statement.
EU Taxonomy		
M3	Copy of the environmental impact assessment (EIA).	No further actions required post-construction; no additional evidence is required other than that listed for the design stage.

Definitions

Avoidance

Preventing negative environmental impacts by avoiding damaging activities entirely (e.g. through project decisions about site location, design, or timing of works).

Biodiversity champion

An individual in a position of authority who is formally tasked by the principal contractor with monitoring and influencing site activities to minimize detrimental impacts on biodiversity. The biodiversity champion need not be an ecologist or ecological expert but must have sufficient knowledge of ecology and construction to carry out the role and must be on site frequently enough to monitor construction activities. The biodiversity champion may be the same person as the sustainability champion in Man 03 Responsible construction.

Ecological Clerk of Works (ECoW)

An Ecological Clerk of Works (ECoW) is a site-based ecologist who ensures that construction activities are compliant with environmental legislation and planning conditions relating to nature conservation. Duties can include carrying out surveys to identify ecological constraints to site operations, and to help guard against ecological risks from design and construction activity. Other responsibilities include:

- Providing guidance on mitigation measures to minimise risks to the environment and avoid potential delays or costs.
- Toolbox talks for site personnel to inform them about ecological constraints and required protection measures.
- Regular record keeping and production of reports, as required.
- Working with project managers, contractors, and other stakeholders to ensure a smooth and environmentally responsible construction process.

An ECoW will meet the requirements of an SQE and have experience of performing this role in the past.

Handover

For the purposes of this issue, handover is when responsibility for the ecology of the site is passed from one individual or organisation to another. An effective handover is critical to meeting the ecological objectives. The handover process encompasses all and any information, activity and responsibility that is relevant to achieving those objectives, including communication, monitoring, and reporting.

No net loss

There has been no overall loss of ecological value on the site resulting from construction or associated activities. For more information, see *Biodiversity net gain: Good practice principles for development – A practical guide* (CIRIA, 2019).[129]

For more definitions, see Lue 02.

Additional information

None.

Lue 04 Ecological change and enhancement

Aim

To enhance ecological value of the area associated with the site in support of local, regional, and national priorities.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	up to 4 + 1 exemplary	None	All
Shell and core	up to 4 + 1 exemplary	None	All
Shell only	up to 4 + 1 exemplary	None	All
EU Taxonomy	-	-	All (see M6)

Assessment type specific notes

Ref	Assessment type specific note
-	None

Building type specific notes

Ref	Building type specific note
-	None

Assessment criteria

Assessment route

Table 11.3: Credits by assessment route (Lue 04)

Assessment criteria	Foundation route	Comprehensive route
Ecological enhancement	1 credit	1 credit
Quantifying change in ecological value	Not applicable	up to 3 credits + 1 exemplary credit

Prerequisite – Managing negative impacts on ecology

1 Achieve criteria 2 and 3 in Lue 03.

One credit – Ecological enhancement

Foundation route

2 Locally relevant ecological measures have been implemented that enhance the site's ecological value (see M2.1). The measures adopted are based on:

2.a Recommendations from recognised 'local' ecological expertise and specialist input and guidance.

2.b Input from the project team in collaboration with representative stakeholders and data collated as part of 'Determining ecological outcomes' in Lue 02.

Comprehensive route

3 Measures have been implemented that enhance ecological value, which are based on input from the project team and SQE in collaboration with representative stakeholders and data collated as part of 'Determining ecological outcomes' in Lue 02. Measures are implemented in the following order:

3.a On-site, and where this is not feasible,

3.b Outside of the site boundary, within the zone of influence.

4 Data collated are analysed and where potentially valuable, provided to the local environmental records centres nearest to, or relevant for, the site.

Up to three credits (plus one exemplary credit) – Quantifying change in ecological value

Comprehensive route | Site baseline > 0.1 BU

5 Up to three credits are available based on the scale in Table 11.4 below. The enhancement measures that contribute to the score for biodiversity net gain should be implemented in the following order:

5.a On-site within the boundary, and where this is not feasible,

5.b Enhancements within the zone of influence/wider development area, and where this is not feasible,

5.c Off-site units following the rules of the Statutory Biodiversity Metric, subject to the following:

5.c.i The SQE confirms that better outcomes for nature can be achieved off-site and/or off-site enhancement would be more be effective than what can be done solely in the development boundary/zone of influence.

5.c.ii There has been no net loss of biodiversity on-site.

5.c.iii There are arrangements in place for the on-going maintenance of the enhanced land to ensure the habitat is safeguarded over a 30-year period.

Table 11.4: Credits awarded based on output from the Statutory Biodiversity Metric tool

Total project biodiversity change	Credits
≥ 10%	1
≥ 20%	2
≥ 30%	3
≥ 40%	3 + 1 exemplary

OR

Comprehensive route | Site baseline ≤ 0.1 BU

6 Up to three credits are available based on biodiversity units (BUs) per site area (ha) or per 10 m of hedgerow post development as shown in Table 11.5 below. This is only based on the hedgerow-based metric and area-based metric. For more information, see M3.4.

Table 11.5: Credits awarded based on biodiversity units (BUs) per site area (ha) and per length of hedgerow

Biodiversity units per site area (BU/ha)	Biodiversity units per 10m length of hedgerow (BU/10m length)	Credits
≥ 1.50	≥ 0.01	1
≥ 2.00	≥ 0.03	2
≥ 2.50	≥ 0.04	3
≥ 3.00	≥ 0.05	3 + 1 exemplary

Methodology

M1: Assessment route

To ensure the correct assessment route is being followed, see M1: Assessment route selection in Lue 02 Ecological risks and opportunities.

M2: Methodology for the foundation route

M2.1: Ecological enhancement

For criterion 2, appropriate measures will vary depending on the site. The following examples may be acceptable if the project team confirm they are locally relevant for the site and its zone of influence (list not exhaustive):

1. Recommendations from biodiversity action plans.
2. Planting appropriate species with a known attraction or benefit to local wildlife or to boost viability of local plant populations.
3. Adopting horticultural good practice in landscape construction, management, and maintenance (e.g. no or low use of residual pesticides).
4. Installing features to encourage existing local wildlife (such as nesting, roosting and insect boxes) at appropriate locations on the site and in line with relevant guidance. For example: Buglife, RSPB, Bat Conservation Trust etc.
5. Increasing the porosity and texture of surfaces on site to encourage wildlife (e.g. improving the texture of the soil and making it more porous will encourage more plants to grow).
6. Introducing surface water features into the environment to encourage birds and other wildlife (e.g. wildlife ponds, wetland areas).

M3: Methodology for the comprehensive route

M3.1: Enhancement measures

For criterion 3, the ecologist's report must clearly justify how the selected measures meaningfully enhance ecological value.

This criterion recognises enhancement measures that have been carried out in line with good practice recommended by an SQE, which build on mitigation measures taken in Lue 03. This also supports meeting good practice principles of biodiversity net-gain (CIRIA, CIEEM, IEMA)[130] before quantifying the change in ecological value in criteria 5 or 6.

M3.2: Collaboration throughout the project

For criterion 3, feedback from relevant stakeholders in Lue 02 informs decisions made in this issue. For example, where appointed, guidance from the landscape architect regarding long term maintenance requirements should be considered as part of decisions made for habitat creation and enhancement.

M3.3: Quantifying change in ecological value – full method (for sites with a baseline > 0.1 BU)

Criterion 5 is based on the outputs from completing the Statutory Biodiversity Metric (SBM) tool.

The Statutory Biodiversity Metric (SBM) tool calculates the percentage biodiversity net gain, among other outputs, from the following three metrics:

- Habitats
- Watercourses
- Hedgerows

Within each metric, "biodiversity units" represent the ecological value of the habitat before and after development.

These units are determined by quantifying the following: type, distinctiveness, condition, and area or length throughout the assessed project lifecycle.

The output with the lowest percentage score (rounded to the nearest whole percentage point) is used to identify the reward level available for the development which is shown in Table 11.4 on the previous page.

Where a metric is not present, for example a watercourse, that metric can be ignored and the lowest of the other two metrics should be used.

Information about the calculation methodology of the Statutory Biodiversity Metric (SBM) tool as well as other supporting documents are available on the UK government website (www.gov.uk/government/publications/statutory-biodiversity-metric-tools-and-guides).

M3.4: Quantifying change in ecological value – low baseline method (for sites with a baseline ≤ 0.1 BU)

When a site has a low baseline of 0.1 biodiversity units (BU) or lower, the total biodiversity net gain calculation would show an output that would either show an overestimated figure that is not representative of reality or would not show a score at all if the baseline is 0. This method provides an alternative calculation which better measures and rewards biodiversity improvements where little biodiversity exists pre-development.

When following criterion 6 you need to fill in either the SSM or SBM for both baseline and post development for the habitat-based metric. If the baseline is 0 the pre-development area tab needs to be left blank.

Using the headline results tab of the SSM or SBM, the difference between the baseline habitat units and post-development habitat units needs to be calculated and divided by the number of hectares of the site. This output will determine the number of credits as shown in Table 11.5. Please see the formula below:

$$\boldsymbol{Area\ unit\ output = \frac{BUA_{Post} - BUA_{Pre}}{A}}$$

Where:

BUA_{Pre} = Area Biodiversity Units pre-development

BUA_{Post} = Area Biodiversity Units post-development

A = Area in hectares (ha)

For the calculation of hedgerows, the difference between the baseline hedgerow units and post-development hedgerow and hedgerow units needs to be calculated and divided by the number of metres of hedgerows divided by 10. This output will determine the number of credits shown in Table 11.5. Please see the formula below:

$$\boldsymbol{Hedgerow\ unit\ output = \frac{BUH_{Post} - BUH_{Pre}}{(Length_H/10)}}$$

Where:

BUH_{Pre} = Hedgerow Biodiversity Units pre-development

BUH_{Post} = Hedgerow Biodiversity Units post-development

$Length_H$ = Length of hedgerow in metres

If both hedgerow and habitat metrics are present, the lowest number of credits must be awarded, e.g. if 2 credits are awarded based on the area-based metric and 1 credit is awarded based on the hedgerow-based metric, then 1 credit must be awarded for criterion 6.

If watercourses are present when using the low baseline methodology, you need to exclude them from the calculations.

M3.5: The Small Sites Metric (SSM)

Figure 5 on the next page shows the steps to determine whether the Small Sites Metric (SSM) can be used instead of the full Statutory Biodiversity Metric (SBM). This is based on the rules set out in the Small Sites Metric guidance.

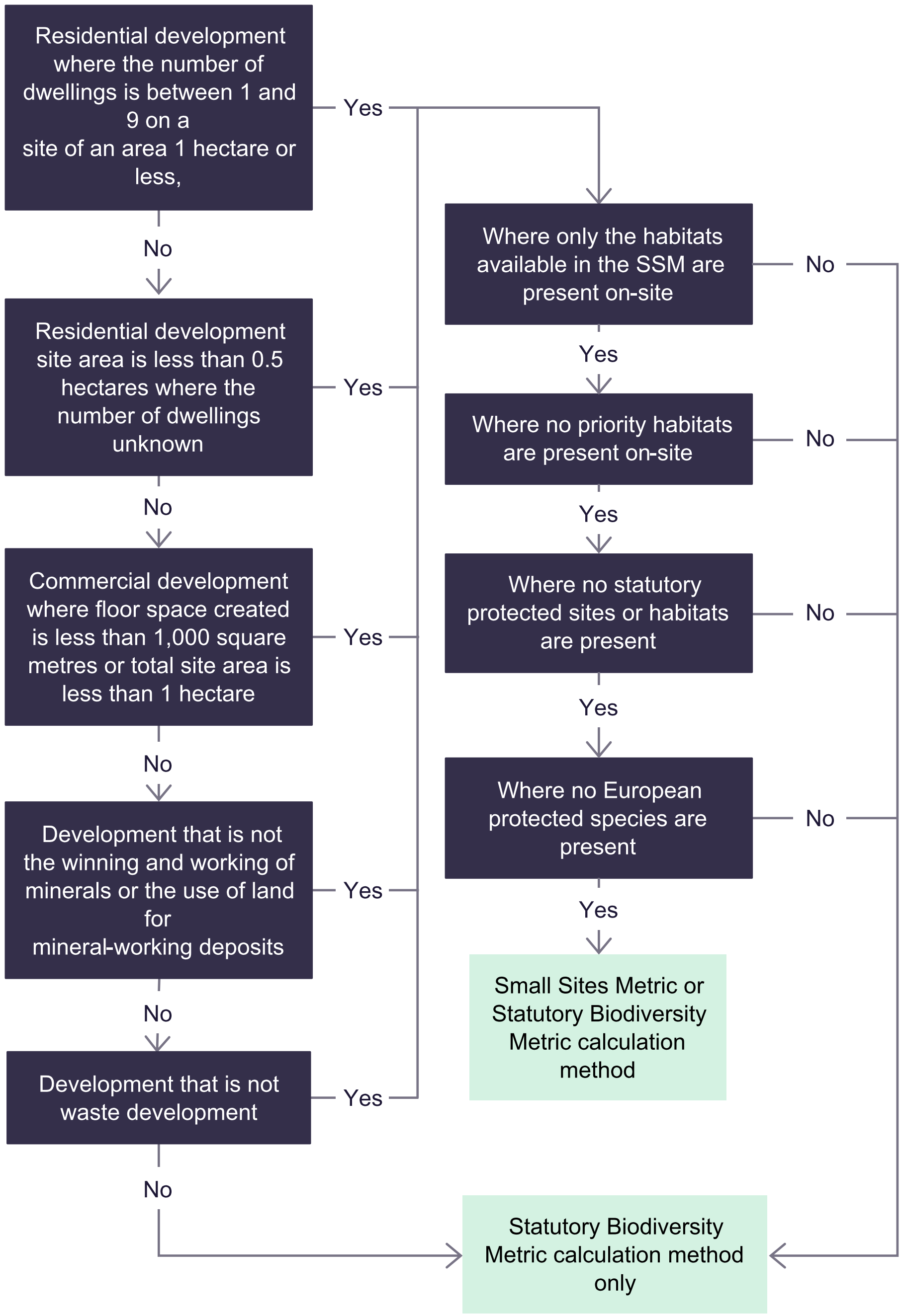

Figure 5: Steps to determine whether the Small Sites Metric can be used

M4: Collating evidence

Guidance Note 41 *Ecology Assessment Reporting Template* (GN41) can be referred to and used to collate information and evidence for the assessment (it is optional – see M4: Collating evidence in Lue 03 Managing impacts on ecology).

M5: Off-site ecological creation and enhancement

In line with criteria 3 and 5, in certain circumstances, BREEAM may recognise ecological creation and enhancements which are not within the boundary of the site being assessed.

Off-site enhancement may be accepted where:

1. The comprehensive route is followed and the SQE confirms:
    a. Better outcomes for nature can be achieved off-site AND/OR
    b. The proposed ecological creation and enhancements are appropriate and more effective than can be done solely within the development boundary.
2. The biodiversity metric confirms that there is no net loss on-site.
3. There are arrangements in place for the on-going maintenance of the enhanced land to ensure the habitat is safeguarded over a 30-year period. This could be demonstrated by planning condition or s106 or conservation covenant and approved by the SQE. Full justification and robust evidence must be submitted when relying on this approach.

M6: EU Taxonomy

M6.1: EIA

An Environmental Impact Assessment (EIA) or screening has been completed in accordance with Directive 2011/92/EU.

Where an EIA has been carried out, the required mitigation and compensation measures for protecting the environment are implemented.

It is not a requirement to do an EIA but where undertaken it will help meet requirements for criteria 1 to 3.

For this issue, the focus is on the implementation of mitigation and compensation measures identified in assessment.

M6.2: Biodiversity-sensitive areas

For sites/operations located in or near biodiversity-sensitive areas (including the Natura 2000 network of protected areas, UNESCO World Heritage sites and Key Biodiversity Areas, as well as other protected areas), an appropriate assessment, where applicable, has been conducted and based on its conclusions the necessary mitigation measures are implemented. For this issue, the focus is on the implementation of mitigation measures identified in the assessment.

Compliance notes

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
2, 3	Report or letters detailing the recommendations for measures of ecological enhancement. Drawings and specifications demonstrating that the recommendations have been implemented in the design.	Site visit confirming measures have been carried out in-practice, in line with recommendations.
4	Evidence demonstrating that data has been submitted to a local environmental record centre, where relevant.	No further actions required post-construction; no additional evidence is required other than that listed for the design stage.
5	Completed version of the Statutory Biodiversity Metric (SBM) or Small Sites Metric (SSM) tool. Evidence to support the data input within the tool such as ecological survey report and landscape plans (existing and proposed).	Completed version of the as-built Biodiversity Metric tool. AND Site inspection reports, as-built landscape plans and/or planting schedules to show the changes in the Biodiversity Metric tool have been carried out as planned, in line with SQE's recommendations.
6	Output from the Statutory Biodiversity Metric (SBM) or Small Sites Metric (SSM) tool and the size of the site to show that the requirements in	As for interim design stage. AND Site inspection report or as-built landscape

Criteria	Interim design stage	Final post-construction stage
	Table 11.5 have been met. Evidence to support the data input within the tool such as ecological survey report and landscape plans (existing and proposed).	plans or site plans.
EU Taxonomy		
M6	Evidence that mitigation and enhancement measures have been implemented into the design.	Site visit confirming measures have been carried out in-practice, in line with recommendations.

Definitions

Development footprint

The development footprint consists of the site, considered to be the land enclosed by the boundary of the BREEAM assessment, and includes any land used for buildings, hardstanding, landscaping, site access or where construction work is carried out (or land being disturbed in any other way). It also includes any areas used for temporary site storage and buildings. If it is not known exactly where buildings, hardstanding, site access, temporary storage and buildings will be located, it must be assumed that the development footprint is the entire development site.

For the change in ecological value calculation, this area will also include any land outside the development boundary where there is an indirect impact on biodiversity, including but not limited to the zone of influence, and land being used to compensate for impacts, either on the site or outside it as a biodiversity offset.

Site area

The area of the land enclosed by the boundary of the BREEAM assessment in hectares (ha).

Small Sites Metric (SSM)

The Small Sites Metric is a simplified version of the Statutory Biodiversity Metric (SBM) for use on small sites.(131)

For further details on the rules about which sites can use this approach, please refer to information at: www.gov.uk/government/publications/statutory-biodiversity-metric-tools-and-guides

Additional information

None.

Lue 05 Long term ecological management

Aim

To secure ongoing monitoring, management and maintenance of the site and its habitats and ecological features, to ensure intended outcomes are realised for the long term.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	up to 2	None	All
Shell and core	up to 2	None	All
Shell only	up to 2	None	All

Assessment type specific notes

Ref	Assessment type specific note
-	None

Building type specific notes

Ref	Building type specific note
-	None

Assessment criteria

Assessment route

Table 11.6: Credits by assessment route (for Lue 05)

Assessment criteria	Foundation route	Comprehensive route
Handover to building owner or tenant	1 credit	1 credit
Landscape and ecology management plan		1 credit

Prerequisite – Ecological change and enhancement

1 Achieve at least one credit in Lue 04.

One credit – Handover to building owner or tenant

2 A section on ecology and biodiversity has been included as part of the information supplied to the tenant or building owner. This information must be in a separate document from the landscape and ecology management plan (which is covered by criterion 3) and:

2.a Inform the building owner or tenant about local ecological features and biodiversity associated with the site (see M1) including an 'as-built' biodiversity metric calculation (where relevant).

2.b Include detailed management and maintenance plans and relevant handover information to minimise loss of planting during establishment phase (see M1).

One credit – Landscape and ecology management plan

3 A landscape and ecology management plan, or equivalent, has been developed in accordance with BS 42020:2013 Section 11.1.[132] This will cover detailed plans for an initial 5-year establishment period and maintenance of the scheme, as well as an additional 25-year management strategy. The whole plan should cover a period of 30 years in total. It should cover the broader management of habitats and other ecological features on site, not just those specific to the BNG measures. The plan includes:

3.a Actions and responsibilities of relevant individuals before handover.

3.b The ecological value and condition of the site at handover and how this is expected to develop and change over time.

3.c Procedures to monitor and review the on-going implementation and effectiveness of measures, incorporating an adaptive management approach.

3.d Risk register, including trigger for action and remedial measures with consideration on how these feed into monitoring requirements (see M2.1).

3.e Maintenance and management plans for the retained, enhanced and created habitats, as well as any features for protected species. This should include a detailed work schedule outlining relevant maintenance on a monthly basis for the first five years after completion.

3.f Identifying opportunities for ongoing alignment with activities external to the asset.

3.g Clearly defined responsibilities and competencies of those delivering the plan.

Methodology

M1: Handover information

For criterion 2, the handover information includes, as appropriate:

1. 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).
2. The benefits of the ecological value to the occupants and the broader community.
3. Guidance on:
   a. 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).
   b. Harmful actions (e.g. disrupting wildlife corridors, planting invasive species, or allowing invasive species to colonise and spread, pesticide and herbicide use, and the impacts of using peat products, the extraction of which releases carbon dioxide in the atmosphere and destroys important habitats).
4. Highlight relevant actions that can enhance ecological value.
5. Contact details for:
   a. Responsible individuals for the management and maintenance of the local ecology.
   b. Sources of local information on biodiversity and ecological management (including management companies and local wildlife trusts).

M2: Landscape and ecology management plan

M2.1: Coordination with other operational and management tasks

Wherever possible, management of biodiversity features should be coordinated with other site management requirements, particularly the management of landscape features where there is often considerable overlap of aims, objectives and necessary management actions. This may be achieved through the preparation of an integrated landscape and ecological management plan.

M2.2: Level of detail

The level of detail required for any given site should be whatever is necessary to ensure the effective management of the biodiversity features that are present. The approach to management planning should remain flexible so that time, money, and energy are not expended on the implementation of non-essential or inappropriate management works.

For some large and complex sites containing a variety of biodiversity and landscape features, a comprehensive management plan covering a broad range of management works should be prepared.

However, on smaller sites, the preparation and implementation of full-scale management might be beyond the resources available or simply be unnecessary. In such circumstances, an outline management document may be prepared.

M2.3: Monitoring and reporting biodiversity outcomes

Monitoring should be undertaken to:

1. Ensure compliance with planning conditions/obligations and/or regulations regarding any protected species imposed by statutory bodies.
2. Establish the success and effectiveness of measures undertaken to avoid, mitigate, restore, or compensate for impacts and/or to achieve biodiversity enhancement.

Where monitoring identifies non-compliance with planning conditions or regulatory requirements, the management plan describes procedures and responsibility. This should be used where appropriate by the relevant decision maker to rectify non-compliance and implement preventive measures to ensure that this does not happen again.

M2.4: Risk register

Provide a site-wide risk register associated with managing each habitat type outlined in the biodiversity metric calculation. Consider what risks might impact the BNG targets being achieved and how these can be remediated. The list of potential risks should be as comprehensive as possible to provide confidence that the management plan objectives will be met.

Compliance notes

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
Handover to building owner or tenant		
2	Draft copy of the ecology and biodiversity handover information.	Copy of the final ecology and biodiversity handover information. Evidence to confirm it has been issued to the building owner or tenant.
Landscape and ecology management plan		
3	Draft copy of the landscape and ecology management plan. OR The relevant section or clauses of the building specification or contract confirming its development and scope.	Copy of the final landscape and ecology management plan.

Definitions

Adaptive management

An approach that involves monitoring and evaluating the effectiveness of actions then adjusting as necessary to improve outcomes over time.

Additional information

None.

Pollution

Summary

This category addresses the prevention and control of pollution and surface water run-off associated with the building's location and use. Issues in this section aim to reduce the building's impact on surrounding communities and environments arising from light pollution, noise, flooding and emissions to air, land and water.

Assessment issues

Pol 01 Impact of refrigerants	3 credits
Pol 02 Local air quality	3 credits
Pol 03 Flood and surface water management	5 credits
Pol 04 Reduction of nighttime light pollution	1 credit
Pol 05 Reduction of noise pollution	1 credit

Pol 01 Impact of refrigerants

Aim

To reduce the impact of greenhouse gas emissions arising from the leakage of refrigerants used in heating and cooling systems in the building.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	3	Outstanding	All
Shell and core	3	Outstanding	All (see ref 1.0)
Shell only	0	None	Not applicable

Assessment type specific notes

Ref	Assessment type specific note
1.0	**Shell and core** All criteria are applicable for shell and core assessments. If the building is designed in such a way that it avoids the need for refrigerant containing building services and no 'refrigerant-using' building services or systems will be specified for the fit-out, then the available credits can be awarded. If the building will require refrigerant containing building services and these systems will be specified for the fit-out then credits may only be awarded where clauses are included in a green lease agreement that ensure that the relevant criteria will be met.

Building type specific notes

Ref	Building type specific note
-	None

Issue specific notes

Ref	Issue specific note
3.0	**Unoccupied or non-conditioned buildings** Credits under this issue should be filtered out where none of the internal areas of the building are intended to be occupied, including cold storage, or contain process-based cooling loads such as those required for server rooms or specialist equipment.

Assessment criteria

Three credits – No refrigerant use

1 Where the building does not require the use of refrigerants within its installed plant or systems.

Up to three credits – Buildings with systems that use refrigerants

Prerequisite – Systems with refrigerants

2 All systems with electric compressors must comply with relevant safety standards for installing refrigerant systems (see M2.1).

3 The refrigerants used must have an ozone depletion potential of zero (see M2.2).

Up to two credits – Impact of refrigerant

One credit

4 Systems using refrigerants (see M3) must have an average direct effect life cycle (DELC) carbon dioxide equivalent (CO_2e) emission rate of < 1000 $kgCO_2e$ per kW of cooling or heating capacity.

Two credits

5 Systems using refrigerants (see M3) must either:

5.a Have an average direct effect life cycle (DELC) carbon dioxide equivalent (CO_2e) emission rate of < 100 $kgCO_2e$ per kW cooling or heating capacity.

OR

5.b Use a refrigerant with a global warming potential (GWP) of < 10 $kgCO_2e$/kg.

One credit – Leak detection

6 Systems using refrigerants are either:

6.a Hermetically sealed.

OR

6.b The refrigerant charge volume is < 500 tonnes of carbon dioxide equivalent (CO_2e).

OR

6.c Use environmentally benign refrigerants (see M4.1).

OR

7 There must be either:

7.a A permanent automated refrigerant leak detection system that is capable of continuously monitoring for leaks.

OR

7.b An inbuilt automated diagnostic procedure for detecting leakage capable of continuously monitoring for leaks.

8 The leak detection system facilitates the isolation and containment of the remaining refrigerant charge in response to a leak detection incident.

Methodology

M1: Refrigerant systems included in the assessment

All fixed refrigerant systems in the building must be included in the assessment except for:

- Systems used for industrial processes.
- Systems that form part of on-site district heating or district cooling generators where the design team has no control over the specification of the system.
- Small appliances with self-contained refrigeration systems.

And:

- For refurbishment projects, existing systems that aren't being upgraded may also be excluded.

M2: Prerequisite – Systems with refrigerants

M2.1: Safety standards for installation of refrigeration systems

Relevant safety standards include:

- EN 378-3:2016+A1:2020 – Refrigerating systems and heat pumps. Safety and environmental requirements – Installation site and personal protection
- ISO 5149:2014 – Refrigeration systems and heat pumps
- ASHRAE 15-2016 – Safety Standard for Refrigeration Systems
- Safety Code of Practice for Ammonia Refrigerant R717 – Institute of Refrigeration
- GBT9237-2017 Standard for Safety and Environmental Requirements for Refrigeration Systems and Heat Pumps

M2.2: Ozone depletion potential

Refrigerants that contain neither chlorine or bromine will have an ozone depletion potential (ODP) of zero. These include:

- Air
- Water
- Carbon dioxide
- Lithium bromide
- R125 (CFC-125)
- Ammonia
- R134a (HFC-134a)
- R143a (HFC-143a)
- R32 (HCFC-32)
- R407C (HFC-407)
- R152a (HFC-152a)
- R404A (HFC blend)
- R410A (HFC blend)
- R413A (HFC blend)
- R417A (HFC blend)
- R507A (HFC azeotrope)
- R290 (HC290 propane)
- R600 (HC600 butane)
- R600a (HC600a isobutane)
- R290/R170 (HC290/HC170)
- R1270 (HC1270 propene)

M3: Impact of refrigerants

The following information must be entered into the BREEAM Platform for each refrigeration system:

- Refrigeration system type
- Maximum cooling or heating output (kW rating)
- Refrigerant type
- Refrigerant charge (kg)

The following system specific information should also be entered or confirmed in the BREEAM Platform, where it is available:

- Annual leakage rate (% refrigerant charge)
- Annual purge release factor (% refrigerant charge)
- Annual service release (% refrigerant charge)

If this information is not available, default values will be used based on the system type.

The most appropriate system type must be selected from the following list.

- Cold storage and display systems: Integral cabinets
- Cold storage and display systems: Split/condensing units
- Cold storage and display systems: Centralised
- Industrial cold storage
- Air conditioning systems: Unitary split
- Air conditioning systems: Chillers
- Air conditioning systems: Heat pumps

Where more than one air-conditioning or refrigeration system is installed in the building, relevant technical data for each system must be entered in the BREEAM Platform.

Where a system uses several different refrigerants (for example, a primary refrigerant and a secondary coolant, or a cascade), then relevant technical data for each type of refrigerant used must be entered into the BREEAM Platform.

Where the refrigerant system provides heating and cooling (reversible heat pump), the highest kW output value should be entered into the BREEAM Platform.

The BREEAM Platform automatically calculates the number of credits achieved based on the information entered.

M3.1: Global warming potential

The global warming potential (GWP) data for refrigerants is included in the BREEAM Platform and is used to determine systems which meet the GWP limit.

Refrigerants with a GWP of less than 10 $kgCO_2e/kg$ are shown in Table 12.1 below.

Table 12.1: Refrigerants with a GWP of less than 10 $kgCO_2e/kg$

Refrigerant	GWP, $kgCO_2e/kg$
R600 = butane	0.006
R290 = propane	0.06
R433B	0.16
R441A	0.23
R170 = ethane	0.437
R433C	0.55
R433A	0.64
Carbon dioxide	1
R443A	1
Dimethylether	1
R1234yf*	1
R1234ze*	1
R510A	1.24
R436A	1.35
R436B	1.47
R432A	1.8
Methyl bromide	2
R1270 = propene	2
R600A = isobutane	3
HFC-161	4
R601 = pentane	5
R601A = isopentane	5
R511A	7
Methylene chloride	9
* There is no specific figure available, however it is known that the GWP factor is < 1 $kgCO_2e/kg$	

M3.2: Direct effect life cycle (DELC) carbon dioxide equivalent

This measures the global warming arising from fugitive refrigerant gas leakage over the lifetime of the system in $kgCO_2e$ and is calculated automatically in the BREEAM Platform based on information entered about the installed refrigeration systems.

M4: Leak detection

M4.1: Leak detection – Benign refrigerants

The following refrigerants are considered environmentally benign:

- Air
- Water
- Carbon dioxide
- Propane
- Butane

— Lithium bromide
— Solid refrigerants

M4.2: Leak detection – Permanent automated refrigerant leak detection system

Tonnes of carbon dioxide equivalent for a system is calculated by multiplying the weight of refrigerant gas by the GWP of the refrigerant.

To qualify for this issue, the leak detection system must:

— Be a permanent installation

— Continuously monitors the atmosphere in the vicinity of refrigeration equipment

— Be calibrated to detect the refrigerant gases in the installed system(s)

— Raise an alarm when a pre-set level of refrigerant is detected.

— Have undergone testing against an appropriate standard

Appropriate standards for testing include:

— Performance of portable locating leak detectors and of fixed gas detectors for all refrigerants EN 14624:2020

— ANSI/ASHRAE Standard 15-2022 Safety Standard for Refrigeration systems

— IEC 60335-2-40 Edition 6

Note: system that uses pressure changes to detect leaks is not necessarily compliant as natural fluctuations in pressure could occur during regular operation. To be deemed compliant this type of leak detection system would need to monitor the refrigerant pressure and the operating conditions to address the problem of natural fluctuation to prevent false alarms.

M4.3: Leak detection – Isolating and containment the remaining refrigerant charge

Examples of a system which could meet the leak isolation and containment requirements include:

— Systems that initiate an automated shut down and pump down of the refrigerant into a separate storage tank.

— Systems that send an alarm to a facilities manager or an engineer to facilitate manual system shutdown and isolation of the refrigerant charge.

Compliance notes

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
All	Letter from M&E engineer or specification document confirming the absence of refrigerants in the development. OR Relevant section or clauses of the building specification or contract or letter of confirmation from the M&E engineer. AND Where specified, manufacturer's literature or data sheets confirming the relevant refrigeration type and system information.	Assessor's site inspection report and photographic evidence. Final construction drawings or equivalent. Manufacturer's product details confirming data for installed systems. Evidence to show that systems are installed in line with the relevant safety standards.

Definitions

Direct effect life cycle (DELC) carbon dioxide equivalent

DELC is a measure of the effect on global warming arising from emissions of refrigerant (in the case of this BREEAM assessment issue) from the equipment to the atmosphere over its lifetime (units: $kgCO_2e$). The calculation involves estimating the total refrigerant release whilst the refrigerant system is in operation and converting this to $kgCO_2e$.

The direct effect life cycle $kgCO_2e$ emissions (DELC) per kW of cooling and heating capacity is calculated within the BREEAM Platform using the following equation:

$$\frac{[RLO+RLSR] \text{ x } GWP}{CC}$$

where:

Refrigerant loss operational (RLO) = (Ref_{charge} × $Sys_{op\text{-}life}$ × (L1 + L2 + S1 + S2))/100

Refrigerant loss system retirement (RLSR) = Ref_{charge} × (1 - Ref_{RecEff}/100)

and where:

Ref_{charge} = Refrigerant charge (kg)
$Sys_{op\text{-}life}$ = System operational lifetime (years)
Ref_{RecEff} = Refrigerant recovery efficiency factor (%)
L1 = Annual leakage rate (% 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
CC = Cooling or heating capacity (kW)

Global warming potential (GWP)

Global warming potential (GWP) is defined as the potential for global warming that a chemical has relative to a unit of carbon dioxide, the primary greenhouse gas. In determining the GWP of the refrigerant, the Intergovernmental Panel on Climate Change (IPCC) methodology using a 100-year Integrated Time Horizon (ITH) is applied.

Green lease

A green lease is a contract that includes additional clauses which provide for the management and improvement of the environmental performance of a building by both owners and occupiers. To be acceptable for BREEAM a green lease agreement must cover all relevant BREEAM requirements and must be signed by both the lessor and the lessee or, where the lessee is unknown, a commitment must be provided by the client that the green lease agreement will be implemented when the building is let.

Hermetically sealed systems

In a hermetically sealed system all refrigerant containing parts are made tight by welding, brazing or a similar permanent connection which may include capped valves and capped service ports that allow proper repair or disposal and which have a tested leakage rate of less than three grams per year. This results in the risk of a large refrigerant leak due to system failure being minimised.

Industrial process

An industrial process is a procedure that involves chemical, physical, electrical, or mechanical steps and is used to manufacture items and is usually carried out on a very large scale.

Ozone depletion potential (ODP)

Ozone depletion potential (ODP) is the ratio of the relative amount of degradation to the ozone layer caused by a particular substance relative to the calculated depletion for the reference gas CFC-11 (ODP = 1.0).

Refrigerant gases

There are three main classes of refrigerants:

1. Hydrogenated fluorocarbon refrigerants (HFCs) are made up of hydrogen, fluorine, and carbon. Because they do not use a chlorine atom (which is used in most refrigerants) they are known to be one of the least damaging to the earth's ozone layer.
2. Hydrogenated chlorofluorocarbon refrigerants (HCFCs) are made up of hydrogen, chlorine, fluorine, and carbon. These refrigerants contain minimal amounts of chlorine; they are not as detrimental to the environment as some other refrigerants.
3. Chlorofluorocarbon refrigerants (CFCs) contain chlorine, fluorine and carbon. These refrigerants carry high amounts of chlorine so they are known to be the most hazardous to the ozone layer.

The use of CFCs and HCFCs as refrigerants has been addressed under the Montreal Protocol. Phase out programmes have been agreed resulting in these substances no longer being used as refrigerants in all new installations and most existing situations. The industry's favoured replacements are currently HFCs which are often potent global warming contributors. Hydrocarbons and ammonia-based refrigerants have low or zero GWP and are therefore preferred long term options. These are now widely available and are valid alternatives to HFCs in all buildings, provided health and safety issues are fully addressed.

Refrigerant leak detection

An automated permanently installed multi-point sensing system, designed to continuously monitor the atmosphere in the vicinity of refrigeration equipment and, in the event of detection, raise an alarm. The system may be aspirated or have multiple sensor heads linked to a central alarm unit or BMS. Various sensor types are available including infrared, semiconductor, or electro-chemical.

Refrigerant pump down

The specification of automatic refrigerant pump down can further limit potential losses and damage to the environment and have subsequent economic benefits to the building owner.

Many countries around the world classify refrigerants and refrigerating oil as controlled or hazardous waste and regulate their transport, storage, transfer, and disposal.

Refrigerant recovery

The process of removing refrigerant from a system and storing it in an airtight container.

Small self-contained appliances

These include domestic scale fridges and freezers and individual display cabinets (for example, drinks cabinets in retail shops).

Additional information

DELC calculations

The formula used to calculate the direct effect life cycle CO_2e emissions in BREEAM is based on the Total Equivalent Warming Impact (TEWI) calculation method for new stationary refrigeration and air-conditioning systems. TEWI is a measure of the global warming impact of equipment that takes into account both direct emissions (as assessed in this BREEAM issue) and indirect emissions produced through the energy consumed in operating the equipment (which is assessed in the BREEAM energy section).

For further details, see EN 378-1[(133)] and the British Refrigeration Association's (BRA) Guideline Methods of Calculating TEWI.

Safe use of HCFC alternatives

The United Nations Environment Programme (UNEP) provide information about the management and phase out of HCFCs and alternatives to HCFCs in the refrigeration and air-conditioning sector, including in their report *Safe use of HCFC alternatives in refrigeration and air-conditioning*.[(134)]

Pol 02 Local air quality

Aim

To contribute to a reduction in local air pollution through the use of no or low-emission combustion plant in the building.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	3	None	All
Shell and core	3	None	All
Shell only	0	None	Not applicable

Assessment type specific notes

Ref	Assessment type specific note
-	None

Building type specific notes

Ref	Building type specific note
-	None

Assessment criteria

Up to three credits – No or low emission combustion plant

Three credits – No installed combustion plant

1 Non-combustion systems supply all space heating and domestic hot water generation on-site.

Up to two credits – Low-emission combustion plant

2 Emissions from all installed combustion plant that provide space heating or domestic hot water do not exceed the levels set in Table 12.2 below.

Table 12.2: Credits awarded based on NO_x emission levels (mg/kWh) by population density

Maximum mg NO_x/kWh fuel input in terms of gross calorific value (GCV)			
1 credit (low population locations)	1 credit (high population locations)	2 credits (low population locations)	2 credits (high population locations)
56	27	27	24

Methodology

M1: Low-emission combustion plant

All items of installed combustion plant that burn either fossil fuel or biomass derived fuels must meet the NO_x emission limit for credits to be awarded.

M1.1: Determining population density

Population density is the number of people per unit of geographic area. It is calculated by dividing the total population of an area by its total land area in people per square kilometre, per hectare or per square mile.

For this issue:

- Low population density is defined as less than 1000 people per square kilometre.

A searchable population density dataset – Human Population Density (Global - Annual - 1 km) – is available from the Food and Agriculture Organization of the United Nations.

M1.2: Determining NO_x emission levels

NO_x emissions must be from manufacturers' data, for example, under the requirements of the Ecodesign Directive 2009/125/EC.

NO_x emissions for all heat sources should be measured under normal operating conditions, which are when all heat sources from the building plant operate to their maximum design heat outputs to meet the building's heating demands.

Where the plant is designed to operate below maximum capacity, for example, multiple or modular systems or standby boilers, the emissions should still be calculated for the plant operating to meet the building's heating demand.

Where manufacturer's data cannot be obtained in mgNO_x/kWh fuel input in terms of GCV on a dry basis the following conversions may be applied:

- Data provided in mg/m^3 multiply by 0.859
- Data provided in ppm/kWh multiply by 1.76
- Data provided as mg/MJ multiply by 3.6
- Data provided on a wet NO_x basis multiply by 100/(100-%water vapour)
- Data provided at 3% excess oxygen multiply by 1.17
- Data provided at 6% excess oxygen multiply by 1.4
- Data provided at 15% excess oxygen multiply by 3.54

Compliance notes

Ref	Terms	Description
CN1	Back-up space or water heating systems	Back-up space or water heating systems that will only be used in emergency systems can be excluded from the assessment.
CN2	Open flues	No credits may be awarded for open flue heating or hot water systems.
CN3	District heating	Where a project is connected to a district heating system which is outside the scope of the project or the wider development (e.g. phased developments), the system does not need to be included in the assessment. This is on the basis that the design team do not have control over the specification of the system. Where the design team do have control over the specification of the system, then it must be assessed, and all combustion plant must meet the limits.
CN4	New build extensions to existing building	If the heating or hot water demand for the new extension is being met by an existing system, then the emission levels for the existing system must be assessed against the criteria for this issue.

Evidence

Criteria	Interim design stage	Final post-construction stage
1	Design drawings, relevant sections of the building specifications or contract clauses that identify all heat-generating equipment for space heating and domestic hot water in the building.	Final construction or equivalent drawings or equipment schedules that identify all heat-generating equipment for space heating and domestic hot water in the building. OR Assessor's site inspection report and photographic evidence showing the installed equipment.
2	Design drawings, relevant section of the building specification or contract clauses confirming	Final construction or equivalent drawings or equipment schedules that identify all heat-

Criteria	Interim design stage	Final post-construction stage
	either: Commitment to meet maximum NO_x ratings for heat generators. OR Where known, details of specified plant and supporting manufacturer's product data sheets. For low population areas, evidence to support population density.	generating equipment for space heating and domestic hot water in the building. Manufacturer's product data sheets for installed systems. Documentary evidence to support the installation of the specified equipment such as: Assessor's site inspection report and photographic evidence. OR Copies of purchase orders, invoices or delivery tickets.

Definitions

Gross calorific value (GCV)

The total amount of heat energy released when a substance undergoes complete combustion in oxygen. This is sometimes referred to as the higher heating value. See also, net calorific value (NCV).

Net calorific value (NCV)

The amount of heat energy released when a substance undergoes complete combustion in oxygen minus heat used to vapourise the water that is generated during the combustion process. This is sometimes referred to as the lower heating value. See also, gross calorific value (GCV).

NO_x emissions

This refers to the nitrogen oxide gases – nitric oxide and nitrogen dioxide – that are produced when fuel is burned. NO_x is a major source of air pollution.

Additional information

None.

Pol 03 Flood and surface water management

Aim

To avoid, reduce and delay the discharge of rainfall to public sewers and watercourses, thereby minimising the risk and impact of localised flooding on-site and off-site, watercourse pollution and other environmental damage.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	5	None	All
Shell and core	5	None	All
Shell only	5	None	All

Assessment type specific notes

Ref	Assessment type specific notes
-	None

Building type specific notes

Ref	Building type specific notes
-	None

Assessment criteria

Prerequisite – Appropriate consultant

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

Up to two credits – Flood resilience

Two credits – Low flood risk

2 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 (see M4: Sources of flooding on page 360).

One credit – Medium or high flood risk

3 A site-specific FRA, developed by an appropriate consultant, 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 (see M4: Sources of flooding on page 360). For smaller sites refer to M6: Level of detail required in the FRA for smaller sites on page 361, which overrides criterion 2 above.

4 To increase the resilience and resistance of the development to flooding, one of the following must be achieved:

4.a 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 (see M5: 600 mm threshold on page 360).

4.b 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.[135]

Two credits – Surface water run-off

Prerequisite for surface water run-off credits

5 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 (see M16: Surface water run-off management on page 362), with justification given by the appropriate consultant where water is allowed to leave the site.

One credit – Surface water run-off – Rate

6 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 pre-developed site. This should comply at the 1-year and 100-year return period events.

7 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.

8 Relevant maintenance agreements for the ownership, long term operation and maintenance of all specified Sustainable Drainage Systems (SuDS) are in place.

9 Calculations include an allowance for climate change. This should be made in accordance with current best practice planning guidance.

One credit – Surface water run-off – Volume

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

EITHER

11 Specify drainage design measures that ensure post-development surface water run-off volume is no greater than the pre-development run-off volume. Show this with calculations for a 100-year 6-hour event adjusted for climate change, timing the event at the end of the development's expected life (see criterion 16).

12 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 criteria 11 and 12 cannot be achieved):

13 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.

14 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:

14.a The pre-development one-year peak flow rate

14.b The mean annual flow rate (Qbar)

14.c 2 L/s/ha.

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

15 Relevant maintenance agreements for the ownership, long term operation and maintenance of all specified SuDS are in place.

16 For either option, above calculations must include an allowance for climate change; this should be made in accordance with current best practice planning guidance.

One credit – Minimising watercourse pollution

17 There is no discharge from the developed site for rainfall up to 5 mm (confirmed by the appropriate consultant).

18 Areas with a low risk source of watercourse pollution, have an appropriate level of pollution prevention treatment provided using appropriate SuDS techniques.

19 Areas with a high risk of contamination or spillage of substances, such as petrol and oil, have separators (or an equivalent system) installed in surface water drainage systems.

20 Chemical or liquid gas storage areas have a means of containment fitted to the site drainage system (i.e. shut-off valves). This is to prevent the escape of chemicals to natural watercourses in the event of a spillage or bunding failure.

21 All water pollution prevention systems have been designed and installed in accordance with the recommendations of documents such as the SuDS manual(136) and other relevant industry best practice. They must be bespoke solutions taking account of the specific site requirements and natural or man-made environment of and surrounding the site.

22 A comprehensive and up to date drainage plan of the site will be made available for the building or site occupiers.

23 Relevant maintenance agreements for the ownership, long term operation and maintenance of all specified SuDS must be in place.

24 All external storage and delivery areas are designed and detailed in accordance with the current best practice planning guidance.

Methodology

M1: Applicable assessment criteria

None of the credits can be awarded where the assessed development has proceeded against the recommendation of the statutory body on the basis that the flooding implications are too great. This includes recommendations given which cannot or are not statutorily enforced. Where the local authority (or other statutory body) has set more rigorous requirements than the criteria in this issue, they must be met in order to achieve the relevant credits.

M2: Functional flood plain

The BREEAM credit for locating in a flood zone of 'medium or high annual probability' cannot be awarded where the building is located in the functional flood plain. This is defined in the current best practice national planning guidance for each country'. If the building assessed has been defined as a 'water-compatible development' by the local authority, confirmation must be provided by them of this designation and that they are satisfied with the proposals.

M3: Contaminated sites

Drainage designs for sites must take into account legislation relating to contaminated sites. In many circumstances of contaminated land there may be opportunities for the installation of some SuDS techniques.

M4: Sources of flooding

The FRA must detail the risk of flooding from the following sources:

1. Fluvial (rivers)
2. Tidal
3. Surface water: sheet run-off from adjacent land (urban or rural)
4. Groundwater: most common in low-lying areas underlain by permeable rock (aquifers)
5. Sewers: combined, foul or surface water sewers
6. Reservoirs, canals and other artificial sources

More detail on the above sources of flooding is provided in Additional information on page 369.

The content of the FRA should be based on historic trends and account for predicted changes to the climate which may impact on the flood risk to the site in future

M5: 600 mm threshold

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 600 mm 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 600 mm 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 600 mm 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 600 mm threshold. Examples of these materials include radioactive materials, microbiological facilities, server rooms, libraries, etc.

M6: Level of detail required in the FRA for smaller sites

For smaller sites, e.g. less than 1 ha (10,000 m²), 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 (2000 m² 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.

M7: Sites with multiple buildings

Where the assessed building is part of a larger development of buildings, there are a number of options for assessment of the surface water run-off credits:

1. The individual building and its associated hardstanding areas can be assessed independently where the run-off is being dealt with on a building-by-building basis (i.e. each building has its own dedicated sub-catchment that serves only that building).
2. When assessing the run-off from a number of buildings (including domestic and non-domestic buildings) the assessment must take into account the drainage from the local sub-catchment serving all those dwellings or buildings. Proportioning cannot be used to calculate the percentage of run-off discharging into the local sub-catchment resulting from just the assessed building.
3. The whole development can be assessed for compliance.

Whichever approach is taken to demonstrate compliance, it must be consistent when completing both the rate of run-off and volume of run-off calculations.

M8: No change in impermeable area – Brownfield sites

Where the man-made impermeable area draining to the watercourse (natural or municipal) has decreased or remains unchanged post-development, the volume of run-off requirements (criteria 11–16) can be considered as met. Volume calculations will not need to be provided. Instead, drawings clearly showing the impermeable areas of the site draining to the watercourse should be provided for the pre- and post-development scenarios. Figures must also be given (ideally on the drawings) to show a comparison between the areas of drained impermeable surfaces pre- and post-development. In this instance, it is still recommended that any opportunities identified to reduce surface water run-off are implemented.

Note 1: Compliance with criterion 10 (regarding 'exceedance') must still be demonstrated.

Note 2: Where the above is applied and the 'Surface water run-off – rate' credit is not targeted, criterion 5 does not need to be met.

M9: Limiting flow-rate discharge

For the surface water run-off credits, where the limiting discharge flow rate would require a flow rate of less than 5 L/s at a discharge point, a flow rate of up to 5 L/s may be used where required to reduce the risk of blockage.

M10: Areas that are a source of pollution

For the purpose of assessing the watercourse pollution credit, areas that presents a risk of watercourse pollution include areas for vehicle manoeuvring, car parks, waste disposal facilities, delivery and storage facilities or plant.

M11: Suitable level of treatment

In all cases the appropriate consultant should use their professional judgement to determine the most appropriate strategy for minimising watercourse pollution.

M12: Roof plant

Roof-top plant space must be considered where there is a risk from polluting substances such as petrol or oil. Refrigerants are not assessed under the pollution aspect of this issue, as the main risk of pollution is to air and not the watercourse.

M13: Calculating peak rate of run-off

Key publications that should be referred to for guidance on calculating the peak rate of run-off include:

1. The SuDS Manual
2. Rainfall run-off management for developments.[137]
3. National planning policy guidance or statement for the specific country.
4. IH Report 124, Flood estimation for small catchments (Marshall and Bayliss, 1994).[138]
5. Flood estimation handbook (Centre for Ecology and Hydrology, 1999).[139]

M14: Greenfield sites

A site which has never been built on, includes minimal development or which has been substantially cleared of all buildings and associated fixed surface infrastructure (typically, the site includes less than 5% residual development by area) and has subsequently remained undisturbed for five years or more.

M15: Brownfield sites

The calculation of brownfield run-off rates should be as follows:

- If the existing drainage is known then it should be modelled using best practice simulation modelling, to determine the one-year and 100-year peak flow rates at discharge points. This is without allowing surcharge of the system above cover levels to drive greater flow rates through the discharge points.
- If the system is not known, then the brownfield run-off should be calculated using the greenfield run-off models described above but with a Soil Type 5.

M16: Surface water run-off management

When specifying and designing surface water run-off management, the appropriate consultant must follow the priority levels listed below (noting that Level 1 has the highest priority). Justification must be provided for each level which does not contribute to managing surface water run-off. This has been set so the most appropriate water management solutions are used, prioritising water use in the development and infiltration over discharge. This is so that the volume of water that leaves the site is limited as far as practicable.

- Priority Level 1: Water is collected for use in the development (e.g. rainwater reuse)
- Priority Level 2: Water is infiltrated into the ground
- Priority Level 3: Water is discharged to surface water body
- Priority Level 4: Water is discharged to the drainage system
- Priority Level 5: Water is discharged to a combined sewer

M17: Limiting discharge rate

The limiting discharge for each discharge point should be calculated as the flow rates from the pre-developed site. The calculation includes the total flow rate from the total area of the site feeding into the discharge point and includes both BREEAM-assessed and non-BREEAM-assessed parts of the development, if applicable. The discharge point is defined as the point of discharge into the watercourse or sewers. This includes rivers, streams, ditches, drains, cuts, culverts, dykes, sluices, public sewers and passages through which water flows (see Definitions on page 365). Where this calculation results in a peak flow rate of less than 5 L/s, the limiting discharge rate may be increased up to a level of no more than 5 L/s at the point of discharge from the site. This is to reduce the risk of blockage.

For example, if the flow rate for the 1 year and 100 year events were 4 L/s and 7 L/s respectively, then the limiting discharges would be 5 L/s and 7 L/s. Similarly, if it was calculated to be 2 L/s and 4 L/s, then a maximum of 5 L/s limiting discharge rate could be applied to both discharge points.

Sites should not be subdivided to enable higher overall limiting discharge rates to be claimed. It is recognised that some sites may require more than one discharge point as a result of the local topography or existing surrounding drainage infrastructure. In such cases, the limiting discharge flow rate may be increased to a level no more than 5 L/s at each discharge point. The assessor should seek evidence that the number of discharge points is necessary due to topography or infrastructure limitations. Evidence may be in the form of a topographical map and an explanation from the appropriate consultant as to why multiple discharge points are required, stating that it is not feasible to have fewer discharge points.

M18: 100-year peak rate event – excess volume of run-off

The storage of excess flows from the 100-year event does not necessarily have to be contained within the drainage system or SuDS features (the features designed solely for the purpose of drainage). Where appropriate, storage of some or all of this volume can be achieved using temporary surface flooding of areas such as a playing field. Specific consideration should be given to overland flow routing. Overland flood flows and temporary storage of flood water on the surface must not be so frequent as to unreasonably inconvenience residents and other users.

M19: Designing for exceedance guidance

CIRIA publication C635 (2006) *Designing for exceedance in urban drainage – good practice* should be referred to for guidance. (140)

Compliance notes

Ref	Terms	Description
CN1	Flood defences. See criteria 2 to 4.	**Third party defences** There are many landscape feature defences, owned by third parties, which due to their location act as a flood defence by default, e.g. motorway, railway embankments, walls etc. It can be assumed that such embankments will remain in place for the lifetime of the development, unless the assessor or project team have reason to believe otherwise. For walls, assurance must be sought that the wall is likely to remain for the design life of the building. **Pre-existing flood defences** In an area protected by existing flood defences (designed to withstand a certain magnitude of flooding) the appropriate number of flood risk credits can be awarded where the defences reduce the risk to 'low' or 'medium' and the following conditions are met: 1. The development is not located in an area where new flood defences have to be, or have been, constructed to minimise the risk of flooding to the site and its locality purely for the purpose of the development or its wider master plan 2. The relevant agency confirms that, as a result of such defences, the risk of a flood event occurring is reduced to low or medium risk. If firm confirmation is not provided, then the credit cannot be awarded. A statutory body's local or regional office may be able to provide more information on existing defences in the area in which the assessed development is located.

Evidence

Criteria	Interim design stage	Final post-construction stage
Prerequisite		
1	Appointment of an appropriate consultant and confirmation they are qualified in line with the definition.	Evidence to show an appropriate consultant was appointed.
Flood risk		

Criteria	Interim design stage	Final post-construction stage
2–3	Copy of a compliant flood risk assessment (FRA). Evidence to confirm that the site is not a functional flood plain, where applicable.	Copy of a compliant flood risk assessment (FRA), updated as necessary. OR Confirmation that the basis of the flood risk assessment has not changed where more than five years have passed since the flood risk assessment was carried out.
4	Evidence to show measures to increase resilience and resistance of the development to flooding: a. Confirmation of the design flood level and design drawings to show ground level of all habitable parts of the building and access to the site and buildings to be at least 600 mm above this. OR b. Report or correspondence from an appropriately qualified professional which includes recommendations for the design of the building and site. Evidence to confirm these are to be implemented such as design drawings, sections of the building specification, contract clauses or commitment letter.	Evidence to show measures to increase resilience and resistance of the development to flooding have been implemented: a. Confirmation of the design flood level and final construction or equivalent drawings to show ground level of all habitable parts of the building and access to the site and buildings to be at least 600 mm above this. OR b. Report or correspondence from an appropriately qualified professional which includes recommendations for the design of the building and site. Evidence to confirm these have been implemented within the final design such as final construction or equivalent drawings and assessor site inspection report.
Surface water run-off		
5	Consultant's report confirming the site-specific surface water-run off design solutions, in line with the priority levels.	Final construction drawings or equivalent showing installed surface water drainage solutions.
6, 7, 9, 11–14, 16	Calculation results to show the pre-development, greenfield and post-development peak rate of run-off and volume of run-off. Surface water drainage report, statement or design drawings to confirm the proposed drainage design. Where credits awarded based on the impermeable area being reduced: drawings showing the impermeable areas pre- and post-development, including areas. Details of any opportunities identified to reduce surface water-run-off.	Calculation results to show the pre-development, greenfield and post-development peak rate of run-off and volume of run-off, updated where required. Details of installed drainage measures. Where credits awarded on the basis of impermeable area reducing: Drawings to show the pre-development and final construction drawings showing the post-development impermeable areas for the site and calculations for the change in impermeable area, updated where required.
8, 15	Relevant section or clauses of the building specification or contract. OR Letter of commitment.	Evidence to confirm that maintenance responsibilities have been defined for any SuDS solutions installed.
10	Information showing the proposed drainage solution, system failure flood flow routes, potential flood ponding levels and ground floor levels.	Information showing the proposed drainage solution, system failure flood flow routes, potential flood ponding levels and ground floor levels, updated with final construction evidence where the design has

Criteria	Interim design stage	Final post-construction stage
		changed.
Minimising watercourse pollution		
17	Calculations and confirmation from the appropriate consultant to demonstrate that there will be no discharge from the site for rainfall up to 5 mm.	Assessor's building or site inspection and photographic evidence. AND EITHER Written confirmation from the developer or suitably qualified consultant that the solutions assessed at the design stage have been implemented. OR Where the design has changed, the evidence identified for the design stage assessment is provided for post-construction or final construction details.
18–21	Design drawings or relevant section or clauses of the building specification or contract or confirmation from the appropriate consultant indicating: 1. High and low risk areas of the site. 2. Specification of sustainable drainage system or SuDS, source control systems, oil or petrol separators and shut-off valves as appropriate. 3. Water pollution prevention systems have been designed in accordance with best practice guidance.	Assessor's building or site inspection and photographic evidence. AND EITHER Written confirmation from the developer or suitably qualified consultant that the solutions assessed at the design stage have been implemented. OR Where the design has changed, the evidence identified for the design stage assessment is provided for post-construction or as-built details.
22	Relevant section or clauses of the building specification or contract. OR Letter of commitment.	Letter of confirmation. As-built drainage plan.
23	Relevant section or clauses of the building specification or contract. OR Letter of commitment.	Evidence to confirm that maintenance responsibilities have been defined for any SuDS solutions installed.
24	Design drawings and confirmation from the appropriate consultant as to how the external storage and delivery areas are in line with best practice planning guidance.	Final construction or equivalent drawings. Confirmation from the appropriate consultant as to how the external storage and delivery areas are in line with best practice planning guidance. where the design has been updated.

Definitions

Adoptable highways

For the purposes of BREEAM, an 'adoptable highway' is a highway that is the responsibility of the highways authority in terms of installation and maintenance of surface water drainage. This drainage must only carry run-off from the highway itself. This means that to fall under the definition of an adoptable highway the drainage network must not be directly connected to any other upstream drainage network (e.g. from a private development). Where drainage within the highway will carry run-off from both the highway and assessed development, it is not regarded as an adoptable highway. In this instance the drainage design must take account of the highway run-off.

Appropriate consultant

A consultant with qualifications and experience relevant to designing SuDS and flood prevention measures and completing peak rate of run-off calculations. Where complex flooding calculations and prevention measures are required, this must be a specialist hydrological engineer.

Appropriate statutory body

This refers to either the appropriate national body (i.e. The Environment Agency in England and Wales, the Rivers Agency in Northern Ireland and the Scottish Environment Protection Agency in Scotland) or the relevant local authority or internal drainage board.

Catchment

The area contributing surface water flow to a point on a drainage or water course. It can be divided into sub-catchments.

Control devices

Any drainage structure or unit designed to control the run-off of storm water. Examples of SuDS control devices are check dams within swales and basins, and combined weir or orifice controls for ponds. Examples of traditional control devices are throttles constructed with pipes and vortex controls. The control devices must be capable of regular inspection and maintenance, and the system should be failsafe so that upstream flooding does not result from blockage or other malfunction. For guidance on control devices, refer to *The SuDS Manual (C753)* (CIRIA, 2015) and other best practice guidelines.

Current best practice national planning guidance

Please refer to the guidance given in the following locations. It is the design team's responsibility to choose the most appropriate guidance from the links below:

- www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/
- www.gov.uk/guidance/pollution-prevention-for-businesses
- www.gov.uk/guidance/storing-oil-at-a-home-or-business
- www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#what-climate-change-allowances-are

Design flood event

An historic or notional flood event of a given annual flood probability, against which the suitability of a proposed development is assessed and mitigation measures, if any, are designed.

Design flood level

The maximum estimated water level during the design storm event. The design flood level for a site can be determined through either known historical data or modelled for the specific site.

Design storm event

Historic or notional weather conditions of a given annual probability, against which the suitability of a proposed development is assessed and mitigation measures, if any, are designed.

Discharge point

The discharge point is the point at which the run-off from the site leaves the site boundary and enters a watercourse.

Flood defences

Flood defences do not completely remove the risk of flooding, but they do reduce it. Building in areas where flood defences are present (and appropriately designed to withstand a certain magnitude of flooding) is therefore preferable to those built in medium- or high-risk areas without defences. However, for the purpose of this issue, it is still preferable to build in areas of low risk than encourage development of new flood defences in areas with a higher risk of flooding purely for the sake of new development.

Flood event

A flooding incident characterised by its peak level or flow, or by its level or flow hydrograph.

Flood probability

The estimated probability of a flood of given magnitude occurring or being exceeded in any specified time period. For example, the 100-year flood has a 1% chance of occurring in any given year.

Flood risk

The combination of the flood probability and the magnitude of the potential consequences of the flood event.

Flood risk assessment

A study to assess the risk of a site flooding, and to assess the impact that any changes or development on the site will have on flood risk to the site and elsewhere. A FRA should be prepared according to relevant planning policy and technical guidance documents. The FRA must account for future climate change and detail any necessary adaptation measures if required. Where more than five years have passed since the FRA was carried out, evidence is required to demonstrate that the basis of the FRA has not changed in that time.

Flood storage

The temporary storage of excess run-off or river flow in ponds, basins, reservoirs or on the floodplain during a flood event.

Flood zones

The definitions of flood risk for planning purposes are set out in each UK nation's primary policy documents: England's Planning Practice Guidance ('Flood Risk and Coastal Change'), Wales's Technical Advice Note 15 (TAN 15), Scotland's National Planning Framework 4 (NPF4), and Northern Ireland's Strategic Planning Policy (SPPS).

Flood risk zone definitions are not standardised across the United Kingdom, with each of the four nations employing its own distinct methodologies and risk thresholds. Consequently, the frameworks for classifying and managing flood risk, managed by separate national agencies, have some differences.

The definitions are outlined in Table 12.3 on page 369.

Greenfield

A site which has either never been built on, or one which has remained undisturbed for five years or more.

Greenfield run-off rate

The rate of run-off that would occur from the site in its undeveloped and therefore undisturbed state.

Hard surfaces

These include roofs, car parks, access roads, pavements, delivery or service yards, and external hard landscaping. Footpaths less than 1.5 m wide which have free drainage to soft landscaped areas on both sides may be excluded.

Infiltration

The passage of water into a permeable surface, such as soil, permeable paving, soakaways, etc.

Level of pollution prevention treatment

When used in the context of one, two or three levels of treatment for surface water, the treatment level should be regarded as: the number of SuDS components in series through which run-off passes from the originating surface on which rainfall fell, to the site discharge point. Where a SuDS component has more than one treatment process, it might be considered to provide more than one level of treatment. In these circumstances advice should be sought from the BREEAM office.

Limiting discharge

The limiting discharge is based upon the calculated pre-development flow rate at a discharge point.

Low risk areas (with respect to watercourse pollution)

Low risk areas can be defined as areas where the risk of contamination or spillage of substances such as petrol and oil is reduced. For the purpose of this credit, roofs and small car parks may be considered as low risk areas.

Peak run-off rate, Qp [m^3/s]

This is the highest rate of flow from a defined catchment area assuming that rainfall is uniformly distributed over the drainage area, considering the entire drainage area as a single unit and estimation of flow at the most downstream point only.

Pre-development

The state of the site under assessment immediately prior to purchase of the site by the client or developer. Where the client has owned or occupied the site for a number of years, this is the current state.

Qbar

An estimation of the mean annual flood flow rate from a catchment (see Report IH124 Flood estimations for small catchments).

Rainwater discharge

This is the rainwater which flows from the development site to watercourses and sewers. It is also referred to as run-off.

Run-off

This is usually rainwater, but can also be groundwater or overspill from sewers and other sources.

Sewerage undertaker

This is a Body, typically a water company, with statutory responsibility for sewerage and sewerage disposal and also surface water from roofs and yards of premises.

Soakaways

A subsurface structure designed to promote the infiltration of surface water into the ground. As a general point, soakaways may be shallow and broad (as in a blanket under permeable paving) or deeper structures. Deeper, point source soakaways should be avoided for road and car park drainage, but shallow structures providing infiltration in an extensive way (infiltration trenches and permeable paving) do not need oil separators.

SuDS management train

An approach to drainage design that combines a sequence of appropriate surface water drainage structures using SuDS systems. These manage the run-off to treat the flow, reduce run-off volume and restrain the run-off rate in order to minimise man's impact on the environment. Additional benefits associated with operation and maintenance, ecology and amenity are aspects which are considered when designing a management system. The management train incorporates a hierarchy of techniques:

1. Source control. Examples of SuDS techniques include:
    - Soakaways
    - Porous or pervious paving
    - Roof water directed to garden (rather than piped drains)
    - Rainwater reuse
    - Green roofs
    - Other surface infiltration, attenuation and conveyance techniques that deal with run-off at source.
2. Site or local control. Examples of SuDS techniques include:
    - Swales
    - Pond
    - Infiltration basins
    - Detention basin
    - Larger soakaways
    - Pervious (porous or permeable) paving.
3. Regional control. Examples of techniques include:
    - Balancing ponds
    - Wetlands
    - Large detention basin.

SuDS techniques

One or more components built to manage surface water run-off to prevent flooding and pollution. For example, these include: wet ponds, infiltration basins, detention basins, swales, reed beds, pervious (porous or permeable) paving, soakaways, rainwater reuse, filter strips, filter drains and trenches with or without perforates pipes, green roofs, and underground attenuation storage.

For more information, refer to *The SuDS Manual (C753)* (CIRIA, 2015) and *Guidance for the construction of SuDS (C768)* (CIRIA, 2017).[141]

Surface water run-off

Water flow over the ground surface to a drainage system. This occurs if the ground is impermeable or saturated, or if the rainfall is particularly intense.

Tidal estuary

A tidal estuary is defined as a semi-enclosed coastal body of water which has a free connection with the open sea and within which seawater is measurably diluted with fresh water derived from land drainage. An estuary should be unconstrained tidal waters, i.e. there should be no barriers or constricted shorelines that would restrict the free flow of water into the open sea in any conditions. The impact on the total volume of run-off from the site (and other sites which may in future discharge into the estuary) should be insignificant in terms of the overall water levels in the estuary. Tidal rivers (i.e. where no or limited measurable seawater content is present during normal tidal movements) cannot be included as part of the estuary for the purposes of BREEAM.

Treatment

Improving the quality of water by physical, chemical or biological means.

Types of oil separator

- **Class 1 separators:** These are designed to achieve a concentration of less than 5 mg/l oil under standard test conditions. They should be used when the separator is required to remove very small oil droplets, such as those arising from car park run-off.
- **Class 2 separators:** These are designed to achieve a concentration of less than 100 mg/l oil under standard test conditions. They are suitable for dealing with discharges where a lower quality requirement applies or for trapping large spillages. Both classes can be produced as 'full retention' or 'bypass' separators:
- **Full retention separators:** These treat the flow that can be delivered by the drainage system, which is normally equivalent to the flow generated by a rainfall intensity of 50 mm/hr.
- **Bypass separators:** These fully treat all flows generated by rainfall rates of up to 5 mm/hr. Flows above this rate are allowed to bypass the separator. These separators are used when it is an acceptable risk not to provide full treatment for high flows.

Volume of run-off

The volume of run-off that is generated by rainfall occurring on the site. This is typically measured in cubic metres. Additional predicted volume of run-off is the difference between the volumes of run-off pre- and post-development.

Water-compatible development

These are developments which are either essential infrastructure or their uses are compatible with a flood plain. For example docks, marinas and wharves, ship building and repair, water-based recreation etc. This designation is made by local authorities.

Watercourses and sewers

A term that includes rivers, streams, ditches, drains, culverts, dykes, sluices, sewers and passages through which water flows.

Additional information

Definition of flood zones by country

Table 12.3: Definition of flood zones by country

	England (Environment Agency)	Scotland (SEPA)	Wales (Natural Resources Wales)	Northern Ireland (Dept. for Infrastructure)
Definitions	Uses Flood Zones for planning, based on annual probability from rivers and the sea,	Uses Likelihood categories (High, Medium, Low) from rivers, sea, and surface	Employs two systems: 1. Flood Risk Bands (High, Medium, Low) for public risk	Uses Annual Exceedance Probability (AEP) for planning. Does not use

	England (Environment Agency)	Scotland (SEPA)	Wales (Natural Resources Wales)	Northern Ireland (Dept. for Infrastructure)
	ignoring defences.	water.	assessment (FRAW map). 2. Flood Zones (2 & 3) for planning, similar to England.	tiered "Zone" or "Risk" terminology in the same way, focusing instead on whether an area is inside or outside a specific probability threshold.
Low annual probability of flooding	Flood Zone 1: < 0.1% annual probability (< 1 in 1,000).	Low Likelihood: 0.1% to 0.5% annual probability (1 in 1,000 to 1 in 200).	FRAW Map: 0.1% to 1% annual probability (1 in 1,000 to 1 in 100).	Not formally defined as a specific low risk zone but represents areas outside the medium probability extents.
Medium annual probability of flooding	Flood Zone 2: Rivers: 1% to 0.1% (1 in 100 to 1,000) Sea: 0.5% to 0.1% (1 in 200 to 1,000)	Medium Likelihood: 0.5% to 10% annual probability (1 in 200 to 1 in 10). For planning, risk is flagged at > 0.5% (1 in 200).	FRAW Map: Rivers: 1% to 3.3% Sea: 0.5% to 3.3% Planning Map (Zone 2): Rivers: 1% to 0.1% Sea: 0.5% to 0.1%	Considered the area with: ≥ 1% AEP for rivers (1 in 100). ≥ 0.5% AEP for the sea (1 in 200).
High annual probability of flooding	Flood Zone 3: Rivers: ≥ 1% (1 in 100) Sea: ≥ 0.5% (1 in 200) Zone 3b (Functional Floodplain) is ≥ 5% (1 in 20).	High Likelihood: ≥ 10% annual probability (1 in 10).	FRAW Map: > 3.3% annual probability (> 1 in 30). Planning Map (Zone 3): Rivers: ≥ 1% (1 in 100) Sea: ≥ 0.5% (1 in 200)	Not formally defined as a "High Risk" zone, but detailed Flood Hazard Maps are produced for Significant Flood Risk Areas, showing potential depth and velocity.

Links:
- England: www.gov.uk/check-long-term-flood-risk
- Scotland: map.sepa.org.uk/floodmaps/
- Wales: naturalresources.wales/flooding/check-your-flood-risk-on-a-map-flood-risk-assessment-wales-map/
- Northern Ireland: www.infrastructure-ni.gov.uk/topics/flood-maps-ni

The above country-specific risk levels are based on flooding from rivers and the sea. To confirm the sources of flooding that need to be taken into account when conducting a flood risk assessment for a particular site, refer to M4: Sources of flooding on page 360.

Sources of flooding and flood risk

1. Streams and rivers: Flooding that can take place from flows that are not contained within the channel due to high levels of rainfall in the catchment.
2. Coastal or estuarine: Flooding that can occur from the sea due to a particularly high tide or surge, or a combination of both.
3. Groundwater: Where the water table rises to such a height where flooding occurs. Most common in low-lying areas underlain by permeable rock (aquifers), usually due to extended periods of wet weather.
4. Sewers and highway drains: Combined, foul or surface water sewers and highway drains that are temporarily over-loaded due to excessive rainfall or due to blockage.
5. Surface water: The net rainfall falling on a surface (on or off the site) which acts as run-off which has not infiltrated into the ground or entered into a drainage system.
6. Infrastructure failure: Canals, reservoirs, industrial processes, burst water mains, blocked sewers or failed pumping stations.

SuDS – Sustainable drainage systems

A sequence of management practices and control structures designed to drain surface water in a more sustainable fashion than some conventional techniques. Examples of SuDS devices include:

— Holding ponds
— Swales
— Reed beds
— Permeable paving – in areas where local geological and hydrological conditions allow this to function, e.g. block paved surface on a permeable sub-base over gravel bed to store the water and allow it to seep into the soil. For less permeable soils, the gravel layer might be deeper and the water taken to a soakaway although this is not an option in some areas
— Local or centralised soakaways either as full systems or as ‘overflow’ or ‘holding’ systems, in areas where local geological and hydrological conditions allow them to function
— Run-off from roofs collected for reuse
— Run-off from roofs directed to a local soakaway or other holding facility such as tanks, ponds, swales etc.
— Green roofs.

For more information refer to *The SuDS Manual (C753)* (CIRIA, 2015).

Contaminated sites

Examples of contamination legislation that should be considered includes: the Water Resources Act 1991, the Environmental Protection Act 1990, the Groundwater Directive (2006/118/EC) and, more recently the Groundwater (England and Wales) Regulations 2009. Where the site risk assessment confirms that infiltration SuDS techniques are not appropriate, SuDS techniques that do not allow infiltration, such as swales lined with an impermeable membrane, can be used.

It may be the case that only some areas of the site are contaminated and therefore infiltration SuDS techniques can be used elsewhere on the site. There may also be a requirement to remediate the contaminated soils, creating opportunities for the use of infiltration SuDS post-remediation.

Pol 04 Reduction of nighttime light pollution

Aim

To ensure that lighting is concentrated in appropriate areas, minimise upward light, and reduce obtrusive light pollution. This aims to limit unnecessary energy consumption, minimise nuisance to neighbouring properties, and mitigate adverse impacts on transport systems and natural habitats.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	1	None	All
Shell and core	1	None	All
Shell only	1	None	All

Assessment type specific notes

Ref	Assessment type specific note
-	None

Building type specific notes

Ref	Building type specific note
-	None

Issue specific notes

Ref	Issue specific note
3.0	**No exterior lighting** Where the assessed development does not include any exterior lighting, this issue is not applicable.

Assessment criteria

One credit – Reduction of light pollution

1 Light pollution has been eliminated through effective design that removes the need for artificial lighting at night. This does not adversely affect the safety and security of the site and its users.

OR alternatively, where the building does use artificial lighting at night, one credit can be awarded as follows:

2 The lighting strategy has been designed to reduce obtrusive light. This includes both external lighting and internal lighting in spaces with glazed apertures.

3 A curfew is established for all external lighting (except for safety and security lighting), which is automatically switched off between 23:00 and 07:00.

4 Illuminated advertisements are designed to control brightness and minimise visual disturbance during nighttime hours.

5 Lighting is designed to minimise impacts on nocturnal wildlife.

Methodology

M1: Lighting guidelines

The following guides when and how to apply the criteria to the lighting associated with a building being assessed.

1. **Assessment scope:** Where the assessment concerns an individual building located inside another building or on an existing site, only those areas affected by the works, i.e. within the construction zone, need to be assessed. Where the assessment concerns a building that forms part of an entirely new development, the criteria apply site-wide.
2. **Assessment of extensions:** When assessing a new extension or infill development on an existing site, only new lighting specified as part of the assessed works must be considered.
3. **Determining lighting types:** The design team and the assessor are responsible for determining which lights are provided for safety and security purposes and which should be considered general lighting. The type of safety and security lighting depends on the project and the location of the lighting.
4. **External areas lit by internally mounted lighting:** 'external lighting' includes both lighting mounted externally and lighting mounted inside a building primarily intended to enhance its external appearance or light external spaces after dark.
5. **Operational hours exemption:** During hours of operation between 23:00 and 07:00, lighting required for operational reasons does not have to be modified for BREEAM compliance.
6. **Exemptions for security purposes:** When specified light fittings adhere to particular security standards that conflict with BREEAM criteria, they may be exempt from assessment in this issue. In such cases, the assessor must procure evidence verifying the specific security standards' applicability to the assessed development.
7. **Exclusion of flush stud lights:** Flush stud lights used for safety purposes in vehicle manoeuvring areas may be excluded from the assessment. In these circumstances, the assessor must obtain evidence confirming the specific security standards and that they apply to the assessed development.
8. **Illuminated advertisements:** All types of illuminated advertisements, both self-illuminated and those illuminated by reflection from other sources, must meet the criteria.

M2: Reduction of obtrusive light

The lighting strategy design should follow the five sets of recommendations outlined in the Institution of Lighting Professionals (ILP) *Guidance Note 01/21 – The reduction of obtrusive light* (GN01/21):

1. Limitation of illumination on surrounding premises
2. Limitation of bright luminaires in the field of view
3. Limitation of the effects on transport systems
4. Limitation of skyglow
5. Limitations of the effect of over-lit building facades and signs

The lighting strategy design must comply with the limits set for light technical parameters in Table 2 to Table 8 of ILP GN01/21, including the accompanying notes.[142]

For cut-off type and angled luminaires which (by design) block out light in obstructive directions, calculations are not required for meeting requirements relating to:

— Vertical illuminance (Table 3), and

— Luminous intensity (Table 4).

ILP GN01/21 for the reduction of obtrusive light is available free of charge from the ILP website (www.theilp.org.uk).

Compliance with the International Dark Skies Association Model Ordinance Guidance may also ensure the requirements for this credit are met (see darksky.org/resources/guides-and-how-tos/model-lighting-ordinances).

M3: Setting a curfew

This will normally include floodlighting, signage, and all lighting that is not required for safety or security. Illuminated advertisements may be excluded from this requirement but will need to comply with different levels of maximum luminance depending on the surrounding and background environment (see criterion 4 and M4).

Where safety or security lighting is provided and will be used between 23:00 and 07:00, this part of the lighting system must comply with the lower lighting levels recommended during these hours in Table 3 to Table 8 of ILP GN01/21.

Where a different curfew time applies for other reasons (e.g., noise control), consideration should be given to coordinating the curfews, e.g., allowing sufficient time of operation for the lighting after the conclusion of the activity to facilitate crowd dispersal, particularly where large numbers of spectators are involved.

M4: Illuminated advertisements

The principles outlined in ILP GN01/21 should be applied to external and internal outward facing illuminated advertisements, including digital displays

The maximum luminance values depend on the building's location (see Table 12.4 below).

Table 12.5 below outlines the maximum luminance (cd/m²) permitted at any point on the surface of an illuminated advertisement during nighttime hours.

Table 12.4: Environmental lighting zone

Zone	Surrounding	Lighting environment	Examples
E0	Protected	Dark	Astronomical observable dark skies, UNESCO starlight reserves, IDA dark sky places
E1	Natural	Dark	National parks or protected sites, areas of outstanding natural beauty, relatively uninhabited rural areas
E2	Rural	Low district brightness	Sparsely inhabited rural areas, village or relatively dark outer suburban locations
E3	Suburban	Medium district brightness	Well inhabited rural and urban settlements, small town centres of suburban locations
E4	Urban	High district brightness	Town centres and commercial districts with high levels of nighttime activity

Table 12.5: Recommendations for maximum nighttime permitted values of display luminance (cd/m²), adapted from PLG05

Illuminated area (m²)	Zone E0	Zone E1	Zone E2	Zone E3	Zone E4
0 to < 5	0	25	200	300	300
5 to < 20	0	0	200	300	300
≥ 20	0	0	100	200	300

The values in Table 12.5 apply to pre-curfew. The post-curfew levels shall generally be the display being off, unless (in Zone E2 to Zone E4 inclusive) the installation is still required to be operational, in which case the performance level should be 50% of the pre-curfew level.

The values in Table 12.5 do not apply to signs for traffic control purposes.

Further guidance from ILP *PLG05 The brightness of illuminated advertisements* (2023) supports meeting the requirements of this criterion.(143)

M5: Nocturnal wildlife

Buildings located near ecologically sensitive areas or known nocturnal wildlife habitats must consider the following recommendations to address the potential impacts of lighting. These considerations are not required for buildings in other locations.

- Determine the presence or potential for nocturnal wildlife and key habitats and assess their ecological importance.
- Avoid any lighting on key habitats to preserve complete darkness.
- Apply mitigation measures and sensitive design; for example:
  - Based on habitat value, dark buffers and concentric zonation should be established with appropriate buffer widths and illuminance limits.
  - Selecting suitable luminaires and site configurations.
  - Implementing physical screening to block light spills.

Further guidance from ILP *GN08/23 Bats and artificial lighting at night* (2023) supports meeting the requirements of this criterion. (144)

Compliance notes

Ref	Terms	Description
CN1	Best practices / National and international frameworks	Projects are encouraged to consider best practices, and national and international frameworks that help to address the criteria on this issue. Examples include the International Dark-Sky Association (IDA) which provide universal principles for reducing light pollution. Adhering to these frameworks supports compliance with the criteria and demonstrates a commitment to minimising obtrusive light pollution impacts.
CN2	Maximum luminance	When considering the zone in which an advertising sign is, or is intended to be, sited, the contrast with the surrounding or background should be considered (e.g. the surrounding could be unlit when viewed from the road or a residential window) and the zone adjusted accordingly. Where an illuminated sign lies on the boundary of two zones or can be observed from another zone, the illumination level used should be that applicable to the most rigorous zone.
CN3	Security lighting	While security lighting must remain unaffected to ensure safety and security, such as in a prison building type, all non-security lighting should adhere to light pollution reduction standards.

Evidence

Criteria	Interim design stage	Final post-construction stage
1	Written confirmation from appropriate member of the design team or design drawings to confirm that there is no artificial lighting at night.	Assessor's site inspection report and photographic evidence.
2–5	Relevant section or clauses of the building specification or contract OR Letter of commitment OR Where available, design drawings and lighting design data or calculations. The M&E engineer or lighting designer must provide indicative examples of where and how the strategy complies with the assessment criteria.	Evidence, including indicative examples, to demonstrate how the installed lighting meets the criteria requirement. This could include where relevant: Final construction or equivalent lighting layout drawings. Lighting calculations. A statement from the M&E engineer or lighting designer. Manufacturer's literature for the installed luminaires.

Definitions

Complete darkness

Achieving complete darkness is not feasible in areas where any form of lighting is present. For the purposes of BREEAM, complete darkness is defined as illuminance levels at or below 0.2 lux on the horizontal plane and 0.4 lux on the vertical plane. These thresholds align with recommendations for maintaining suitable conditions for light-averse nocturnal wildlife.

Curfew

A designated time period during which all non-essential external lighting (e.g. general and decorative lighting) is automatically switched off to reduce light pollution.

Dark buffers

Unlit or minimally lit zones established around key habitats to minimise light intrusion.

Environmental lighting zones

Categories defining the surrounding lighting environment, ranging from Zone E0 (Dark/Protected) to Zone E4 (Urban). See Table 12.4 on page 374.

Illuminated advertisements

An advertisement designed or adapted to be illuminated by artificial lighting, directly or by reflection. It also includes any billboard or similar structure used, designed or adapted for the display of advertisements, including self-illuminated and externally illuminated types.

Nocturnal wildlife habitats

Areas of high ecological value that serve as critical living, breeding, or foraging spaces for nocturnal wildlife.

Obtrusive light

Any light that creates unwanted or excessive illumination beyond the intended area, causing adverse effects such as glare, light trespass, or skyglow.

Additional information

None.

Pol 05 Reduction of noise pollution

Aim

To reduce the likelihood of noise arising from fixed installations on the new development affecting nearby noise-sensitive buildings.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
Fully fitted	1	None	All
Shell and core	1	None	All
Shell only	0	None	Not applicable

Assessment type specific notes

Ref	Assessment type specific notes
-	None

Building type specific notes

Ref	Building type specific notes
-	None

Assessment criteria

One credit – Noise level

1 There are no noise-sensitive areas within the assessed building or within 800 m radius of the assessed site.

OR

2 Where there are noise-sensitive areas within the assessed building or noise-sensitive areas within 800 m radius of the assessed site, a noise impact assessment compliant with BS 4142:2014[145] is commissioned. Noise levels must be measured or determined for:

2.a Existing background noise levels:

2.a.i At the nearest or most exposed noise-sensitive development to the proposed assessed site.

2.a.ii Including existing plant on a building, where the assessed development is an extension to the building.

2.b New noise level from the assessed building (see M1 and M2).

3 The noise impact assessment must be carried out by a suitably qualified acoustic consultant.

4 The noise level from the assessed building, as measured in the locality of the nearest or most exposed noise-sensitive development, must be at least 5 dB lower than the background noise throughout the day and night.

5 If the noise sources from the assessed building are greater than the levels described in criterion 4, measures have been installed to attenuate the noise at its source to a level where it will comply with criterion 4.

Methodology

M1: Noise level measurements at the design stage

At the design stage assessment, when noise-sensitive areas or buildings are present, actual measurement may not be feasible due to the absence of the planned installation. In such scenarios, compliance can be demonstrated through acousticians' calculations or scale model investigations.

BS 4142 stipulates that when direct measurement of ambient noise levels is impractical or unrepresentative, sound levels must be estimated using calculation methods. Detailed reporting of the calculation method and justification for its use is required in such cases. If prediction methods are unavailable, measurement becomes necessary using either a noise source similar to the proposed one or measurement of the actual noise post-installation. Compliance with the latter approach entails a written commitment to appoint a qualified acoustician to conduct the necessary measurements post-installation and a further commitment to attenuate the noise source if required by the measurements, in accordance with criteria 4 on the previous page and 5 on the previous page.

M2: Noise level measurements at post-construction stage

Noise level measurements do not need to be taken at the post-construction stage if the acoustician has accurately modelled the noise level from the plant using the manufacturer’s literature and site measurements taken at the design stage. Any attenuation measures specified by the acoustician in their report must be confirmed as being present post-construction.

If the acoustician cannot model the noise level accurately, post-construction measurements are needed to demonstrate compliance.

Calculations and recommendations from the acoustician are relied on to be accurate and in keeping with best practices; attenuation measures are assumed to be specified and installed correctly.

Compliance notes

Ref	Terms	Description
CN1	Natural ventilation	The Pol 05 credit may be awarded by default for areas utilizing natural ventilation or buildings intentionally designed to remain untreated. For example, internal spaces not serviced by heating, ventilation or air-conditioning systems have no noise-generating plants. This approach addresses noise concerns without requiring a separate acoustics report.
CN2	Untreated buildings	This assessment issue does not apply to buildings designed to be untreated, i.e. where internal spaces will not be serviced by heating, ventilation or air-conditioning systems and, therefore, have no noise-generating plant. Examples of such building types could include industrial warehouse storage.
CN3	Campus development	A campus development project with multiple building assessments being built in conjunction with each other, each building should be assessed independently. Where there are noise-sensitive buildings, including any new buildings in the process of being built, the criteria requirements must still be met.
CN4	No external plant specified	Where no external plant is specified and the acoustician confirms that there is no significant noise source, it is acceptable for the acoustician to provide a formal statement instead of the noise impact assessment. All other evidence for this issue must be provided in the Evidence table. The formal statement should be produced by a suitably qualified acoustician. It should justify this approach concerning the specific internal plant to be installed and the proximity of any noise-sensitive areas or buildings. The statement must explain clearly how the aim of the issue is being met.
CN5	Temporary power solutions in noise impact assessments	Plants such as standby generators that are only used temporarily are excluded from the noise impact assessment.
CN6	Low background	Where background noise levels are low (e.g. at night), no flexibility applies. The criteria,

Ref	Terms	Description
	noise levels	including the required 5 dB reduction, remain valid. The aim is to limit noise impact on sensitive receptors, and acoustic experts confirm the requirements are appropriate even in quiet environments.

Evidence

Criteria	Interim design stage	Final post-construction stage
1	Design drawings highlighting: 1. All existing and proposed noise-sensitive buildings local to, and within, the site boundary. 2. Proposed sources of noise from the new development. 3. Distance (m) from these buildings to the assessed development.	Updated evidence to confirm no noise-sensitive areas or buildings within an 800 m radius of the assessed site. Assessor's site inspection report and photographic evidence.
2–4	The acoustician's noise impact assessment report and evidence to verify the acoustician's qualifications and professional status. AND Commitment to complete post-construction testing. OR Relevant section of the building specification, contract clauses or letter of commitment requiring a compliant noise assessment to be carried out by a suitably qualified acoustician.	The acoustician's noise impact assessment report with measurements based on installed and operating plant. Evidence to verify the acoustician's qualifications and professional status. Where relevant, manufacturer's details and final construction drawings or equivalent showing installed plant. Assessor's site inspection report and photographic evidence.
5	Acoustician's report with recommendations for noise attenuation measures. AND EITHER A marked-up design plan highlighting the specification of the acoustician's attenuation measures. OR A formal letter from the client or design team confirming where relevant, that attenuation measures recommended by an appointed suitably qualified acoustician will be installed.	Assessor's site inspection report and photographic evidence confirming the existence of the specified noise attenuation measures. OR A letter from the acoustician confirming that all specified attenuation measures have been installed to the required standard. OR Manufacturer's details and final construction drawings or equivalent showing installed attenuation measures.

Definitions

Noise-sensitive area

Landscapes or buildings where the occupiers are likely to be sensitive to noise created by the new plant installed in the assessed building, including:

1. Residential areas
2. Hospitals, health centres, care homes, doctor's surgeries etc.
3. Schools, colleges and other teaching establishments
4. Libraries
5. Places of worship
6. Wildlife areas, historic landscapes, parks and gardens

7. Located in an Area of Outstanding Natural Beauty or near a Site of Special Scientific Interest
8. Any other development that can be considered noise-sensitive, as specified by the suitably qualified acoustician.

Not all of these locations will necessarily be sensitive at all times. The assessments should be carried out at times which are relevant to the location use. For example, schools, libraries and doctor's surgeries may not require a night-time assessment of background noise if they are unoccupied at the time. When making the assessment the SQA should make it clear during which periods the receptor is considered sensitive providing clear reasoning and justification.

Suitably qualified acoustician (SQA)

An individual achieving all the following items can be considered to be 'suitably qualified' for the purposes of a BREEAM assessment:

1. 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.
2. Holds a recognised qualification in acoustics and membership of an appropriate professional body. The primary professional body for acoustics in the UK is the Institute of Acoustics.

Where an SQA is verifying the acoustic measurements or 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:

1. Represent good industry practice.
2. Be appropriate given the building being assessed and scope of works proposed.
3. Avoid invalid, biased and exaggerated recommendations.

Additionally, written confirmation from the third-party verifier that they comply with the definition of an SQA is required.

Additional information

Attenuating noise at its source

BS 8233:2014[146] gives recommendations for the control of noise in and around buildings and may be a useful reference when considering control of noise from external plant.

See criteria 4 and 5 on page 377.

Innovation

Summary

The innovation category provides opportunities for exemplary performance and innovation to be recognised that are not included within, or go beyond, the requirements of the credit criteria. This includes exemplary performance credits, for cases where the building meets the exemplary performance levels of a particular issue. It also includes innovative products and processes for which an innovation credit can be claimed, where they have been approved by BRE Global.

The cost-saving benefits of innovation are fostered and facilitated by helping encourage, drive and publicise accelerated uptake of innovative measures.

Assessment issues

Inn 01 Innovation	up to 10 exemplary

Inn 01 Innovation

Aim

To support innovation within the construction industry through the recognition of sustainability-related benefits which are not rewarded by standard BREEAM issues.

Overview

Assessment type	Credits available	Minimum standards	Applicable assessment criteria
All	10 exemplary	None	All

Assessment type specific notes

Ref	Assessment type specific notes
-	None

Building type specific notes

Ref	Building type specific notes
-	None

Assessment criteria

Exemplary level of performance in existing BREEAM issues

1 Where the building demonstrates exemplary performance by meeting defined exemplary level performance criteria in one or more of following BREEAM assessment issues:

- 1.a Man 03 Responsible construction
- 1.b Man 05 Aftercare
- 1.c Hea 01 Natural light
- 1.d Hea 02 Artificial light
- 1.e Hea 04 Indoor air quality
- 1.f Hea 08 Security
- 1.g Ene 01 Energy and carbon performance for regulated energy uses
- 1.h Ene 02 Prediction of operational energy and carbon
- 1.i Wat 01 Water consumption
- 1.j Wat 05 Prediction of operational water consumption
- 1.k Mat 01 Building life cycle assessment
- 1.l Mat 03 Responsible sourcing of construction products
- 1.m Wst 01 Construction waste management
- 1.n Wst 02 Use of recycled and sustainably sourced aggregates
- 1.o Wst 05 Adapting to climate change

1.p Lue 02 Ecological risks and opportunities

1.q Lue 04 Ecological change and enhancement

> Refer to each assessment issue for details of the exemplary level performance criteria.

Approved innovations

2 One innovation credit can be awarded for each innovation application approved by BRE Global, where the building complies with the criteria defined within an approved innovation application form.

> Up to a maximum of 10 exemplary credits are available in aggregate from a combination of criteria 1 and 2 (with the total BREEAM score capped at 100%).

Methodology

M1: Exemplary level of performance

For information on the methodology for exemplary level credits refer to the Methodology section of the relevant BREEAM assessment issues.

M2: Approved innovations

Innovation applications can be submitted to BRE Global by a licensed BREEAM Assessor using the formal Approved Innovation Application Form (available from BREEAM Projects).

Evidence

Criteria	Interim design stage	Final post-construction stage
1	As defined within existing BREEAM issues.	As defined within existing BREEAM issues.
2	A copy of the approved innovation application form. AND A copy of the innovation application report stating the application outcome as 'approved'. AND Relevant documentary evidence demonstrating specification of the approved innovation.	As per interim design stage. AND Relevant documentary evidence confirming that the project has achieved or installed the approved innovation as described and quantified within the approved innovation application form.

Definitions

Approved innovation

Any new technology, design, construction, operation, maintenance or demolition method or process that can be shown to improve the sustainability performance of a building and is of demonstrable benefit to the wider industry in a manner that is not covered elsewhere in BREEAM. In addition the innovation has been approved by BRE Global in accordance with its published BREEAM Innovation credit procedures.

Additional information

Applying for approved innovation credits

For more information on BREEAM Innovation credit eligibility criteria, application process, application fees and previously approved innovations, refer to the BREEAM Innovation section documents available from BREEAM Projects.

Appendices

Appendix A – Asset types and sub-types

A full list of asset types and sub-types that can be assessed using BREEAM UK New Construction Version 7 is given in Table A.1 below.

Table A.1: List of building types covered under BREEAM UK New Construction Version 7

Asset category	Asset type	Asset sub-type
Commercial laboratory	Laboratory (CL 2 or 3)	-
Community	Coast guard station or mountain rescue station	-
	Community hub, community centre, day centre	-
	Crematorium	-
	Library	-
	Mortuary	-
	Place of worship	-
	Visitor centre	-
Culture and entertainment	Cinema or movie theatre	-
	Exhibition or conference hall	-
	Museum or art gallery	-
	Performing arts theatre or music hall or concert hall	-
Education	Preschool	Nursery school
		Children's centre
		Crèche or daycare
	School	Primary school
		Secondary school
		All age range school
		K-12 school
		Non-acute special educational needs (and disability) school (SEN/SEND)
	Further education institution	Sixth form school or college
		Vocational college
	Higher education institution	College
		University
Government services	Fire station	-
	Holding centre	-
	Law court	-
	Police station	-
	Prison	High security closed prison
		Closed prison
		Open prison
		Youth custody establishment
	Town hall	-

Asset category	Asset type	Asset sub-type
Healthcare	Primary healthcare surgery	-
	Health centre or clinic	-
	Hospital	Acute and maternity hospital
		Community and mental health hospital
		Long stay hospital
		Teaching and specialist hospital
	Ambulance station	-
	Ambulatory surgical centre	-
Hospitality	Hotel (STR*)	Luxury chain
		Upper upscale chain
		Upscale chain
		Upper midscale chain
		Midscale chain
		Economy chain
	Serviced apartment (STR*)	Luxury chain
		Upper upscale chain
		Upscale chain
		Upper midscale chain
		Midscale chain
		Economy chain
	Hostel	-
	Guest house	-
Industrial	Manufacturing	General manufacturing
		Light manufacturing
	Logistics	Ambient warehouse
		Temperature-controlled warehouse
	Self-storage facility	-
	Vehicle servicing unit	-
	Film or TV studios	-
Office	Office	-
	Financial office	-
	Veterinary office	-
Residential institution	Long term stay	Co-living
		Key worker accommodation
		Local authority secure residential accommodation
		Military barracks
		Residential care home
		Sheltered housing
		Student accommodation (halls of residence)
	Short term stay	Residential training centre
		Short stay housing units

Asset category	Asset type	Asset sub-type
Retail	Bar, pub, drinking establishment	Bar, pub, drinking establishment (with food service)
		Bar, pub, drinking establishment (without food service)
	Café	-
	Convenience store	-
	Fast food restaurant or takeaway	-
	Restaurant	-
	Retail park or warehouse	-
	Retail services	-
	Retail store	Grocery shop or grocery store
		Specialty store (non-food)
	Shopping centre	-
	Showroom	-
	Supermarket	-
	Wholesale club or supercentre	-
Sports and leisure	Fitness centre or gym	-
	Ice rink	-
	Indoor arena	-
	Leisure centre or recreation centre	Leisure centre or recreation centre (with pool)
		Leisure centre or recreation centre (without pool)
	Stadium (closed)	-
	Swimming pool	Swimming pool (indoor)
		Swimming pool (outdoor)
Transport hub	Rail station (above ground)	-
	Airport terminal	-
	Coach or bus station	-
	Maritime passenger terminal	-
	Tram station	-
Bespoke	Building types that are not listed in this table must undergo a scoping and tailoring exercise to facilitate an assessment and rating. For an individual project this involves BRE Global selecting appropriate issues from the existing pool of assessment issues to provide criteria against which the building can be assessed. This is sometimes known as a 'bespoke' assessment. Further guidance on the 'bespoke' process can be found in Guidance Note 23 (GN23).	
Notes * STR stands for Smith Travel Research, an organisation that provides market data for the hotel industry worldwide. ** CL stands for Containment Level as defined in Management, Design and Operation of Microbiological Containment Laboratories 2018, ACDP.		

Education building types

BREEAM UK New Construction Version 7 can be used to assess the educational establishments mentioned in Table A.1. This BREEAM scheme has not been specifically tailored to assess acute SEN/SEND schools.

Acute SEN/SEND refers to children with severe disabilities or learning difficulties that prevent them from interpreting their surroundings without feeling anxious or distressed. These children can become easily distracted or overstimulated, or both. This group of pupils mainly include children with behavioural, emotional or social difficulties (BEDS) and children with communication and interaction disability (autistic spectrum disorder (ASD)).

Acute SEN/SEND schools therefore require a bespoke assessment. Assessors carrying out assessments on schools for pupils with such needs need to consider carefully all the BREEAM issues that might be affected by the need to provide special facilities for these building users (e.g. view out, cyclist facilities, etc). Where criteria in this scheme document are not explicit for this building type, the assessor will need to decide which criteria are appropriate and apply them accordingly, seeking confirmation from BRE Global on the application of alternative building criteria.

For more information on SEN/SEND please refer to the following documents:

— Building Bulletin 102: Designing for disabled children with special educational needs, published by the Department for Children, Schools and Families.

— Building Bulletin 104: Area guidelines for SEND and alternative provision, published by Department for Education.

Healthcare building types

Typical facilities and services offered by and forming part of one of the healthcare buildings are described in Table A.2 below. If a healthcare development does not fit with building types outlined in the scope section of this document, bespoke assessment criteria will be required to assess the project.

Table A.2: Typical facilities and services as part of different healthcare buildings

Typical descriptions	Facility	Service
Teaching and specialist hospital, Long stay hospital	In patient High concentration of energy- intensive engineering services and specialist equipment	Diagnostic and treatment services for physical healthcare together with specialist services, Consultant-led
Acute and maternity hospital	Inpatient Medium concentration of energy- intensive engineering services and specialist equipment	Diagnostic and treatment services for physical healthcare, Consultant-led
Community and mental health hospital Learning disability unit	Inpatient Basic engineering services and equipment	Limited diagnostic and treatment services for physical healthcare Nurse- or GP-led, Care services for physical healthcare, Nurse- or GP-led, Mental health and learning disability services, Consultant- or nurse-led
Primary healthcare surgery	Non-inpatient Use typically 50–65 hours per week Basic engineering services and equipment	Primary care consultation GP-led
Health centre or clinic	Non-inpatient Use typically 35–45 hours per week Basic engineering services and equipment	Primary care and mental health Nurse, dental, visiting consultant or specialist

Care homes providing acute care

Care homes providing acute care would typically be assessed under 'Healthcare: Hospital: Acute and maternity hospital'. BREEAM Assessors carrying out assessments on these types of buildings will need to consider carefully all the BREEAM issues that might be affected by the need to provide special facilities for the building users. Where criteria in this scheme document are not explicit for this building type, the assessor will need to decide which criteria are appropriate and apply them accordingly, seeking confirmation from BRE Global on the application of alternative building criteria if necessary.

Appendix B – Shell only and Shell and core project assessments

Speculative or non-speculative shell only or shell and core new buildings can be assessed using BREEAM New Construction Version 7.

This section provides guidance to assessors and project teams on the application of BREEAM to shell only and shell and core projects.

A shell only or shell and core building project is defined as one where the developer's scope of works is the design and construction of the base building only, leaving a range of construction and fit-out works to be completed before the building can be occupied. The project will have some or all of the following elements:

— the structure
— building envelope
— core building systems including building servicing strategy
— installations (such as HVAC) or plant support for installation of such systems
— fit-out of common areas.

Category A and B projects

Shell and core projects will often be fitted out to a 'Category A' standard, the scope of which varies between different developers, and may include in addition to the shell and core of the building: the provision of raised floors, suspended ceilings, extension of core services above ceilings across the lettable space, finishes to the internal face of external and core walls, and blinds. Upon completion, the whole building or space within the building is sold or let to be fitted out as appropriate for occupation. The new owners or tenants will fit-out the accommodation in accordance with their corporate and operational needs, often referred to as a 'Category B' fit-out. These terms widely used in the property sector are not used within BREEAM as the scope of works varies significantly between developers and as such makes them incomparable.

In these projects performance of the building and compliance with BREEAM is verified based on the developer's scope of works. Two standard project-type options are defined with applicable assessment criteria. For projects that are in-scope for these standard options, assessment against some BREEAM issues will be excluded even where the issues are within the developer's scope of works. This approach ensures clarity, consistency and comparability within the property market. Varying the criteria or issues based on each individual project's scope would make BREEAM ratings incomparable in terms of performance benchmarking and for promotional or publicity purposes.

Defining the project type

The scope of assessment and BREEAM certification labelling for a new construction project that is not fully fitted out can be categorised into one of the following types:

— Shell only assessment and certification
— Shell and core assessment and certification.

Shell only assessment

This assessment and certification option is available where the developer's scope of works covers new-build works to the fabric, substructure and superstructure of the building only, including:

— External walls, windows, doors (external), roof, core internal walls, structural floors
— Hard and soft landscaping areas (where present and within the scope of works).

Shell and core assessment

This assessment and certification option is available where the developer's scope of works covers shell works, as described for Shell only, plus core building services. Core building services relates to the installation of central or communal transportation systems, water systems, fit-out of common areas, central mechanical and electrical systems including HVAC, but without local fitting of systems within tenant areas. The systems will typically be centralised with capped off distribution to each tenanted area (for future connection as part of a tenant's fit-out works). This does not include the full scope of a typical Category A fit-out, due to the fact that the specification of items such as ceiling finishes, raised floors and the zoning of local services above the lettable floor area and other Category A works are not typically finalised until the space undergoes final fit-out according to the tenant's specification and are liable to change. These items are, therefore, excluded from a Shell and core assessment.

The Shell only and Shell and core assessment options are available for all building types.

For these assessments, the scope of works being undertaken must be specified clearly and provided for the accurate certification of the project.

Assessing new-build Shell and core projects

In the main, the assessment process and application of a majority of the BREEAM assessment issues will be unaffected by the scope of the new-build shell only or Shell and core works. Most of the BREEAM criteria are concerned with impacts, processes and management procedures that occur with any new-build development, regardless of whether or not it is a fully fitted project. Several BREEAM issues and criteria are, however, tailored for the assessment of fitted out buildings, for example acoustic performance, and so additional guidance in the form of compliance notes is given in the assessment issues. These Shell only and Shell and core compliance notes confirm whether the assessment issue is applicable to the project and, where it does apply, how to assess it for the project.

Table B.1 on page 392 summarises the BREEAM UK New Construction Version 7 assessment issues and their applicability to shell only and shell and core projects.

Shell only and Shell and core building assessments and minimum BREEAM standards

BREEAM standards remain applicable to Shell only and Shell and core building assessments for the developer's scope of works. The only exceptions are minimum standards for BREEAM issues, credits, or criteria which are not assessed in a Shell only or Shell and core project (confirmed by the assessment type specific notes in the relevant issue).

BREEAM New Construction and BREEAM Refurbishment and Fit-out

BREEAM New Construction and BREEAM Refurbishment and Fit-out can be used to assess a fully fitted building where the construction works and finishing stages have been carried out separately. A Shell only or Shell and core project assessed under BREEAM New Construction can undergo a first fit-out (and subsequent fit-outs) assessed against the BREEAM Refurbishment and Fit-out. Figure 6 illustrates the relationship between BREEAM New Construction and BREEAM Refurbishment and Fit-out.

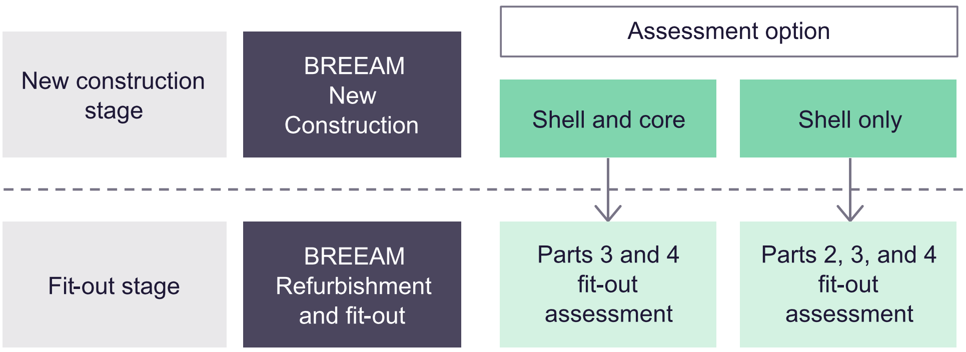

Figure 6: Assessment options using BREEAM New Construction and BREEAM Refurbishment and Fit-out

The scope of BREEAM New Construction - Shell only and Shell and core assessment types - and BREEAM Refurbishment and Fit-out have been defined using recognised industry definitions, such as the British Council for Offices definition of Category A and B fit-out as far as possible. However, in practice, there is no fixed industry standard definition of refurbishment and fit-out works, with a large degree of variability from project to project. Due to this variety and also the need to ensure a consistent definition is used for assessment comparability purposes, the BREEAM Refurbishment and Fit-out scheme has defined a number of optional assessment 'parts'. The scope for each of these assessment parts has largely been based upon setting boundaries around the key physical parameters of the building. Under that scheme, clients are able to seek assessment certification against any combination of parts according to the scope of their refurbishment and fit-out works, therefore providing a highly flexible scheme.

The scope of Part 1 of BREEAM Refurbishment and Fit-out aligns with the Shell only option of BREEAM New Construction. Parts 1 and 2 combined align with the Shell and core option of BREEAM New Construction. Parts 3 and 4 cover the scope of work that is covered under the tenant's fit-out works could be used to 'top up' a Shell and core assessment.

BREEAM Refurbishment and Fit-out assessment types:

- Part 1 – Fabric and structure: external envelope including walls, roof, windows and floor
- Part 2 – Core services: centralised mechanical and electrical plant including heating, cooling and ventilation
- Part 3 – Local services: localised services including lighting, local heating, cooling and ventilation
- Part 4 – Interior design: interior finishes, furniture, fittings and equipment

Further information on BREEAM Refurbishment and Fit-out can be found on the BREEAM website (www.breeam.com/standards/refurbishment).

Table B.1: BREEAM UK New Construction assessment issues: shell only and shell and core project applicability

Ref	Applicability	
	Shell only	Shell and core
Management		
Man 01 Project brief and design	Yes	Yes
Man 02 Life cycle cost and service life planning	Yes	Yes
Man 03 Responsible construction	Yes	Yes
Man 04 Commissioning and handover	Yes	Yes
Man 05 Aftercare	No	No
Health and wellbeing		
Hea 01 Natural light	Yes	Yes
Hea 02 Artificial light	Yes	Yes
Hea 03 Non-visual effects of light	No	No
Hea 04 Indoor air quality	No	Yes
Hea 05 Thermal comfort	No	Yes
Hea 06 Acoustic performance	Yes	Yes
Hea 07 Safe and accessible design	Yes	Yes
Hea 08 Security	Yes	Yes
Energy		
Ene 01 Energy and carbon performance for regulated energy uses	Yes	Yes
Ene 02 Prediction of operational energy and carbon	No	Yes
Ene 03 Energy monitoring	No	Yes
Ene 04 Low carbon design	Yes	Yes
Ene 05 Energy efficient equipment	No	Yes
Ene 06 Energy efficient systems	No	Yes
Ene 07 Flexible demand response	No	Yes
Ene 08 Installed controls	No	Yes
Transport		
Tra 01 Transport assessment and travel plan	Yes	Yes
Tra 02 Sustainable transport measures	Yes	Yes
Water		
Wat 01 Water consumption	No	Yes
Wat 02 Water monitoring	Yes	Yes
Wat 03 Water leak detection and prevention	Yes	Yes
Wat 04 Water efficient equipment and systems	No	Yes
Wat 05 Prediction of operational water consumption	No	Yes
Materials		
Mat 01 Building life cycle assessment	Yes	Yes
Mat 02 Environmental product declarations	Yes	Yes
Mat 03 Responsible sourcing of construction products	Yes	Yes
Mat 04 Durability and resilience	Yes	Yes
Mat 05 Material efficiency	Yes	Yes
Waste		
Wst 01 Construction waste management	Yes	Yes
Wst 02 Use of recycled and sustainably sourced aggregates	Yes	Yes
Wst 03 Operational waste	Yes	Yes
Wst 04 Speculative finishes (Offices only)	No	No
Wst 05 Adapting to climate change	Yes	Yes
Wst 06 Disassembly and adaptability	Yes	Yes
Land use and ecology		
Lue 01 Site selection	Yes	Yes

Ref	Applicability	
	Shell only	Shell and core
Lue 02 Ecological risks and opportunities	Yes	Yes
Lue 03 Managing impacts on ecology	Yes	Yes
Lue 04 Ecological change and enhancement	Yes	Yes
Lue 05 Long term ecological management	Yes	Yes
Pollution		
Pol 01 Impact of refrigerants	No	Yes
Pol 02 Local air quality	No	Yes
Pol 03 Flood and surface water management	Yes	Yes
Pol 04 Reduction of nighttime light pollution	Yes	Yes
Pol 05 Reduction of noise pollution	No	Yes
Innovation		
Inn 01 Innovation	Yes	Yes

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