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BREEAM International New Construction

Version 6.0

Technical Manual – SD250

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Cover image: The Flow Building in Prague - the first building in the Czech Republic to achieve a BREEAM Outstanding rating under BREEAM International New Construction 2016.

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About BRE Global

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We aim to achieve this by:

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

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About this Scheme Document

This document is the technical manual for BREEAM International New Construction Version 6. It describes an environmental performance standard against which new buildings worldwide 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 International 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 BREEAM scheme document

This scheme 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 of this document is provided below.

Scheme document reference	Version	Date
SD250	6.0.0	01/12/2021

Introduction to BREEAM

BREEAM (Building Research Establishment's Environmental Assessment Method) is the world's first sustainability rating scheme for the built environment and has contributed much to the strong focus in the UK on sustainability in building design, construction and use. BREEAM is now an international standard that is locally adapted, operated and applied through a network of international operators, assessors and industry professionals. Through its application and use BREEAM helps clients measure and reduce the environmental impacts of their buildings and in doing so create higher value, lower risk assets.

To date, BREEAM has been used to certify over 590,000 building assessments across the building life cycle and it is being applied in over 85 countries.

Aims of BREEAM

- To mitigate the life cycle impacts of buildings on the environment.
- To enable buildings to be recognised according to their environmental benefits.
- To provide a credible, environmental label for buildings.
- To stimulate demand and create value for sustainable buildings, building products and supply chains.

Objectives of BREEAM

- To provide market recognition of buildings with a low environmental impact.
- To ensure best environmental practice is incorporated in the planning, design, construction and operation of buildings and the wider built environment.
- To define a robust, cost effective performance standard surpassing that required by regulations.
- To challenge the market to provide innovative, cost effective solutions that minimise the environmental impact of buildings.
- To raise awareness among owners, occupants, designers and operators of the benefits and value of buildings with a reduced life cycle impact on the environment.
- To allow organisations to demonstrate progress towards corporate environmental objectives.

BREEAM is developed and operated to meet the following underlying principles:

- Ensure **environmental quality** through an accessible, holistic and balanced measure of environmental impacts.
- Use **quantified measures** for determining environmental quality.
- Adopt a **flexible approach** that encourages and rewards positive outcomes, avoiding prescribed solutions.
- Use **robust science** and **best practice** as the basis for quantifying and calibrating a cost effective and rigorous performance standard for defining environmental quality.
- Reflect the **social and economic benefits** of meeting the environmental objectives covered.
- Provide a **common international framework** of assessment that is tailored to meet the 'local' context including regulation, climate and sector.
- **Integrate building professionals** in the development and operational processes to ensure wide understanding and accessibility.
- Adopt **third party certification** to ensure independence, credibility and consistency of the label.
- Adopt **existing industry tools**, practices and other standards wherever possible to support developments in policy and technology, build on existing skills and understanding, and minimise costs.
- Align technically and operationally with **relevant international standards**, including the suite of standards on the 'Sustainability of Construction Works' prepared by the European Committee for Standardisation Technical Committee CEN/TC 350, as well as other international initiatives that promote harmonisation in the assessment of sustainability performance of built environment assets across their life cycle.
- Engage with a representative range of **stakeholders** to inform ongoing development in accordance with the underlying principles and the pace of change in performance standards (accounting for policy, regulation and market capability).

The aims, objectives and principles of BREEAM are embodied within a Core Technical Standard owned and managed by BRE Global. This is applied through a suite of BREEAM schemes covering aspects of the built environment life cycle. These schemes are locally developed and operated by a number of different organisations, called National Scheme Operators (NSOs), across a range of countries.

For a full list of BREEAM NSOs and schemes visit the BREEAM website (www.breeam.com).

The BREEAM schemes

BRE Global is the NSO of BREEAM in the UK. We develop and operate a number of BREEAM schemes for the UK and internationally, each designed to assess the environmental performance of developments at various stages in the life cycle, and these include:

- **BREEAM Communities** for the master-planning of a larger community of buildings.
- **CEEQUAL** for civil engineering, infrastructure, landscaping and public realm works.
- **BREEAM New Construction** for new-build domestic and non-domestic buildings.
- **Home Quality Mark** 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.

Independent BREEAM Assessors, trained, qualified and licensed by BRE Global can undertake a BREEAM assessment using this scheme document and associated reporting and calculation tools.

Once an assessment is complete and quality assured BRE Global will issue a BREEAM certificate. The BREEAM certificate provides formal verification that the Assessor has completed an assessment of a building in accordance with the requirements of the scheme and its quality standards and procedures.

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

Anyone wishing to verify the BREEAM rating of a building can do so by either checking its BREEAM certificate, which will contain the certification mark, (see Figure 1 below) or by searching the BREEAM buildings listings on BREEAM Projects (www.breeam.com/projects). Examples of a BREEAM New Construction certificate can be found in Appendix F – Examples of BREEAM New Construction certificates on page 414.

Figure 1: The BREEAM certification mark

Ensuring quality and consistency

All BREEAM schemes are developed and operated by NSOs in accordance with the Code for a Sustainable Built Environment. The Code for a Sustainable Built Environment is a set of strategic principles and requirements which define an integrated approach to the design, management, evaluation and certification of the environmental, social and economic impacts of the built environment.

The Code is interpreted through the BREEAM Core Process and Technical Standards. These linked documents set out the requirements that a compliant scheme must meet in order to be affiliated with the Code. The Standards 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 National Scheme Operators are required to maintain scheme operations to internationally agreed standards and seek accreditation from a national accreditation body.

BRE Global is a United Kingdom Accreditation Service (UKAS) accredited certification body (No. 0007). The scope of our accreditation to ISO/IEC 17065 'Conformity assessment - Requirements for bodies certifying products, processes and services' can be verified on the UKAS website, and includes BREEAM Scheme SD123 'Environmental assessments of the built environment – certification of the process'.

BRE Global is also certified to ISO 9001 'Quality management systems – Requirements' for all its BREEAM related activities.

As an accredited certification body, BRE Global maintains an open and accountable governance structure.

BREEAM operates a series of Technical Working Groups, these provide BRE Global with access to a range of experts that can review BRE Global's standards and schemes to ensure their 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.

About BREEAM International New Construction Version 6

The BREEAM International New Construction Version 6 scheme is a performance based assessment method and certification scheme for new buildings.

The primary aim of BREEAM International New Construction Version 6 is to mitigate the life cycle impacts of new buildings on the environment in a robust and cost effective manner. This is achieved through integration and use of the scheme by clients and their project teams at key stages in the design and construction process.

This enables the client, through the BREEAM Assessor and the BRE Global certification process, to measure, evaluate and reflect the performance of their new building against best practice in an independent and robust manner.

This performance is quantified by a number of individual measures and associated criteria stretching across a range of environmental issues, see Table 1 below, which is ultimately expressed as a single certified BREEAM rating, i.e. the label. To see how a BREEAM rating is calculated, see Scoring and rating BREEAM assessed buildings on page 28.

Table 1: Environmental sections and assessment issues in BREEAM International New Construction Version 6

Section	Assessment issues
Management	— Project brief and design — Life cycle cost and service life planning — Responsible construction practices — Commissioning and handover — Aftercare
Health and wellbeing	— Visual comfort — Indoor air quality — Safe containment in laboratories — Thermal comfort — Acoustic performance — Accessibility — Hazards — Private space — Water quality
Energy	— Reduction of energy use and carbon emissions — Energy monitoring — External lighting — Low carbon design — Energy efficient cold storage — Energy efficient transport systems — Energy efficient laboratory systems — Energy efficient equipment — Drying space — Flexible demand side response
Transport	— Public transport accessibility — Proximity to amenities — Alternative modes of transport — Maximum car parking capacity — Travel plan — Home office

Section	Assessment issues
Water	— Water consumption — Water monitoring — Water leak detection — Water efficient equipment
Materials	— Life cycle impacts — Hard landscaping and boundary protection — Responsible sourcing of materials — Insulation — Designing for durability and resilience — Material efficiency
Waste	— Construction waste management — Recycled aggregates — Operational waste — Speculative floor and ceiling finishes — Adaptation to climate change — Functional adaptability
Land use and ecology	— Site selection — Ecological value of site and protection of ecological features — Minimising impact on existing site ecology — Enhancing site ecology — Long term impact on biodiversity
Pollution	— Impact of refrigerants — NO_x emissions — Surface water run-off — Reduction of night time light pollution — Reduction of noise pollution
Innovation	— Innovation

When and how to engage with BREEAM International New Construction

Timing the engagement with and use of the BREEAM International New Construction scheme via the BREEAM Assessor is essential for ensuring seamless integration of the methodology in the new-build procurement process. Without this, the ability to optimise cost-effectively the building's environmental performance and achieve the desired BREEAM rating will be compromised. Appointing a BREEAM Assessor or Advisory Professional early in the project will help in achieving the target rating without undue impacts on the flexibility of design decisions, budgets and potential solutions.

Figure 2 on the next page serves to highlight the link between the BREEAM International New Construction Version 6 assessment and certification stages and the RIBA Plan of Work 2020.

This figure can assist clients in timing their engagement with BREEAM and the appointment of a BREEAM Assessor.

Clients can view up-to-date listings of licensed BREEAM International New Construction Assessors and BREEAM Advisory Professionals on BREEAM Projects (www.breeam.com/projects).

It is important to recognise that BREEAM primarily reflects the overall performance of the building rather than just the opportunities or limitations placed on specific stakeholders involved in the procurement process. This means that the client, design team, principal contractor and BREEAM Assessor, as well as other specialist disciplines, have an important role to play throughout the procurement process, if the desired performance level is to be achieved and reflected through the certified BREEAM rating.

The onus of orientating the brief towards sustainability needs to come first and foremost from the client. To facilitate this, BRE Global recommends that clients and their project teams engage with a BREEAM Assessor or BREEAM Advisory Professional no later than the Preparation and Briefing stage (RIBA Stage 1 or equivalent) and ideally sooner where practical. 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 to environmental impacts can be sought and applied wherever possible.

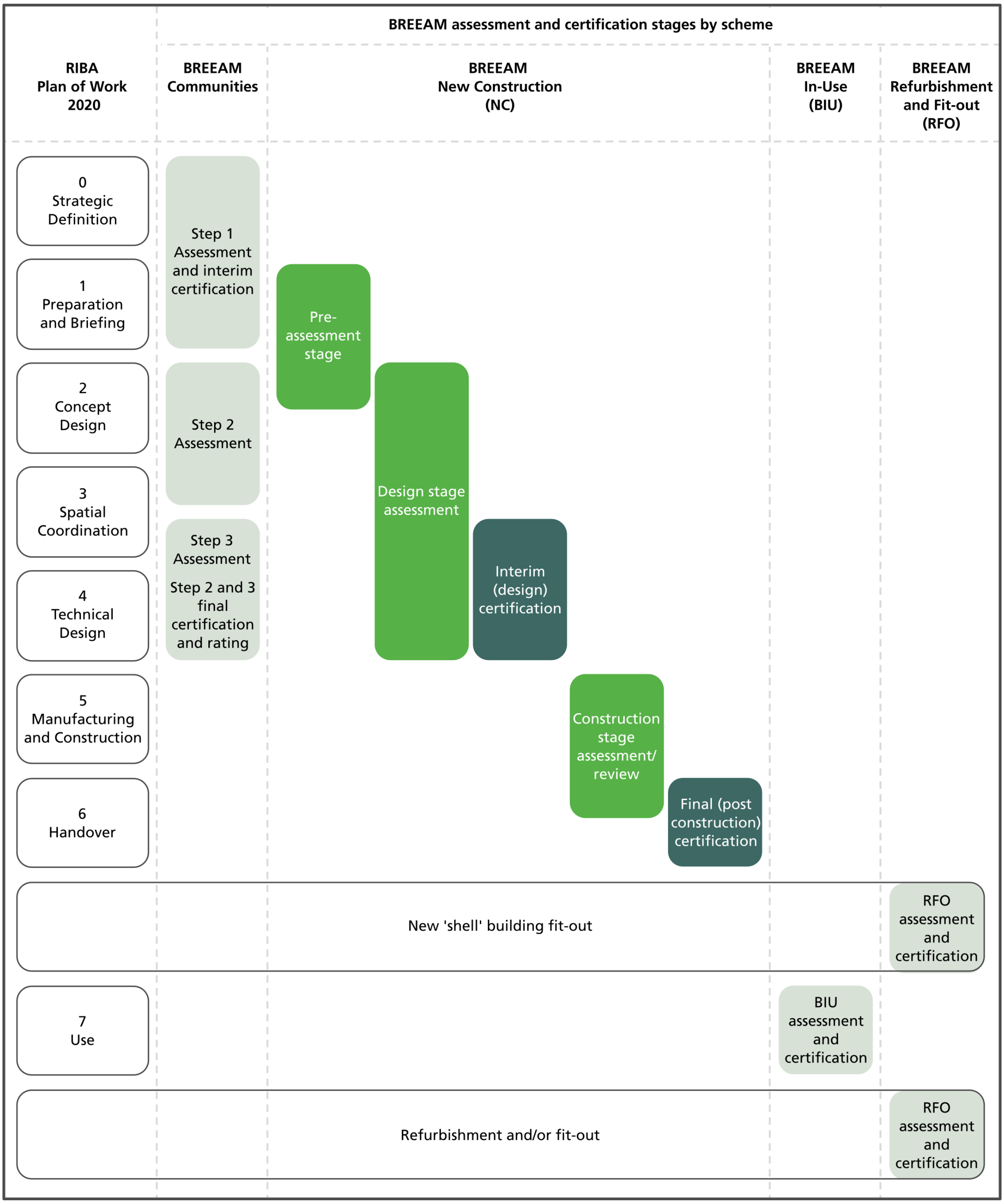

Figure 2: BREEAM assessment and certification stages and the Royal Institute of British Architects (RIBA) Plan of Work 2020 stages

How to use BREEAM International New Construction

This BREEAM scheme document is a technical document which 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 report, 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.

The scheme document is split into the following parts:

1. Introduction to BREEAM
2. Scope of the BREEAM International New Construction scheme
3. Scoring and rating BREEAM assessed buildings, including minimum standards and BREEAM rating benchmarks
4. The BREEAM evidential requirements
5. Assessment criteria
6. Appendices
7. Checklists

The **Scope** section describes the types of buildings and stages of assessment that this BREEAM scheme can be applied to. Appendices A to F provide additional scoping guidance for specific building and project types. The Scope section can be used by clients and BREEAM Assessors to check whether this is the correct BREEAM scheme to use for their project.

The **Scoring and rating** section illustrates how a building's assessed performance is measured and rated. It outlines the BREEAM rating level benchmarks, the minimum BREEAM standards for each rating level and the BREEAM environmental section weightings. It also includes a description of the BREEAM assessment issues and 'credits', including BREEAM 'innovation credits', and how performance against these is calculated and expressed as a BREEAM rating.

Please note that, for the purpose of formal assessment and certification, the building's actual BREEAM performance must be determined by the BREEAM Assessor using the relevant BREEAM reporting and calculation tools.

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

The **Assessment criteria** section includes the individual BREEAM assessment issues, categorised in 10 environmental sections. Each issue defines a level of performance (the assessment criteria) against which the assessed building demonstrates compliance (using appropriate project information, i.e. evidence) in order to achieve a corresponding number of available BREEAM credits.

The majority of BREEAM issues and credits are tradable, meaning that a client and their project team can pick and choose which to target in order to build their BREEAM performance score and achieve the desired BREEAM rating. Several BREEAM issues have minimum standards, meaning that to achieve a particular BREEAM rating specific credits or criteria must be achieved (BREEAM's minimum standards are outlined in the Scoring and rating BREEAM-assessed buildings section).

Each BREEAM issue is structured as follows:

1. **Issue information**: This contains the assessment issue reference, title, number of credits available[1] and whether the issue forms part of BREEAM's minimum standards.
2. **Aim**: This outlines the broad objective of the issue and the impact it measures or mitigates.
3. **Assessment criteria**: This outlines 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 Innovation on page 401). Up to a maximum of 10 innovation credits are available.
4. **Checklists and tables**: This section contains any checklists and tables referenced in the assessment criteria section. This can include tables of benchmarks or building type specific performance criteria.
5. **Compliance notes**: These notes provide additional guidance that supports the application and interpretation of the main assessment criteria, including how to assess compliance in a particular location or for a particular building or project type, e.g. shell only.
6. **Methodology**: This section includes a description of any methodology used to determine the number of BREEAM credits achieved for a given level of building performance. It includes, for example, calculation procedures or guidance on how non-BREEAM schemes, standards or qualifications referenced in the assessment criteria relate to those criteria.
7. **Evidence**: This section describes the types of project information that must be provided by the design team or client and given to the BREEAM Assessor to enable verification of the building's performance against the assessment criteria and so justify the award of the relevant number of BREEAM credits. The BREEAM evidential requirements section provides further guidance on evidential requirements.
8. **Additional information**: This section contains any further information relevant to the application of the assessment criteria, including any definition of terms used in the assessment issue or sources of additional information that may be of use in addressing the issue.

The **Appendices** provide supporting information relevant to either the scope of the BREEAM International New Construction Version 6 scheme or its assessment criteria.

Scope of BREEAM International New Construction

The BREEAM International New Construction scheme 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.

This BREEAM International New Construction scheme version is applicable to new buildings in countries without a BREEAM affiliated National Scheme Operator (NSO). Note: Where the country has a NSO offering a country-specific local scheme that is appropriate to the building type, their scheme must be used in preference to BREEAM International. Information on countries with local schemes can be found in Appendix A and also on the BREEAM website (www.breeam.com).

Type of buildings that can be assessed using BREEAM International New Construction

The building types which can be assessed and rated using this scheme version are outlined in Table 2 below. Additional guidance for some of the building types listed is also provided in the appendices (refer to the endnotes).

Table 2: List of building types covered under BREEAM International New Construction Version 6

Sector	Building type	Description
Residential	Residential	— Single dwellings — Multiple dwellings
Commercial	Offices	— General office buildings — Offices with research and development areas (category 1 laboratories only)
	Industrial	— Industrial unit – warehouse storage or distribution — Industrial unit – process, manufacturing or vehicle servicing
	Retail	— Shop or shopping centre — Retail park or warehouse — 'Over the counter' service provider, e.g. financial, estate and employment agencies, and betting offices — Showroom — Restaurant, café and drinking establishment — Hot food takeaway
Education[2]		— Preschool — Schools and colleges — Universities — Higher education institutions
Residential institutions[3]	Long term stay	— Residential care home — Sheltered accommodation — Residential college or school (halls of residence) — Local authority secure residential accommodation — Military barracks

Sector	Building type	Description
Hotels and Residential institutions	Short term stay	— Hotel, hostel, boarding and guest house — Secure training centre — Residential training centre
Non-standard building types	Bespoke	— Community or visitor centre — Town hall or civic centre — Conference facility — Theatre or concert hall — Sports or leisure facility (with or without a pool) — Library — Cinema — Hospital and other healthcare facility — Prison — Law court — Police station — Fire station — Transport hub (coach, bus or rail station) — Gallery or museum — Place of worship — Research and development (category 2 or 3 laboratories - non-higher education)

Mixed-use developments and building types

Developments which consist of a number of separate buildings of differing functional types, or a single building containing a number of different functions, e.g. office and retail or retail and residential, will typically require an assessment and therefore BREEAM rating and certificate for each individual building or functional use within a single building.

This is necessary as BREEAM defines differing criteria and benchmarks for some assessment issues according to building type, function and use. Therefore to maintain comparability and consistency of the assessment and BREEAM rating, a separate assessment score and rating are required for each building type, function or use in the development.

Further guidance on how to define mixed-use developments for the purpose of a BREEAM assessment can be found in Guidance Note 10 *Mixed-use developments and similar buildings (or units).*

Part new-build, part refurbishment projects

For developments that are a mixture of 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 1000m², 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 issue Ene 01 Reduction of energy use and carbon emissions on page 150 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.

BREEAM International New Construction assessment types

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

- Non-residential
  - Fully fitted
  - Shell and core (see Appendix D – Shell and core project assessments on page 409)
  - Shell only (see Appendix D – Shell and core project assessments on page 409)
- Residential
  - Fully fitted (see Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412)
  - Partially fitted (see Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412).

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.

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 10 *Mixed use developments and similar buildings (or units).*

Shell and core, speculative buildings

Non-fitted out ‘speculative’ new buildings, often referred to as shell and core buildings, can be assessed using the BREEAM International New Construction scheme. Further details on the application of the scheme to these types of new building can be found in Appendix D – Shell and core project assessments on page 409.

Non-standard building types

Non-standard building types

If a building type requiring assessment is listed as a non-standard building in Scope of BREEAM International New Construction: Table 2 on page 23 or is not listed at all, it can still be assessed using BREEAM International New Construction. Such building types will require the development of a set of bespoke assessment criteria to be used in conjunction with this International New Construction scheme. In such instances BREEAM Assessors and clients should contact BRE Global for advice and information on how to proceed. Further details are given in Guidance Note 23 *BREEAM Bespoke Process*.

Data centres

Data centres are currently assessed in the UK with BREEAM Data Centres 2010 (SD5068). Internationally, bespoke criteria development is required as detailed above for other non-standard buildings. At the time of writing BRE Global are updating the Data Centres scheme, and will produce a Data Centres appendix to this International New Construction scheme, so bespoke criteria development will not be required.

Building life cycle stages covered

This scheme 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) – 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 confirms the proposed new building's performance at the design stage of the life cycle. Assessment and ideally certification will 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 (PCS)

The post-construction stage (PCS) assessment and BREEAM rating confirms 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 post-construction assessment (PCA).

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

Building life cycle stages not covered

The BREEAM International New Construction scheme is not designed for, and therefore not appropriate to assess the environmental impacts of buildings at the following life cycle stages:

1. Infrastructure projects (refer to CEEQUAL)
2. Master planning projects (refer to BREEAM Communities)
3. Existing building refurbishment and fit-out (refer to BREEAM International Refurbishment and Fit-out)
4. Existing building in operation or existing unoccupied building (refer to BREEAM In-Use)

Scoring and rating BREEAM assessed buildings

BREEAM 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 environmental section weightings
5. The BREEAM assessment issues and credits

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

The BREEAM rating benchmarks for projects assessed using the BREEAM International New Construction Version 6 scheme are as follows:

Table 3: BREEAM rating benchmarks

BREEAM Rating	% score
OUTSTANDING	≥ 85
EXCELLENT	≥ 70
VERY GOOD	≥ 55
GOOD	≥ 45
PASS	≥ 30
UNCLASSIFIED	< 30

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 maintain a flexible system BREEAM adopts a 'balanced scorecard' approach to the assessment and rating of a project. This means that to achieve a particular level of performance the majority of BREEAM credits can be traded, i.e. non-compliance in one area can be offset through compliance in another to achieve the target BREEAM rating.

However, to ensure that 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. It is important to bear in mind that these are minimum acceptable levels of performance and in that respect they should not necessarily be viewed as levels that are representative of best practice for a BREEAM rating level.

To achieve a particular BREEAM rating, the minimum overall percentage score must be achieved and the minimum standards, detailed in Table 4 below, applicable to that rating level complied with.

Table 4: Minimum BREEAM standards by rating level

BREEAM issue	**Minimum standards by BREEAM rating level**				
	Pass	Good	Very Good	Excellent	Outstanding
Man 03 Responsible construction practices	Criterion 2 only (Health and Safety)	Criterion 2 only (Health and Safety)	Criterion 2 only (Health and Safety)	One credit (Considerate construction)	Two credits (Considerate construction)
Man 04 Commissioning and handover	None	None	None	Criterion 10 (Building or home user guide)	Criterion 10 (Building or home user guide)
Man 05 Aftercare	None	None	None	One credit (Seasonal commissioning)	One credit (Seasonal commissioning)
Hea 01 Visual comfort	Criterion 1 only (High frequency ballast)	Criterion 1 only (High frequency ballast)	Criterion 1 only (High frequency ballast)	Criterion 1 only (High frequency ballast)	Criterion 1 only (High frequency ballast)
Hea 02 Indoor air quality	Criterion 1 only (No asbestos)	Criterion 1 only (No asbestos)	Criterion 1 only (No asbestos)	Criterion 1 only (No asbestos)	Criterion 1 only (No asbestos)
Hea 06 Accessibility	None	None	None	None	Two credits (Inclusive and accessible design - residential buildings and residential institutions only)

BREEAM issue	Minimum standards by BREEAM rating level				
	Pass	Good	Very Good	Excellent	Outstanding
Hea 08 Private space	None	None	None	None	One credit
Hea 09 Water quality	Criterion 1 only (minimise legionellosis risk)	Criterion 1 only (minimise legionellosis risk)	Criterion 1 only (minimise legionellosis risk)	Criterion 1 only (minimise legionellosis risk)	Criterion 1 only (minimise legionellosis risk)
Ene 01 Reduction of energy use and carbon emissions	None	None	None	Four credits (Energy performance) OR Four credits (Prediction of operational energy consumption)*	Six credits (Energy performance) AND Four credits (Prediction of operational energy consumption)
Ene 02a Energy monitoring	None	None	One credit (First sub-metering credit)	One credit (First sub-metering credit)	One credit (First sub-metering credit)
Wat 01 Water consumption	None	One credit	One credit	One credit	Two credits
Wat 02 Water monitoring	None	Criterion 1 only (mains water meter)	Criterion 1 only (mains water meter)	Criterion 1 only (mains water meter)	Criterion 1 only (mains water meter)
Mat 03 Responsible sourcing of construction products	Criterion 1 only (Legal timber)	Criterion 1 only (Legal timber)	Criterion 1 only (Legal timber)	Criterion 1 only (Legal timber)	Criterion 1 only (Legal timber)
Wst 01 Construction waste management	None	None	None	None	One credit
Wst 03a Operational waste Wst 03b Operational waste	None	None	None	One credit	One credit

* For the 'Prediction of operational energy consumption' in Ene 01, it must be demonstrated that the operational energy performance has been substantially improved.

Environmental section weightings

Environmental weightings are fundamental to any building environmental assessment method as they provide a means of defining, and therefore ranking, the relative impact of environmental issues. In 2016, BREEAM developed a new, independently peer reviewed, weightings methodology to derive new consensus-based category weightings for use in BREEAM schemes operated by BRE Global (for more information, see the briefing paper: New methodology for generating BREEAM category weightings).

Table 5: The table shows how weightings may vary depending on the project type. The example shows the Luxembourg weightings types

Environmental section	Weighting						
	Non-residential			Single residential dwellings		Multiple residential dwellings	
	Fully fitted	Shell only	Shell and core	Partially fitted	Fully fitted	Partially fitted	Fully fitted
Management	11.00%	11.13%	10.64%	9.58%	9.10%	11.18%	10.57%
Health and wellbeing	19.00%	12.66%	13.87%	21.64%	21.70%	21.58%	21.49%
Hazards	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Energy	20.00%	20.07%	19.09%	19.03%	21.23%	17.98%	19.97%
Transport	6.00%	8.50%	6.77%	5.74%	6.13%	6.10%	6.41%
Water	7.00%	3.30%	7.90%	6.69%	6.36%	6.32%	6.73%
Materials	13.00%	18.41%	14.67%	13.98%	13.29%	13.21%	12.50%
Waste	6.00%	7.43%	6.77%	5.65%	5.37%	6.10%	5.77%
Land use and ecology	8.00%	9.02%	9.02%	8.60%	8.18%	8.13%	7.69%
Pollution	10.00%	6.54%	12.28%	9.10%	8.65%	9.38%	8.87%
Total	100.00%	100%	100%	100%	100%	100%	100%
Innovation (additional)	10.00%	10%	10%	10%	10%	10%	10%

Each of the above environmental sections consists of a differing number of assessment issues and BREEAM credits (as described elsewhere and defined in detail in the technical sections of this scheme document).

Adaptation of weightings for local conditions

In order to provide weightings that are adapted for local conditions, the weightings are reviewed for the first project that registers for assessment in a country or region. These weightings are then set as appropriate for that project and all other projects thereafter in that country or region for the life of the current BREEAM International New Construction version. The development of these weightings is based on robust and independent information forwarded from 'local experts' who have an understanding of local conditions. This may be a member of the design team if they can demonstrate sufficient knowledge of the environmental conditions of the region or country, or another individual or organisation with the relevant expertise.

The required information is compiled by the BREEAM Assessor using the 'BREEAM International Weightings' form (available from BREEAM Projects). It is the assessor's responsibility to correctly complete the 'Environmental Weightings' and submit the form to BRE Global, who use the information to develop appropriate weightings for that country or region.

The weightings are tailored based on the 10 technical categories, with categories being considered 'Fixed' or 'Variable'. Fixed categories are those defined as having a universal impact, independent of the local context. Variable categories are those defined as being variable locally, due to social, environmental, political or economic factors. BRE Global will take account of these factors when determining the relative importance of the technical sections.

The influence of location

As well as having an impact on the weightings attributed to BREEAM sections and assessment issues (see Adaptation of weightings for local conditions above), the culture, economy, climate and work practices can also affect the development of criteria and the method of assessing certain BREEAM issues.

One example involves the opportunity for rainwater recycling in the BREEAM issue Wat 01 Water consumption on page 253. In this instance the higher performance benchmarks vary according to the amount of precipitation available. The assessor can determine the precipitation zone in which the building is located using the map in Figure 4 on the next page (and other information below) and consequently use this climatic zone to establish the appropriate water consumption benchmark for a building in that location.

The map below highlights the Earth's climatic zones according to the Köppen-Geiger climate classification method. They are defined according to maximum and minimum temperature ranges, as well as the total and seasonal distribution of precipitation.

For the purposes of BREEAM, the climatic zones (refer to Figure 3 on the next page) are defined as:

A. Equatorial - tropical climates where temperatures remain above 18°C
B. Arid - dry climates (semi-arid and desert climates)
C. Warm temperate - mid-latitude climates (warm, dry summers with cool, wet winters)
D. Snow - temperate, is generally between -3°C and 10°C (subarctic or temperate alpine areas and low precipitation)
E. Polar - permafrost or tundra climates.

For the purposes of Wat 01 Water consumption on page 253, the precipitation zones (refer to Figure 4 on the next page) are defined as:

1. Precipitation zone 1: corresponds to Köppen's precipitation regions f (fully humid) and m (monsoonal)
2. Precipitation zone 2: corresponds to Köppen's precipitation regions s (summer dry) and w (winter dry)
3. Precipitation zone 3: corresponds to Köppen's precipitation regions S (steppe) and W (desert)

Advice and guidance on how to carry out a classification can be found at:
www.physicalgeography.net/fundamentals/7v.html.

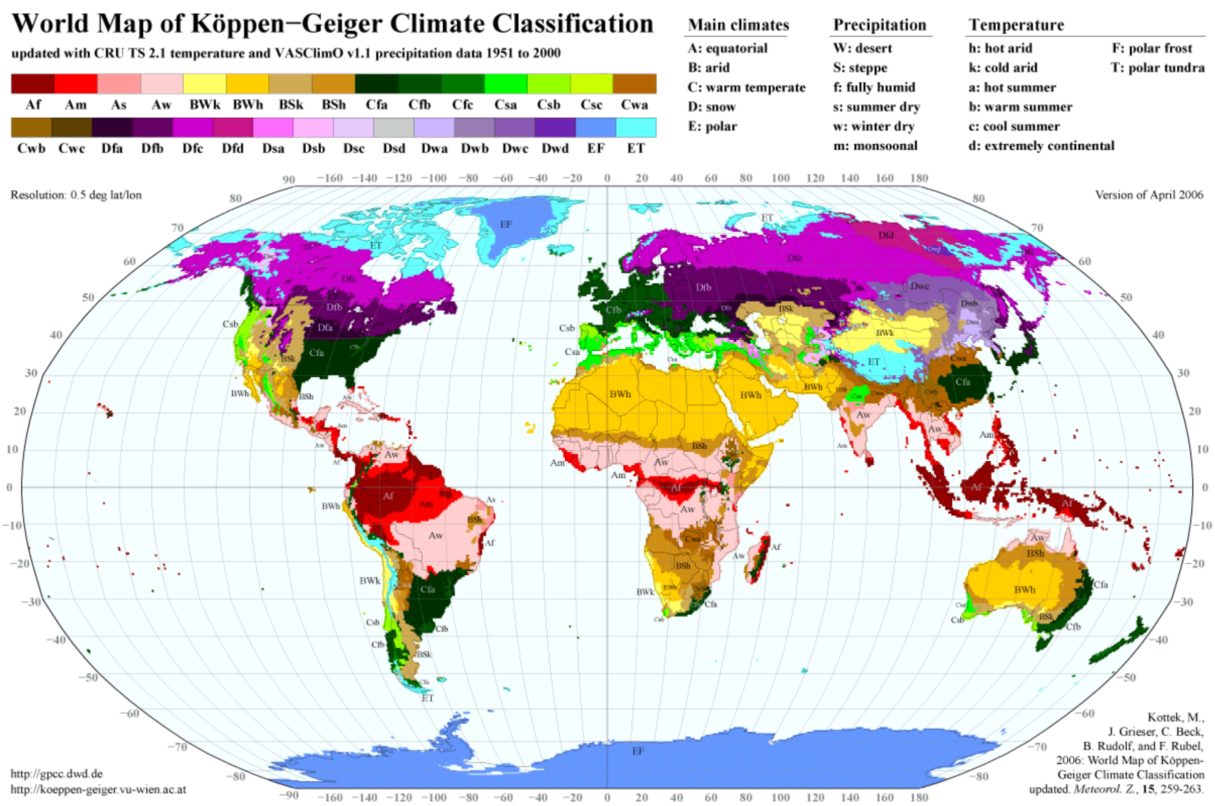

Figure 3: World map of Köppen-Geiger climate classification

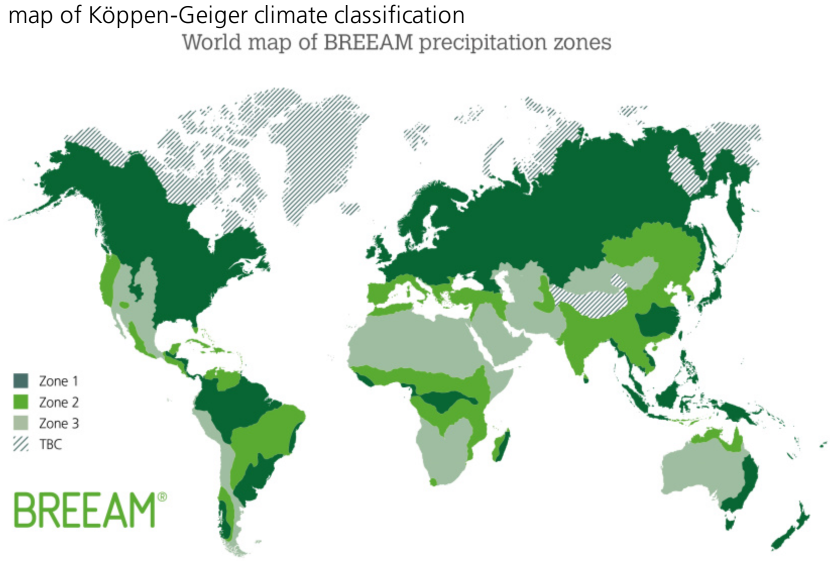

Figure 4: World map of BREEAM precipitation zones

BREEAM assessment issues and credits

BREEAM International New Construction Version 6 consists of 57 individual assessment issues spanning the nine environmental categories, plus a tenth category called 'Innovation' (described below). Each 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 building demonstrates that it meets the best practice performance levels defined for that issue, i.e. it has mitigated an impact or, in the case of Health and wellbeing on page 81, addressed a specific building occupant-related issue, e.g. good thermal comfort, daylight or acoustics.

The number of credits available for an individual assessment issue will vary and generally the higher the number there are for a given issue, the more important that issue is in terms of mitigating its impact. 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 environmental sections, 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

It is one of the aims of BREEAM to support innovation within the construction industry and its supply chain. BREEAM does this by making additional credits available for the recognition of sustainability related benefits or performance levels which are currently not recognised by standard BREEAM assessment issues and criteria. By doing this BREEAM is rewarding buildings that go beyond best practice in terms of a particular aspect of sustainability, i.e. where the building or its procurement has demonstrated innovation.

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.

There are two ways in which BREEAM awards 'innovation credits' to recognise innovation in building design and procurement. The first is by meeting exemplary performance criteria defined within an existing BREEAM issue, i.e. going beyond the standard BREEAM assessment criteria and therefore best practice. Note, not all assessment issues have exemplary performance criteria. The second route is 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 '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' that can be awarded for any one 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. Refer to Inn 01 Innovation on page 402 for more detail.

Local codes and standards

Use of local codes and standards

Certain criteria in BREEAM require compliance with specified standards or best practice documents. In some countries there may be local equivalents of these standards and in these cases BREEAM International allows BRE Global staff, with support from assessors and the project team, to review the local standards against BREEAM specified requirements and confirm their equivalence. The assessors need to send in the local standards to BRE Global for approval. Ideally the relevant sections of the standards will be translated into English; however, BRE Global can also provide this service for a fee.

If BRE Global approves the standard as equivalent, the local standard will form part of the approved standards for that country, region or area.

Approved standards and weightings list

The individual requirements for a particular local standard and a list of approved standards are provided in the approved standards and weightings list (ASWL).

Every BREEAM International assessment must include a version of the approved standards and weightings list when an assessment is submitted to inform BRE Global which standards the project team have worked to and complied with. This may involve the use of a 'New country worksheet' or, where assessments have already been undertaken in that country, an 'Existing country-specific worksheet' that is amended to suit the specific project.

For each BREEAM criterion requiring compliance with specified standards or best practice documents a combination of the following three situations is likely, as circumstances vary between issues.

1. No specific local standard is specified - when submitting the assessment the project team uses the approved standards and weightings list to inform BRE Global that it will be working to the requirements detailed in the criteria or the default International Standard.
2. Approved local standard is specified - when submitting the assessment the project team uses the approved standards and weightings list to inform BRE Global that it will be using the approved local standards detailed in the 'Existing country-specific worksheet'. The team also need to confirm that the standards being used are current.
3. Unapproved local standard is proposed - at the earliest opportunity the project team uses the approved standards and weightings list to inform BRE Global that they will be working to (as yet unapproved) local standards. The team will need to send the relevant sections of the standard to BRE Global with evidence of its robustness.
   Note: The approvals process for local standards happens at the very early stages of a project assessment, i.e. well before a report is submitted for certification so that:
   a. Certification is not delayed, and
   b. The project team or client have certainty over which approved standards against which their building's performance is being assessed.

If BRE Global approves the local equivalent, it is added to the 'approved standards' for that country or region. If not, it is added to the 'rejected standards' for that country - this is included for information and to prevent duplication of effort.

More details on this process can be found within the BREEAM Operations Manual (SD5070), available on [BREEAM Projects].

Calculating a building's BREEAM rating

A BREEAM Assessor must determine the BREEAM rating using the appropriate assessment tools and calculators. An indication of performance against the BREEAM scheme can also be determined using a BREEAM Pre-Assessment Estimator, which is available on BREEAM Projects. Any pre-assessment estimate should be informed by a licensed BREEAM Assessor who understands the full details of the process.

The process of determining a BREEAM rating is outlined below and an example calculation included in Table 6.

1. Firstly, the scope of the project being assessed needs to be determined, i.e. Shell only or Shell and Core. The appropriate BREEAM assessment tool or calculator then adjusts the scoring and weightings to reflect the categories and individual credits assessed.
2. The BREEAM Assessor will then determine for each of BREEAM's nine environmental sections (as applicable) the number of 'credits' awarded. This must be determined by the BREEAM Assessor 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 section.
4. The percentage of 'credits' achieved in each section is then multiplied by the corresponding section weighting. This gives the overall environmental section score.
5. The section scores are then 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 6: Example BREEAM score and rating calculation

BREEAM section	Credits achieved	Credits available	Credits achieved, %	Section weighting (fully fitted)	Section score
Management	10	20	50.00%	0.12	6.00%
Health and wellbeing	17	21	80.95%	0.14	11.33%
Hazards	1	1	100.00%	0.01	1.00%
Energy	16	32	50.00%	0.19	9.50%
Transport	5	11	45.45%	0.08	3.63%
Water	5	9	55.56%	0.06	3.33%
Materials	10	14	71.43%	0.125	8.92%
Waste	3	13	23.07%	0.075	1.73%
Land use and ecology	5	5	100.00%	0.10	10.00%
Pollution	9	12	75.00%	0.10	7.44%
Innovation	2	10	20.00%	0.10	2.00%
Final BREEAM score					64.88%
BREEAM rating				VERY GOOD	

Table 7: Minimum standards for a BREEAM Very Good rating

Minimum standards for BREEAM 'Very Good' rating	Achieved?
Man 03 Responsible construction practices on page 56	Y
Hea 01 Visual comfort on page 83	Y
Hea 02 Indoor air quality on page 98	Y
Hea 09 Water quality on page 144	Y
Ene 01 Reduction of energy use and carbon emissions on page 150	N/A
Wat 01 Water consumption on page 253	Y
Wat 02 Water monitoring on page 264	Y
Mat 03 Responsible sourcing of construction products on page 282	Y

Producing case studies for BREEAM ‘Outstanding’ rated buildings

Projects certified to the BREEAM ‘Outstanding’ rating should act as exemplars for the industry. If they are to do this, case studies of these projects are needed so that other project teams and clients can refer to them.

Prior to Final Certification, the design team and client for BREEAM ‘Outstanding’ rated projects are asked to provide either a case study of the building or information to allow BRE Global to produce a case study. This information will be requested at the final Post-construction stage and should be provided with the BREEAM Assessor’s Final Certification Report.

BRE Global will publish the case study on the BREEAM website, Green Book Live website and in other BRE and BREEAM-related publications.

The BREEAM evidential requirements

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

Why does BREEAM require evidence?

BREEAM is a third party assessment and certification scheme operated in accordance with international standards. Operating to international standards ensures that certification schemes such as BREEAM are run in a consistent and reliable manner. The BREEAM Assessor's assessment report and the BRE Global quality assurance process are the fundamental tenets of BREEAM, ensuring consistency of, and confidence in, the BREEAM rating awarded by the assessor.

To maintain this consistency and credibility, all certification decisions must be based on verified and credible project information that is traceable, i.e. evidence based. This is not only important for ensuring compliance with the international standards to which BREEAM operates, but also in terms of managing risk to clients and BREEAM Assessors in the event that a certification outcome is challenged.

The assessment report and the BREEAM Assessor role

It is the BREEAM Assessor who determines the BREEAM rating and the assessment report 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 (that is, the process of producing the assessment report) has been conducted in accordance with the requirements of the scheme. The purpose of the certificate is therefore to give confidence to the client in the assessor's performance and processes in determining a BREEAM rating.

It is the role of the assessor to gather project information and use it to assess performance against the BREEAM scheme in a competent and impartial manner. To award a BREEAM credit, the assessor must be satisfied beyond reasonable doubt that the evidence gathered demonstrates unambiguous compliance with all relevant criteria defined in the BREEAM scheme. All evidence must be appropriately referenced in the formal report produced by the assessor and made available on request from BRE Global for quality assurance checks.

Clear, ordered and well referenced evidence for each BREEAM issue and criterion facilitates efficient quality assurance and certification. BREEAM Assessors can access further guidance on assessment report referencing in Assessor Guidance Note 01, and the 'reporting process' webinar, both available from the BREEAM Assessor Guidance section of BREEAM Projects (www.breeam.com/projects).

Evidence

Evidence should not necessarily need to be prepared specifically for the purpose of the BREEAM assessment. In many instances, the assessor should be able to source readily available and prepared project information for the purpose of demonstrating compliance. For this reason, BREEAM aims to avoid being prescriptive on the type of evidence required, while each issue does have specific documents listed these are provided as guidance rather than a definite list.

The 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, or alternatively, one piece of information may be sufficient to demonstrate compliance with multiple criteria.

Written commitments at the interim stage of assessment – Design stage

At the interim design stage of assessment it is permissible to use letters or emails to demonstrate intent to comply with BREEAM criteria (provided they meet the requirements for the communication records below). Such evidence must also make clear the actions and evidence (or an understanding thereof) that will be undertaken and provided to ensure the project's ongoing compliance, particularly at the final stage of assessment, i.e. post-construction. This is to ensure that the party who makes the commitment is clearly aware of the actions and evidence that needs to be 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 copy and paste the BREEAM criteria into a formal commitment. The commitment should specifically detail how criteria are to be achieved in the context of the assessment, and often copying and pasting the BREEAM criteria will not provide this level of detail.

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 not unreasonable to expect formal design or specification information to be available to confirm compliance.

Written commitments at the final stage of assessment – Post-construction

As stated in the Scope section, there are two types of assessment that 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. 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 be reflective of 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 as-built drawings showing the location of the sub-meters.

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 post-construction, i.e. after handover and possibly during the building operation. An example could be a written commitment from the building owner or occupier making a commitment to conduct post-occupancy evaluation. As with written commitments at the design stage, the BREEAM Assessor must not award BREEAM credits where they have a reason to doubt the validity or intent of written commitments or where it is not unreasonable to expect formal documentation, e.g. a schedule of services or professional services contract.

Evidence principles that BREEAM Assessors and BRE Global Quality Assurance work to

As described above, where specific evidence is stated in the 'Evidence' table within each assessment issue, this must be sourced and verified by the BREEAM Assessor.

In determining the appropriateness of evidence for each issue, the principles outlined in Table 8 below must be considered by BREEAM Assessors. Where the evidence meets the principles outlined in Table 8 below and, where appropriate, the guidance provided in the 'Robustness of evidence' section, such evidence is admissible for the purpose of the assessment and the BRE Global Quality Assurance checks.

These principles are not listed in a hierarchical order and are all equally important when considering which evidence type to submit to demonstrate compliance for each issue or criterion.

Table 8: BREEAM evidence principles

	Summary	Principle	Objective	A question to ask to check
1	Evidence provided for all criteria for all credits sought	Evidence must demonstrate that ALL relevant* criteria and sub-criteria for each credit sought are achieved and where relevant, is provided to support compliance notes, definitions etc.	Completeness	Are all criteria and sub-criteria covered? Have all relevant compliance notes and definitions been addressed?
2	Unambiguous assessment	The assessment must demonstrate unambiguous compliance and the evidence must support this assessment. Evidence (and supporting notes) must clearly demonstrate to a third party reviewer that the criteria have been met.	Independent review compatibility	If a third party (e.g. BRE Global) reviewed my report with the submitted evidence, would they be able to confirm compliance and award the same credits I have?
3	Robust	1. When selecting the evidence, always ensure it is robust and relevant to the stage of assessment. 2. The selected evidence contains all the relevant basic information, with the necessary constituent parts to be deemed robust. (See Robustness of evidence on the next page for further details on both of these principles).	Proof that evidence is robust and from a reliable source.	Is this the most robust form of evidence available to demonstrate compliance with this criterion? Does the evidence contain all the relevant basic information? Is it fully auditable?
4	Use existing evidence	Use existing project information to demonstrate compliance. In most cases evidence should not need to be 'created' for BREEAM compliance purposes.	Minimises evidence and reduces time and cost of compliance.	Does robust evidence meeting the above principles already exist that I can use? If I need to ask for more evidence, is the project seeking credits where compliance is not adequately demonstrated?

* Where the assessor or design team deem specific criteria 'not relevant' to the assessment, a full justification should be collated and then submitted as a technical query for review by BRE Global.

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 the most robust and appropriate piece of evidence to demonstrate that a particular criterion has been achieved?

Any evidence submitted for a BREEAM assessment must be robust in terms of its source and its traceability. Below is a list of the minimum information the assessor must expect to see when certain types of evidence are submitted.

Communication records: Any communication records used as evidence must provide clear confirmation of the site name, author's identity and role, the date and recipient's identity.

Formal letters of correspondence: Must be on company or organisation headed note-paper with a signature (electronic signatures are acceptable). Ideally letters should be a secured document. (Please see sections relating to written commitment for further information.)

Meeting minutes: Must include date, location and attendee information (names, organisations and roles), along with a record of the meeting and agreed actions.

Drawings: All drawings must have the building or site name, phase (if applicable), title of drawing, date, revision number and a scale.

Specification: A specification must be clear that it relates to the project under assessment, and it must have a date and revision number. Where sections of a specification are provided, the assessor should reference the extract and as a minimum submit the front page of the specification detailing the project name, revision number and date.

Site inspection report: A site inspection report must include the building or site name, date, author and summary text to detail what was witnessed, confirming compliance. Photographic evidence can be used to support the text in the report.

For other types of evidence not listed, the assessor should use the above as a guide for the sort of evidence that is suitable. As a minimum, in most cases, the evidence used to assess compliance should always contain key information such as the project name, the author, date, revision numbers etc.

Management

Summary

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

Category summary table

Issue	Credits	Credit summary
Man 01 Project brief and design	4	— Stakeholder consultation covering project delivery and relevant third parties. — Sustainability champion appointed to facilitate the setting, monitoring and achievement of BREEAM performance targets for the project.
Man 02 Life cycle cost and service life planning	4	— Recognising and encouraging the use of life cycle costing and service life planning and the sharing of data to raise awareness and understanding.
Man 03 Responsible construction practices	6	— The principal contractor demonstrates sound environmental management practices and consideration for neighbours across their activities on site. — Site related energy, water and transport impacts are monitored and reported to ensure ongoing compliance during the Construction, Handover and Close Out stages and to improve awareness and understanding for future projects.
Man 04 Commissioning and handover	4	— Schedule of commissioning including optimal timescales and appropriate testing and commissioning of all building services systems and building fabric in line with best practice. — Inspecting, testing, identifying and rectifying defects via an appropriate method. — Provision of a non-technical building user guide and user training or operator training timed appropriately around handover and proposed occupation.
Man 05 Aftercare	3	— Provision of the necessary infrastructure and resources to provide aftercare support to the building occupiers. — Seasonal commissioning activities will be completed over a minimum 12 month period, once the building becomes substantially occupied. — The client or building occupier commit to carrying out a post occupancy evaluation (POE) exercise one year after initial building occupation and to disseminate the findings in terms of the building's post occupancy performance.

Man 01 Project brief and design

(all buildings)

Number of credits available	Minimum standards
4	No

Aim

To recognise and encourage an integrated design process that optimises building performance.

Assessment criteria

This issue is split into two parts:

- Stakeholder consultation (2 credits)
- Sustainability champion (2 credits)

The following is required to demonstrate compliance:

One credit - Stakeholder consultation (project delivery)

1 A clear sustainability brief is developed prior to completion of the concept design which sets out:
 1.a Client requirements, e.g. internal environmental conditions required
 1.b Sustainability objectives and targets including target BREEAM rating, business objectives etc.
 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 delivery stakeholders (see Relevant definitions on page 48) have met to identify and define their roles, responsibilities and contributions for each of the key phases of project delivery.

3 In defining the roles and responsibilities for each key phase of the project, the following must be considered:
 3.a End user requirements
 3.b Aims of the design and design strategy
 3.c Particular installation and construction requirements and limitations
 3.d Design and construction risk assessments, e.g. national health and safety regulations or best practice, legionella risk assessment
 3.e Legislative requirements, e.g. local building regulations, heritage requirements
 3.f Procurement and supply chain
 3.g Identifying and measuring project success in line with project brief objectives
 3.h Occupiers' budget and technical expertise in maintaining any proposed systems
 3.i Maintainability and adaptability of the proposals
 3.j Requirements for the production of project and end user documentation
 3.k Requirements for commissioning, training and aftercare support.

4 The project team demonstrate how the project delivery stakeholder contributions and the outcomes of the consultation process have influenced or changed the initial project brief. This includes, if appropriate, the project execution plan, communication strategy, and the concept design.

One credit - Stakeholder consultation (third party)

5 Prior to completion of the concept design work stage, all relevant third party stakeholders have been consulted by the design team and this covers the minimum consultation content (see CN3 on the next page).

6 The project must demonstrate how the stakeholder contributions and outcomes of the consultation exercise have influenced or changed the initial project brief and concept design.

7 Prior to completion of the detailed design, consultation feedback has been given to, and received by, all relevant parties.

Additionally for Education only:

8 The consultation exercise used a method carried out by an independent party (see Relevant definitions on page 48).

One credit - Sustainability champion (design)

9 A sustainability champion has been appointed to facilitate the setting and achievement of BREEAM performance targets for the project. The design stage sustainability champion is appointed to perform this role during the feasibility (Preparation and Brief) stage.

10 The defined BREEAM performance targets have been formally agreed (see Relevant definitions on page 48) between the client and design or project team no later than the concept design work stage.

11 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 - Sustainability champion (monitoring progress)

12 The credit for sustainability champion (design) (criteria 9 to 11 above) has been achieved.

13 A sustainability champion is appointed to monitor progress against the agreed BREEAM performance targets throughout the design process and formally report progress to the client and design team.

14 The sustainability champion must attend key project and design team meetings during the concept design, developed design and technical design work stages (see Relevant definitions on page 48). Reporting must be carried out during and prior to completion of each stage, as a minimum.

Checklists and tables

None.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	Both options: All criteria relevant to the building type and function apply. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.

<table>
<tr><th>Ref</th><th>Terms</th><th>Description</th></tr>
<tr><td colspan="3">Residential - Partially fitted and fully fitted</td></tr>
<tr><td>CN2</td><td>Applicable assessment criteria - Single dwellings</td><td>Both options: All criteria relevant to the building type and function apply.

See CN2.2 below for more detail on the sustainability champion role.
Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.</td></tr>
<tr><td>CN2.1</td><td>Applicable assessment criteria - Multiple dwellings</td><td>Both options: All criteria relevant to the building type and function apply.

Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.</td></tr>
<tr><td>CN2.2</td><td>Sustainability champion for single dwellings</td><td>For single dwellings a BREEAM International New Construction Assessor can act as the Sustainability champion. In this situation it will still be necessary to manage any conflicts of interest that could arise.</td></tr>
<tr><td colspan="3">General</td></tr>
<tr><td>CN3</td><td>Minimum consultation content. See criterion 5 on the previous page.</td><td>Minimum consultation content will be dependent on the building and scope of the project, but would typically include the following:
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 and transport impacts
6. Opportunities for shared use of facilities and infrastructure with the community and appropriate stakeholders, if relevant and appropriate to the building type
7. Compliance with statutory (national or local) consultation requirements
8. Inclusive and accessible design
In the case of educational building types, minimum content also includes:
9. How the building and grounds could best be designed to facilitate learning
10. Where the scope of works involves changes to the internal layout and function, the consultation considers how the design can best provide a range of social spaces appropriate to the needs of pupils, students and other users.
In the case of building types containing technical areas or functions, e.g. laboratories, workshops etc., minimum content also includes:
11. The end users' broad requirements for such facilities, including appropriate sizing, optimisation and integration of equipment and systems.</td></tr>
</table>

Ref	Terms	Description
CN3.1	Assessing and awarding the available credits for a sustainability champion	There is an additional credit for appointing a sustainability champion during the construction and handover phase (see BREEAM issue Man 03 Responsible construction practices on page 56). The aim of the credit in Man 03 Responsible construction practices on page 56 is to encourage and reward contractors and project teams that appoint a sustainability champion and therefore ensure continuation of the sustainability objectives during the construction phase, and that the constructed building meets the client's target BREEAM rating.
CN3.2	BREEAM-related performance targets. See criteria 9 to 13 on page 45.	If the BREEAM-related performance targets set at the end of the Concept Design stage have not been achieved at the post-construction stage assessment, the credits awarded at the interim design stage assessment for appointing the sustainability champion must be withheld in the final assessment (see Relevant definitions on the next page).
CN3.3	National health and safety regulations and best practice	Where there are no national health and safety regulations in the country of assessment, evidence is required to demonstrate that EITHER: — The principal contractor has an occupational health and safety management system compliant with OHSAS 18001:2007 OR — The works will be carried out in accordance with the International Labour Association's Safety and health in construction Code of Practice.

Methodology

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
Stakeholder consultation		
1–8	A list of the stakeholders consulted. A consultation plan setting out the process and the scope of the consultation. Agenda or minutes from consultation meetings. Documentation demonstrating consultation feedback and subsequent actions.	As design stage.
Sustainability champion credits		

Criteria	Interim design stage	Final post-construction stage
9–14	The sustainability champion appointment letter. Relevant section or clauses of the building specification or contract. Project programme indicating the dates by which the key work stages (Preparation and design) are to be completed. Meeting notes or minutes, recorded correspondence or schedules that can demonstrate BREEAM issues are a regular agenda item and sustainability champion attendance. The sustainability champion progress report (for each work stage). Design stage BREEAM assessment report.	As design stage, plus the final post-construction assessment report.

Additional information

Relevant definitions

BREEAM Advisory Professional (AP)

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.

BREEAM-related 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.

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.

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.

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.

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

EN 15221-1:2006 states that 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.

Independent party (see criterion 8 on page 45)

To comply with criterion 8, 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.

Key design team meetings

Key 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. 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.

Key phases

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

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

Project delivery stakeholders

The purpose of criterion 1 on page 44 is to reflect the need to consider the input of all the major project stakeholders from the earliest practical stage. This is to ensure smooth and successful delivery of the project's sustainability objectives. Project delivery stakeholders therefore include the client, the building occupier (where known), the design team and the principal contractor. With regards to contractors' involvement, it ensures their input in terms of formulating sustainable design solutions, commenting 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 1 on page 44 would not be possible. In these instances, criterion 1 on page 44 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.

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'.

Relevant third parties (see criterion 5 on page 45)

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. Potential users of any shared facilities, e.g. operators of clubs and community groups

AND the following where relevant:

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

Sustainability champion (design and monitoring progress)

Members of formal schemes approved by BRE Global in connection with the provision of design advice. Providers of schemes or qualifications not listed, who feel their members meet this definition and who would like to be listed as approved membership schemes, should contact BRE Global.

At present the following schemes are deemed to satisfy this requirement:

- BREEAM Advisory Professional (AP) Membership Scheme.

Sustainability Champions are trained and qualified to provide BREEAM-related advice to the design team. They are able to facilitate timely and successful target setting, scheduling, prioritisation and monitoring of BREEAM compliance relating to the design of the building. They will be subject to ongoing training and competency requirements to ensure that their knowledge is maintained.

Note: The aim of the sustainability champion credits is to encourage an integrated design and construction process that uses BREEAM as a framework for establishing, agreeing and achieving the desired level of sustainability performance for the project. The sustainability champion credits in this BREEAM issue focus on achieving this objective through the provision of appropriate expertise during the preparation, brief, and design stages of the project.

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.

Other information

None.

Man 02 Life cycle cost and service life planning (all buildings)

Number of credits available	Minimum standards
4	No

Aim

To deliver whole life value by encouraging the use of life cycle costing to improve design, specification, through-life maintenance and operation, and through the dissemination of capital cost reporting to promote economic sustainability.

Assessment criteria

This issue is split into three parts:

- Elemental life cycle cost (2 credits)
- Component level life cycle cost (1 credit)
- Capital cost reporting (1 credit)

The following is required to demonstrate compliance:

Two credits - Elemental life cycle cost (LCC)

1 An outline, entire asset elemental LCC plan has been carried out at the Concept Design stage together with any design option appraisals in line with 'Buildings and constructed assets – Service life planning – Part 5: Life cycle costing ISO 15686-5:2008[4].

2 The outline 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.

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 component level LCC options appraisal has been developed by the end of Process Stage 4 (equivalent to Technical Design Stage) in line with ISO 15686-5:2008, 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
 4.c Finishes, e.g. walls, floors or ceilings
 4.d External spaces, e.g. alternative hard landscaping, boundary protection.

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 , via the BREEAM Assessment Scoring and Reporting tool.

Checklists and tables

None.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	**Elemental life cycle cost, capital cost reporting and maintenance strategy, criteria 1 to 3 and 6 above** Both options: All assessment criteria relevant to the building type and function apply. **Component level LCC plan, criteria 4 to 5 on the previous page** Both options: The plan must include all component types to be installed by the developer. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - Partially fitted and fully fitted		
CN2	Applicable assessment criteria - Single and multiple dwellings	Both options: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN3	Appropriate examples See criterion 3 on the previous page.	The options selected to demonstrate how life cycle costs have been minimised and critical value maximised must be appropriate in terms of their relative impact on project costs, future building maintenance burden and size (volume or area) and the stage of the project. At 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 stage 4, when considering the outputs from the **component level options 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 and maximise critical value).

Ref	Terms	Description
CN3.1	Predefined specifications	Where the building is constructed to a predefined standard specification, the LCC elemental plan for this specification may be used to help demonstrate compliance.
CN3.2	Capital cost reporting final information not available	At the design stage of assessment, where the final information is not available, the credit can be awarded where the client provides the predicted capital cost, including contingencies, and commits to providing this information for the final stage of assessment. At the final stage, if the final capital cost is not known, the client's or cost consultant's best estimate should be provided. This data will be used to inform future BREEAM performance benchmarking and will be anonymised.
CN3.3	Independent assessment of parts	All three parts 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.
CN3.4	Component level LCC options appraisal – assessing types 4.a–4.d on page 51	The component level LCC options appraisal should review all of the component types listed, 4.a–4.d (where present). However not every single example cited under each component need be considered; 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.
CN3.5	Elemental LCC plan study period	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 has not yet been formally agreed (due to the early stages of the design process), the default design life of 60 years should be used for modelling purposes.

Methodology

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
1–3 on page 51	Elemental LCC plan.	As per interim design stage.
4–5 on page 51	Component level LCC options appraisal.	As per interim design stage.
6 on the previous page	Predicted capital costs via the BREEAM scoring and reporting tool.	Capital costs via the BREEAM scoring and reporting tool.

Additional information

Relevant definitions

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.

Elemental LCC plan

This is commonly used for developing solutions at project level during option 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 floor area (GIFA) and presented for elemental analysis, aligned to the level of capital cost plans.

Component level LCC options appraisal

A component level LCC plan is commonly used for cost planning specification choices of systems or component levels during design development. Component level LCC 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.

Capital cost

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

- Construction, including preparatory works, materials, equipment and labour
- Site management
- Construction financing
- Insurance and taxes during construction
- Inspection and testing.

Costs relating to land procurement, clearance, design, statutory approvals and post occupancy aftercare should not be included.

Other information

Capital cost reporting

The lack of data relating to capital and life cycle costs and benefits arising from more sustainable building design presents a major barrier to take-up of more sustainable solutions. This issue seeks to encourage the sharing of data to break down these barriers and 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. This is used to inform the business case for sustainability and the ongoing development of BREEAM. All data submitted will be treated as confidential and will only be used anonymously.

When to undertake life cycle costing

Life cycle costing is relevant throughout the building or 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 ISO 15686-5.)

Standardised method for life cycle costing (SMLCC) for construction

ISO 15686-5:2008 describes the standardised method for life cycle costing (SMLCC) for construction procurement. The objectives of this guide are to provide the following.

1. LCC practitioners with a standardised method of applying life cycle costing, applicable to the construction industry and to the key stages of the procurement process.
2. 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 LCC planning.
3. Instructions on how to define the client's specific requirements for life cycle costing and the required outputs and forms of reporting - and to decide on which method of economic evaluation to apply.
4. Simplification and demystification - by providing practical guidance, instructions and definitions, together with informative worked examples on how to undertake life cycle costing (for construction).
5. 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 15686-5:2008 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 practices (all buildings)

Number of credits available	Minimum standards
6	Yes

Aim

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

Assessment criteria

This issue is split in to four parts:

- Environmental management (1 credit)
- Sustainability champion (1 credit)
- Considerate construction (up to 2 credits)
- Monitoring of construction site impacts (2 credits)

The following is required to demonstrate compliance:

Prerequisite - Legally harvested and traded timber

1 All timber and timber-based products used during the construction process of the project are 'Legally harvested and traded timber' (see Relevant definitions on page 63).

Note: For other materials there are no prerequisite requirements at this stage.

Prerequisite - National health and safety legislation

2 All national health and safety legislation and regulations for construction sites are considered and implemented during (refer to CN3.6 on page 62):
- 2.a The design of the asset; to minimise health and safety risks
- 2.b Pre-construction work planning and organisation; to collate health and safety information from all relevant stakeholders (refer to Relevant definitions on page 63)
- 2.c Site set-up; to implement health and safety features
- 2.d Construction; to manage, monitor and report on the health and safety of construction site staff.

One credit - Environmental management

3 The principal contractor operates an environmental management system (EMS) covering their main operations. The EMS must be third party certified to ISO 14001/EMAS or an equivalent standard.

4 Implement best practice pollution prevention policies and procedures on site, demonstrated through the project team completing the checklist outlined in Table 9 on page 58. To demonstrate compliance, not all actions need to be achieved; however the assessor and project team must demonstrate that the intent of each section (i.e. air quality) has been met.

One credit - sustainability champion (construction)

5 A sustainability champion is appointed to monitor the project to ensure ongoing compliance with the relevant sustainability performance and process criteria, and therefore BREEAM targets, during the construction, handover and close out work stages. To do this the sustainability champion will ideally be site-based or will visit the site regularly to carry out spot checks, with the relevant authority to do so, and will require action to be taken to address shortcomings in compliance. The sustainability champion will monitor site activities with sufficient frequency (see compliance note CN3.3 on page 61) to ensure that risks of non-compliance are minimised. They will report on progress at relevant project team meetings, including identifying potential areas of non-compliance and any action needed to mitigate.

6 The defined BREEAM performance target forms a requirement of the principal contractor's contract (see Man 01 Project brief and design: CN3.2 on page 47 and Man 01 Project brief and design – Relevant definitions on page 48).

7 To achieve this credit at the final post-construction stage of assessment, the BREEAM-related performance target for the project must be demonstrably achieved by the project. This is demonstrated via the BREEAM Assessor's final post-construction stage assessment report.

Up to two credits - Considerate construction

8 For single dwellings:
- 8.a One credit can be awarded where an individual is responsible for implementing and maintaining the following considerate construction practices throughout the works stage (see Relevant definitions on page 63):
  - 8.a.i Keeping the site clean and tidy
  - 8.a.ii Reducing impacts on the community through community and neighbour engagement
  - 8.a.iii Continuous improvements in safety
  - 8.a.iv Commitments to respect and ensure fair treatment of all workers
  - 8.a.v Suitable site facilities for operatives and visitors.
- 8.b Two credits can be awarded where the contractor achieves six items in each of the four sections within Checklist A1 on page 418

9 For all other building types, the BREEAM credits can be awarded as follows:
- 9.a One credit where the principal contractor achieves six items in each of the four sections within Checklist A1 on page 418
- 9.b Two credits where the principal contractor achieves all items in each of the four sections within Checklist A1 on page 418 AND the contractor's performance has been confirmed by independent assessment and verification.

Up to two credits - Monitoring of site impacts

10 Responsibility has been assigned to an individual for monitoring, recording and reporting energy use, water consumption and transport data (where measured) resulting from all on site processes (and dedicated off-site monitoring) throughout the programme. To ensure the robust collection of information, this individual must have the appropriate authority and responsibility to request and access the data required. Where appointed, the sustainability champion could perform this role.

First monitoring credit - Utility consumption

Energy consumption

11 Criterion 10 above is achieved.

12 Monitor and record data of the site energy consumption in kWh (and where relevant, litres of fuel used) as a result of the use of construction plant, equipment (mobile and fixed) and site accommodation (as relevant to the project type).

13 Report the total carbon dioxide emissions (total kg CO_2/project value) from the construction process via the BREEAM Assessment Scoring and Reporting tool (for the purposes of potential future BREEAM performance benchmarking).

Water consumption

14 Criterion 10 on the previous page is achieved.

15 Monitor and record data on the principal constructor's and subcontractors' potable water consumption (m^3) arising from the use of construction plant, equipment (mobile and fixed) and site accommodation (as relevant to the project type, see Compliance notes.

16 Using the collated data report the total net water consumption (m^3), i.e. consumption minus any recycled water use from the construction process via the BREEAM Assessment Scoring and Reporting tool (for the purposes of potential future BREEAM performance benchmarking).

Second monitoring credit - Transport of construction materials and waste

17 Criterion 10 on the previous page is achieved.

18 Monitor and record data on the transport movements and impacts resulting from delivery of the majority construction materials to the site and construction waste from the site. As a minimum this must cover:
- 18.a Transport of materials from the factory gate to the building site, including any transport, intermediate storage and distribution, see Relevant definitions on page 63.
- 18.b The scope of this monitoring must cover the following as a minimum:
  - 18.b.i Materials used for major building elements, (i.e. those defined as mandatory in the BREEAM International Mat 01 Calculator tool), including insulation materials
  - 18.b.ii Where within scope, ground works and landscaping materials.
- 18.c Transport of construction waste from the construction gate to waste disposal processing or the recovery centre gate. The scope of this monitoring must cover the construction waste groups outlined in the project's waste management plan.

19 Using the collated data, report separately for materials and waste, the total transport-related carbon dioxide emissions ($kgCO_2eq$) via the BREEAM Assessment Scoring and Reporting tool (for the purposes of potential future BREEAM performance benchmarking).

Exemplary level criteria

The following outlines the exemplary level criteria to achieve one innovation credit for this BREEAM issue:

20 Where the principal contractor has achieved compliance with a BREEAM 'compliant' organisational, local or national considerate construction scheme and their performance against the scheme has been confirmed by independent assessment and verification.

Checklists and tables

The project team are to complete this checklist. The assessor and project team must ensure that the intent of each section is met through actions appropriate to the site.

Table 9: Checklist of actions to minimise air and water pollution during construction works

Section	Action	Completed (Y/N)
Noise and vibration	Intent: To minimise the impact of noise and vibration in the local community.	
A	Plan the noisiest activities for times that will result in the least disturbance to the local community.	
B	Use noise control devices, e.g. temporary noise.	

Section	Action	Completed (Y/N)
C	Use barriers or deflectors for impact and blasting activities.	
D	Avoid or minimise transport through community areas.	
Air quality	Intent: To prevent dust and other air pollution on site and in the local community.	
A	Minimise dust from materials by using covers, storage, control equipment, and increasing moisture content.	
B	Minimise dust from vehicle movements, using water sprays if appropriate.	
C	Avoid burning of materials on site.	
Water run-off management	Intent: To prevent water pollution from on site activities.	
A	Prepare a drainage plan and mark manholes or water entry points to highlight risk areas. Note: this plan may change as the works progress.	
B	Where possible or appropriate, schedule works to avoid heavy rainfall periods (i.e. during the dry season) and modify activities during extreme rainfall and high winds.	
C	Contour and minimise length and steepness of slopes.	
D	Mulch to stabilise exposed areas or line steep channels or slopes, e.g. using jute matting.	
E	Revegetate areas promptly.	
F	Reduce or prevent off-site sediment transport through the use of settlement ponds, silt fences, or water treatment.	
G	Segregate or divert clean water run-off to prevent it mixing with water with a high solids content (therefore minimising the amount of water requiring treatment).	
H	Provide adequate drainage systems to minimise and control infiltration.	
I	Carry out any activities that could cause pollution in designated, bunded areas away from rivers, boreholes or other water courses.	
Hazardous materials	Intent: To prevent hazardous materials polluting local water courses.	

Section	Action	Completed (Y/N)
A	Provide adequate secondary containment for fuel storage tanks and for the temporary storage of other fluids such as lubricating oils and hydraulic fluids.	
B	Train workers on the correct transfer and handling of fuels and chemicals, and the response to spills.	
C	Use impervious surfaces for refuelling areas and other fluid transfer areas.	
D	Provide portable spill containment and clean-up equipment on site and train staff to use it.	
E	Provide adequate sanitation facilities serving all workers.	

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	Both options: All criteria relevant to the building type and function apply. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - Partially fitted and fully fitted		
CN2	Applicable assessment criteria - Single dwellings	Both options: All criteria relevant to the building type and function apply, see CN2.2 below for more detail on the sustainability champion role. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
CN2.1	Applicable assessment criteria - Multiple dwellings	Both options: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
CN2.2	Sustainability champion for single dwellings	For single dwellings a BREEAM International New Construction Assessor can act as the Sustainability champion. In this situation it will still be necessary to manage any conflicts of interest that could arise.
General		

Ref	Terms	Description
CN3	BREEAM compliant organisational, local or national considerate construction schemes	Where a considerate construction or constructors' scheme exists and is not listed as a BREEAM compliant scheme, the scheme administrator or operator can apply to BRE Global for recognition as a compliant scheme. Prior to any application, the operator should first review their scheme against the requirements of Appendix G – Considerate constructor scheme requirements on page 415. If they believe their scheme demonstrates equivalence with Appendix G – Considerate constructor scheme requirements on page 415, they should contact BRE Global. BRE Global will review the scheme and, if appropriate, add it to the list of compliant schemes and define appropriate benchmarks of performance for achieving BREEAM credits using the scheme.
CN3.1	Site timber and reusable formwork. See criterion 1 on page 56.	Reusable timber formwork itself does not automatically comply. All timber used in the manufacture of the formwork must be either initially reclaimed, or 'legally harvested and traded' (see Mat 03 Responsible sourcing of construction products – Relevant definitions on page 292).
CN3.2	Environmental management system (EMS)	The EMS can be developed following guidance in the WRAP publication 'Your Guide to Environmental Management Systems', which can be downloaded from the WRAP website. While a UK based document, this guide follows the requirements of ISO 14001 and EMAS; however certification against ISO 14001, EMAS or the equivalent standard will be required to demonstrate compliance with criterion 3 on page 56.
CN3.3	Frequency of site monitoring. See criterion 5 on page 57.	In this context, visits should occur at key stages of the construction process, at times where: — Works can be observed before they are covered up or new works or trades start; where significant risks of conflicts or errors could occur — Timing is critical to demonstrating compliance — Key evidence is required to be produced at specific times including, but not limited to, photographic, delivery notes and other documentary evidence — Different trades and systems come together and one could harm the integrity or compliance of another system's performance against BREEAM requirements.
CN3.4	Independent assessment and verification	An assessment of the site activities against Checklist A1 on page 418 which is carried out by an individual who can demonstrate their independence from the project delivery, i.e. someone not employed by (or working under a contract for) the contractor's organisation. The individual must have at least five years experience working within the construction industry, either as a contractor or as part of a design team. Where the assessor meets the criteria above, they can fulfil this role.
CN3.5	Compliance with Considerate Contractor Checklist	In instances where items in Checklist A1 on page 418 are not relevant due to the scope of works on site, the assessor should seek guidance from BRE Global on the appropriate number of items required.

Ref	Terms	Description
CN3.6	National health and safety regulations and best practice	Where there are no national health and safety regulations in the country of assessment, evidence is required to demonstrate that EITHER: — The principal contractor has an occupational health and safety management system compliant with OHSAS 18001:2007 OR — Works will be carried out in accordance with the International Labour Association's Safety and health in construction Code of Practice.
CN3.7	Water Consumption	Where there is no water use associated with construction plant, equipment (mobile and fixed) and site accommodation, the requirement for monitoring water consumption is not required.

Methodology

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
All	Relevant section or clauses of the building specification or contract. OR A signed and dated letter of commitment to meet the relevant criteria.	Name of the individuals responsible for monitoring, recording and reporting data resulting from all construction processes. Summary details of the monitoring and data gathering mechanism, protocols or system used to collate and process the relevant data. Collated construction phase data or information as follows: — Total site energy consumption by fuel type or total carbon dioxide emissions — Total site net water consumption (m^3) — For both materials and waste, the total fuel consumption by type or total carbon dioxide emissions plus total distance travelled (km). For certified and non-certified site timber, evidence as required for BREEAM issue Mat 03 Responsible sourcing of construction products on page 282. A copy of the principal contractors EMS/EMAS certificate. Copies of the documented procedures used on site for working to best practice pollution management guidelines. A letter from the principal contractor confirming: — Procedures for pollution management and mitigation were implemented — Name or job title of the individual responsible for monitoring and managing construction site impacts throughout the project.

Additional information

Relevant definitions

BREEAM Advisory Professional (AP)

Refer to Man 01 Project brief and design on page 44.

Construction processes

The construction process includes the enabling works, assembly, installation and disassembly 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 a development project.

Factory gate

For the purposes of this issue, the factory gate is defined as being the product manufacturer 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.

Legally harvested and traded timber

Refer to Mat 03 Responsible sourcing of construction products on page 282.

Principal contractor

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

Sustainability champion (construction)

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

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

Sustainability Champions are trained and qualified to provide BREEAM-related advice to the design team to facilitate timely and successful target setting, scheduling, prioritisation and monitoring of BREEAM compliance relating to the design of the building. They will be subject to ongoing training and competency requirements to ensure that their knowledge is maintained. Providers of schemes or qualifications not listed, who feel their members meet this definition and who would like to be listed as approved membership schemes, should contact BRE Global.

Note: The aim of the sustainability champion credits is to encourage an integrated design and construction process that uses BREEAM as a framework for establishing, agreeing and achieving the desired level of sustainability performance for the project. The sustainability champion credits in this BREEAM issue focus on achieving this objective through the provision of appropriate expertise during the Construction, Handover and Close Out stages of the project.

BRE site sustainability manager

An individual qualified by BRE to help ensure quality in project delivery and to minimise the environmental impacts of the construction process, as well as achieving the intentions of the building designers. They are based on site and ensure that the construction site is managed in an environmentally efficient manner and that the site teams are confident in achieving the exacting regulations and requirements of environmental certification schemes, for example BREEAM. Only qualified individuals who are members of BRE's associated membership scheme and are registered to the scheme throughout the period of construction 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.

Other information

CO_2 reporting protocols

At the time of publication, the following guidance is available for CO_2 measuring protocols.

1. Encord (www.encord.org): They have launched a CO_2 reporting protocol.
2. GHG Protocol (www.ghgprotocol.org)

Tools for monitoring and targeting construction site impacts

SMARTWaste is an online environmental reporting tool for the construction industry. It enables organisations to efficiently capture, monitor and report on:

- Waste (including Site Waste Management Plans & Pre-Demolition Audits)
- Energy (including conversion to carbon dioxide emissions)
- Water
- Responsibly sourced materials (including timber)
- Transport
- Considerate Contractors Scheme.

Used to meet the criteria of this issue and as a source of evidence for demonstrating compliance, SMARTWaste helps organisations to reduce their environmental impacts, making substantial time and cost savings.

More information about SMARTWaste can be found at: www.smartwaste.co.uk.

The International Finance Corporation website provides information relating to this issue, i.e. the IFC World Bank Group - Environmental, Health and Safety (EHS) Guidelines.

Considerate construction practices

The following are examples of considerate construction practices that provide possible ways of meeting the criteria for single dwellings. Further examples can be found at the Considerate Contractors Scheme website under Examples of Good Practices.

1. Keeping the site clean and tidy:
   a. Ensure there is no loose materials or debris lying around the site including the perimeter
   b. Vehicles are regularly checked for cleanliness
   c. Implement a 'Tidy Friday' initiative.
2. Reduce the impacts to the community:
   a. Schedule the timing of deliveries to the site to avoid disturbance to local residents
   b. Ensure that any noisy work is carried out at agreed times with adjoining neighbours
   c. Record car registration numbers of all operatives in the event that a complaint was made with regard to nuisance parking.
3. A drive for continuous improvements in safety:
   a. Toolbox talks on safety matters
   b. Passport or helmet stickers for operatives who have successfully completed health and safety training
   c. Near miss reporting procedure.
4. A commitment to respect and provide fair treatment of all workers:
   a. A 'Respect for people' wall chart displayed, recording satisfaction levels with welfare and other relevant topics
   b. Questionnaires issued to all operatives to establish what can be done to improve working conditions
   c. Information on dealing with abusive behaviour.
5. Provide suitable site facilities:
   a. Suitable toilet facilities for male and female operatives
   b. Rest areas for operatives to have breaks away from work areas
   c. Suitable first aid facilities.

Man 04 Commissioning and handover (all buildings)

Number of credits available	Minimum standards
4	Yes

Aim

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

Assessment criteria

This issue is split into four parts:

- Commissioning and testing schedule and responsibilities (1 credit)
- Commissioning building services (1 credit)
- Testing and inspecting building fabric (1 credit)
- Handover (1 credit)

The following is required to demonstrate compliance:

One credit - Commissioning and testing schedule and responsibilities

1 There is a schedule of commissioning and testing that identifies the appropriate commissioning required for the scope of works. The schedule includes a suitable timescale for commissioning and recommissioning of building services and control systems, as well as testing and inspecting the building fabric.

2 The schedule will identify the appropriate standards that all commissioning activities will be conducted in accordance with. This will include national best practice commissioning codes or other appropriate standards, where applicable. Where a building management system (BMS) is specified, refer to compliance note CN3.2 on page 69 on BMS commissioning procedures.

3 An appropriate project team member is appointed to monitor and programme pre-commissioning, commissioning and testing. Where necessary, this will include recommissioning activities on behalf of the client.

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

One credit - Commissioning building services

5 The commissioning and testing schedule and responsibilities credit is achieved.

6 For complex building services and systems, a specialist commissioning manager is appointed during the design stage (by either the client or contractor) with responsibility for:
- 6.a Undertaking design reviews and giving advice on suitability for ease of commissioning
- 6.b Providing commissioning management input to construction programming and during installation stages
- 6.c Management of commissioning, performance testing and handover or post-handover stages.

6.d For simple building services, this role can be carried out by an appropriate project team member (see criterion 3 on the previous page), provided they are not involved in the general installation works for the building services systems.

One credit - Testing and inspecting building fabric

7 The commissioning and testing schedule and responsibilities credit is achieved.

8 The integrity of the building fabric, including continuity of insulation, avoidance of thermal bridging and air leakage paths is quality assured through completion of post-construction testing and inspection. Dependent on the building type or construction, this can be demonstrated through the completion of a thermographic survey, as well as an airtightness test and inspection (see compliance notes CN3.3 and CN3.4 on page 70. The survey and testing is undertaken by a suitably qualified professional (see Relevant definitions on page 71) in accordance with the appropriate standard.

9 Any defects identified in the site inspection, thermographic survey and the airtightness testing reports are rectified 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.

One credit - Handover

10 A building or home user guide is developed, prior to handover for distribution to the building occupiers and premises managers (see Relevant definitions on page 71). 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.

11 A training schedule is prepared for building occupiers or premises managers, timed appropriately around handover and proposed occupation plans, which includes the following content as a minimum:

11.a The design intent of the building

11.b The available aftercare provision and aftercare team main contacts, including any scheduled seasonal commissioning and post occupancy evaluation

11.c Introduction to, and demonstration of, installed systems and key features, particularly BMSs, controls and their interfaces, to ensure they are fully conversant with the detailed operation of the building

11.d Introduction to the building user guide and other relevant building documentation, e.g. design data, technical guides, maintenance strategy, operations and maintenance (O&M) manual, commissioning records, log book etc.

11.e Maintenance requirements, including any maintenance contracts and regimes in place.

Checklists and tables

None.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	**Commissioning and testing schedule and responsibilities, commissioning building services, criteria 1 to 6 on page 66** Shell only: These criteria are not applicable. Shell and core: With regard to the scope of services being specified or installed, all criteria relevant to the building type and function apply. **Testing and inspecting building fabric, criteria 7 to 9 on the previous page** Shell only: criteria **8** and **9 on the previous page** Shell and core: All criteria relevant to the building type and function apply **Handover, criteria 10 and 11 on the previous page** Shell only: These criteria are not applicable. Shell and core: Criterion **10 on the previous page** only is applicable. The guide includes, 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. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - Partially fitted and fully fitted		
CN2	Applicable assessment criteria - Single dwellings	**Commissioning and testing schedule and responsibilities, commissioning building services, criteria 1 to 6 on page 66** Both options: These criteria do not apply. **Testing and inspecting building fabric, criteria 7 to 9 on the previous page** Both options: These criteria do not apply. **Handover, criteria 10 and 11 on the previous page** Both options: Criterion **10 on the previous page** only is applicable. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.

Ref	Terms	Description
CN2.1	Applicable assessment criteria - Multiple dwellings	**Commissioning and testing schedule and responsibilities, commissioning building services, criteria 1 to 6 on page 66** Partially fitted: With regard to the scope of services being specified or installed, all criteria relevant to the building type and function apply. Fully fitted: All criteria relevant to the building type and function apply. **Testing and inspecting building fabric , criteria 7 on page 67 to 9 on page 67** Both options: All criteria relevant to the building type and function apply. **Handover, criteria 10 and 11 on page 67** Partially fitted: The home user guide includes, as far as possible, all relevant sections regarding the services and fabric installed. Fully fitted: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN3	National best practice commissioning codes	Please refer to the Approved Standards and Weightings List (ASWL) to locate the appropriate national building regulations and best practice commissioning codes in the county of assessment. Alternatively, please demonstrate that the minimum requirements as set out in the Approved standards and weightings list are covered by the proposed documents. Where appropriate commissioning codes do not exist for a country, the design team should demonstrate compliance with the UK or European standards as listed in each relevant country reference sheet.
CN3.1	Process-related equipment. See criterion 2 on page 66.	Any process or manufacture-related equipment specified as part of the project may be excluded from the assessment of the commissioning credits, except where they form an integral part of the building HVAC services, such as some heat recovery systems.
CN3.2	BMS commissioning procedures. See criterion 2 on page 66.	Where a BMS is specified, the following commissioning procedures must be carried out: 1. Commissioning of air and water systems is carried out when all control devices are installed, wired and functional 2. In addition to air and water flow results, commissioning results include physical measurements of room temperatures, off-coil temperatures and other key parameters, as appropriate 3. The BMS or controls installation should be running in auto with satisfactory internal conditions prior to handover 4. All BMS schematics and graphics (if BMS is present) are fully installed and functional to user interface before handover 5. The occupier or facilities team is fully trained in the operation of the system.
CN3.3	Scope of the thermographic survey	The thermographic survey must cover 100% of the treated spaces, unless it is a large complex building (see CN3.4 on the next page), and ensure that all elements of the building fabric that enclose an internal heated or conditioned (treated) zone of the building will be tested. This includes internal walls separating treated and untreated zones.

Ref	Terms	Description
CN3.4	Thermographic survey of large complex buildings	In the case of large and complex buildings, e.g. airports, large hospitals and high-rise buildings, it may be impractical for the thermographic survey and air tightness testing to cover 100% of the building. Where a complete thermographic survey is deemed impractical by a Class/Category II thermographic surveyor, the guidance in air tightness standard ISO 9972:2015[5] should be followed on the extent of the survey and testing.
CN3.5	Appropriate standards for thermal imaging and air leakage testing (where applicable)	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. The other parts of this standard are still under development; until they are published the previous version will be applicable. ISO 6781:1983 Thermal performance of buildings - Qualitative detection of thermal irregularities in building envelopes - Infrared method. ISO 9972:2015 Thermal performance of buildings - Determination of air permeability of buildings - Fan pressurisation method.
CN3.6	Requirement for a thermographic survey AND air tightness testing	The requirement for this credit is to ensure continuity of insulation, and avoidance of thermal bridging and air leakage paths. How this is achieved is up to the judgment of the suitably qualified professional. Therefore there is no requirement to carry out both, unless this has been deemed necessary by a suitably qualified professional.
CN3.7	Remediation work	Any remediation work undertaken, resulting from a thermographic survey and air tightness 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. Where any defects are identified that relate to aspects that are outside of the scope of refurbishment works, these do not need to be remediated, e.g. where testing highlights that glazing has defects, but was not included in the scope of refurbishment works.
CN3.8	Thermographer qualification	The thermographic survey is normally undertaken by a suitably qualified professional classified and qualified as a Class/Category II in thermography (see Relevant definitions on the facing page). Where a Class/Category II thermographer is not available at the site, the survey may be undertaken by a Class/Category I thermographer and then the images interpreted by a Class/Category II thermographer.
CN3.9	Distribution of Home user guide for residential buildings	The Home user guide must be supplied to all dwellings in a development. Where the development is divided into multiple dwellings and whenever there are communal systems and features in place, one central building user guide should be provided covering the scope of the building owner or manager controlled areas and responsibilities. A separate building user guide should be provided for each individual dwelling with content appropriate to the residents and their interaction with the building and its systems.

Methodology

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
Commissioning and testing schedule and responsibilities, commissioning building services		
1–6 on page 66	Project budget. Programme of works. Appointment letter or commissioning responsibilities schedule. Relevant section or clauses of the building specification or contract. Main contractor's programme. Commissioning schedule.	Commissioning records or reports. Main contractor's programme. Commissioning schedule.
Testing and inspecting building fabric		
7–9 on page 67	Drawings clearly marked with the line of the thermal insulation barrier AND Confirmation that these details have been checked to verify the continuity of the thermal barrier.	Thermographic survey or air leakage report. Thermographic qualification (if applicable) OR Evidence of inspection to confirm continuity of the thermal barrier during the construction process. Confirmation of remedied defects identified by either the thermographic survey or air tightness testing.
Handover		
10–11 on page 67	Relevant section or clauses of the building specification or contract. OR A letter of commitment from the client or developer.	A copy of the building or home user guide. 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 schedule, with confirmation that it was (or will be) issued to the relevant people at the required time.

Additional information

Relevant definitions

Building user guide

Dedicated building or site-specific guidance for the non-technical building user. The purpose of the guide is to help building users access, understand and operate the building efficiently and in a manner in keeping with the original design intent. A building user guide should be written so that it will provide easily accessible and understandable information relevant to the following stakeholders:

- The building's staff (or where relevant, residents)
- The non-technical facilities management team or building manager
- Other building users, e.g. visitors, community users.

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

- Overview of the building and its environmental strategy, e.g. energy or water or waste efficiency policy or strategy and how users should engage with and deliver the policy or strategy
- Building services overview and access to controls, e.g. where to find them, what they control, how to operate them effectively and efficiently etc.
- Pre-arrival information for visitors, e.g. access and security procedures and provisions
- Provision of, and access to, shared facilities
- Safety and emergency information and instructions
- Building related operational procedures specific to the building type or operation, e.g. laboratories
- Building related incident reporting and feedback arrangements
- Provision of, and access to, transport facilities, e.g. public transport, cyclist facilities, pedestrian routes etc.
- Provision of, and access to, local amenities
- Re-fit, refurbishment and maintenance arrangements and considerations
- Links, references and relevant contact details.

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

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.

Home user guide

The aim of the Home user guide is to ensure the appropriate provision of guidance for the non-technical building user, so they can access, understand and operate the building efficiently and in a manner in keeping with the original design intent.

The guide should provide information relevant to the following stakeholders:

1. The building’s residents
2. The non-technical facilities management team or building manager
3. Other building users, e.g. visitors or community users.

The section titles of the Home user guide are provided below. For further details on the scope or content of the guide refer to Checklist A2 on page 425.

Part 1 – Operational issues

1. Environmental strategy, design and features
2. Energy
3. Water use
4. Recycling and waste
5. Links, references and further information
6. Provision of information in alternative formats.

Part 2 – Site and surroundings

1. Recycling and waste
2. Sustainable (urban) drainage systems (SuDS)
3. Public transport
4. Local amenities
5. Responsible purchasing
6. Emergency information
7. Links, references and further information.

Suitably qualified professionals - thermographic survey and airtightness testing

Airtightness testing: professionals with membership of an organisation maintaining accreditation by the relevant Accreditation Body (to fulfil the requirements of ISO 17024), or a nationally recognised competent persons scheme, e.g. ATTMA.

Thermographic survey: professionals holding a valid Category II in thermography, as defined by ISO 18436-7:2014 or Class II in infrared thermography as defined by ISO 6781-3:2015.

Other 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 Reduction of energy use and carbon emissions on page 150, 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.

Man 05 Aftercare

(all buildings)

Number of credits available	Minimum standards
3	Yes

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.

Assessment criteria

This issue is split into three parts:

- Aftercare support (1 credit)
- Seasonal commissioning (1 credit)
- Post-occupancy evaluation (1 credit)

The following is required to demonstrate compliance:

One credit - Aftercare support

1 There is (or will be) operational infrastructure and resources in place to provide aftercare support to the building occupiers, which includes the following as a minimum:
  1.a A meeting programmed to occur between the aftercare team or individual and the building occupier or management (prior to initial occupation, or as soon as possible thereafter) to:
    1.a.i Introduce the aftercare team or individual to the aftercare support available, including the building user guide (where existing) and training schedule and content
    1.a.ii Present key information about 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, to include a walkabout of the building and 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 Initial aftercare support provision for at least the first month of building occupation, e.g. on site attendance on a weekly basis to support building users and management (this could be more or less frequent depending on the complexity of the building and building operations)
  1.d Longer term aftercare support provision for occupants 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 There is (or will be) operational infrastructure and resources in place to coordinate the collection and monitoring of energy and water consumption data for a minimum of 12 months, once the building is occupied. This is done to facilitate analysis of discrepancies between actual and predicted performance, with a view to adjusting systems or user behaviours accordingly.

One credit - Seasonal commissioning

3 The following seasonal commissioning activities will be completed over a minimum 12-month period, once the building becomes substantially occupied:

3.a Complex systems - Specialist Commissioning Manager:
  3.a.i Testing of all building services under full load conditions, i.e. heating equipment in midwinter, cooling and ventilation equipment in midsummer, and under part load conditions (spring and autumn)
  3.a.ii Where applicable, testing should also be carried out during periods of extreme (high or low) occupancy
  3.a.iii Interviews with building occupants (where they are affected by the complex services) to identify problems or concerns regarding the effectiveness of the systems
  3.a.iv Recommissioning of systems (following any work needed to serve revised loads), and incorporating any revisions in operating procedures into the operations and maintenance (O&M) manuals.

3.b Simple systems (naturally ventilated) - external consultant or aftercare team or facilities manager:
  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 Take all reasonable steps to recommission systems following the review to take account of deficiencies identified and incorporate any relevant revisions in operating procedures into the O&M manuals.

One credit - Post-occupancy evaluation (POE)

4 The client or building occupier makes a commitment to carry out a POE exercise one year after initial building occupation. This is done to gain in-use performance feedback from building users to inform operational processes. This includes recommissioning activities, and to maintain or improve productivity, health, safety and comfort. The POE is carried out by an independent party (see Independent party on page 78) and needs to cover:

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

4.b Feedback from a wide range of building users including facilities management on the design and environmental conditions of the building covering:
  4.b.i Internal environmental conditions (light, noise, temperature, air quality)
  4.b.ii Control, operation and maintenance
  4.b.iii Facilities and amenities
  4.b.iv Access and layout
  4.b.v Other relevant issues.

4.c Sustainability performance (energy consumption, water consumption, performance of any sustainable features or technologies, e.g. materials, renewable energy, rainwater harvesting etc.).

5 The client or building occupier makes a commitment to carry out the appropriate dissemination of information on the building's post-occupancy performance. This is done to share good practice and lessons learned, inform changes in user behaviour, building operational processes and procedures, and system controls. Refer to CN3.1 and CN3.2 on page 77 for a definition of appropriate dissemination. This also provides advice on appropriate dissemination where the building or building information is commercially or security sensitive.

Exemplary level criteria

The following outlines the exemplary level criteria to achieve one innovation credit for this BREEAM issue:

6 There are, or will be, operational infrastructure and resources in place to coordinate the following activities at quarterly intervals for the first three years of building occupation:

6.a Collection of occupant satisfaction, energy consumption and (where available) water consumption data

6.b Analysis of the data to check the building is performing as expected, make any necessary adjustments to systems controls or to inform building user behaviours

6.c Setting targets or appropriate actions for reducing water and energy consumption and monitor progress towards these

6.d Feedback any 'lessons learned' to the design team and developer for use in future projects

6.e Provision of the actual annual building energy, water consumption and occupant satisfaction data to BRE.

Checklists and tables

None.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	Both options: This issue is not applicable. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - Partially fitted and fully fitted		
CN2	Applicable assessment criteria - Single dwellings	**Aftercare support and Seasonal commissioning: criteria 1to 3.b on the previous page.** Both options: All criteria relevant to the building type and function apply. **Post-occupancy evaluation and Exemplary level: criteria 4 to 6 on the previous page** Both options: These criteria are not applicable Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
CN2.1	Applicable assessment criteria - Multiple dwellings	Both options: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN3	Collection and monitoring of energy and water consumption data. See criteria 2 and 4 on the previous page.	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.

Ref	Terms	Description
CN3.1	Appropriate dissemination of POE information See criterion 5 on page 75.	1. Appropriate dissemination includes communication to immediate stakeholders such as building occupants, managers and owners. In addition information should be communicated externally. 2. Appropriate dissemination in most cases will be the production and publication of a building case study through one of the following means: a. The client's or building owner's own website, publicly available literature or press release b. Industry, sector, government or local authority sponsored website or information portals. Where there is a demonstrably justifiable reason why public dissemination is not possible, for example the information is commercially or security sensitive, compliance can be demonstrated by a commitment to produce and disseminate the relevant information at an organisational level or to appropriate internal or external stakeholders. Alternatively, the sensitive parts of the relevant information for dissemination can be omitted from the publication.
CN3.2	Relevant information for dissemination. See criterion 5 on page 75.	This includes the following information about the building and its performance: 1. A basic description of the project and building 2. BREEAM rating and score 3. The key innovative and low-impact design features of the building 4. Project cost 5. Project size: floor area, site area 6. Facilities available for community use (where relevant) 7. Any steps taken during the construction process to reduce environmental impacts, i.e. innovative construction management techniques 8. Predicted and actual carbon dioxide emissions or Energy Performance Certificate rating 9. Outcomes of the POE study to share lessons learned from the project including: a. Occupant feedback b. Energy and water consumption including renewable energy generation, level of rainwater or grey water provision

Methodology

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
Aftercare support		
1-2 on page 74	Evidence of a commitment or contract to provide compliant aftercare support and training.	Evidence of a contract to provide compliant aftercare support and training.
Seasonal commissioning		
3	Appointment letters or commissioning responsibilities schedule. Evidence of either existing procedures or a commitment or contract to put in place a mechanism to: 1. Collect, compare and analyse relevant data 2. Undertake suitable adjustments if necessary.	Seasonal commissioning records, reports or a letter of appointment and commissioning responsibilities schedule. Records of occupant interviews.
Post-occupancy evaluation (POE)		
4–5	A signed and dated commitment by the client or developer or future building occupier.	As design stage.
Exemplary level requirements		
6	Evidence as above (for the data collection and aftercare support credit), but from the end user.	Evidence as above (for the data collection and aftercare support credit), but from the end user.

Additional information

Relevant definitions

Complex systems

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

Specialist commissioning manager

The specialist commissioning manager is a specialist subcontractor rather than a general subcontractor.

Independent party

To comply with criterion 4 on page 75 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 POE exercise using a compliant method OR
2. If the POE is to be carried out by an organisation involved with the design of the building, e.g. the project architect, they must present the assessor with the evidence that demonstrates the independence of the POE process from the design process. BREEAM has not attempted to define what form this exercise must take; the onus is on the design team or relevant individual to clearly demonstrate to the BREEAM Assessor a credible level of independence.

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 models. Figures reported via the UK's Carbon Buzz website show that on average, buildings consume between 1.5 and 2.5 times the predicted values. When comparing predicted with actual values, an analysis should be carried out to understand why there may be discrepancies in performance. These discrepancies can be for a number of reasons including:

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

CIBSE TM54, Evaluating Operational Energy Performance of Buildings at the Design Stage, CIBSE, 2013 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', also provides additional guidance on this issue.

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. The following sources of benchmarking information are from the UK and are internationally recognised. Building performance benchmarks can be found in CIBSE Guidance including:

- Guide F: Energy Efficiency in Buildings
- CIBSE TM46: Energy Benchmarks
- CIBSE TM47: Operational Ratings and Display Energy Certificates.

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

POE Methodologies

The most relevant POE methodology that fulfils the criteria should be used. For example, in the UK, the building use studies (BUS) methodology was developed following a series of Government funded 'PROBE' building performance evaluation studies in 1995. The BUS methodology is used by independent licensed partners following a four part process. Further information can be found at: www.busmethodology.org.uk. BRE's Design Quality Method (DQM) is a tried and tested, independent, POE method used by all UK auditing authorities, and many funding bodies. Further information can be found at: www.bre.co.uk/dqm. Further guidance on POE:

- The BCO guide to Post Occupancy Evaluation (POE), British Council for Offices, 2007
- BRE Digest 478, Building performance feedback: getting started, Building Research Establishment, 2003
- Guide to Post Occupancy Evaluation Report and Toolkit, HEFCE, AUDE & University of Westminster, 2006.

Other information

Soft Landings Framework[6]

A framework written and produced by the Usable Buildings Trust (UBT) and the Building Services Research and Information Association (BSRIA) that seeks to promote improved briefing, design, handover and building performance in-use. Embedding the principles of this framework within a project should ensure that the evidence is available to demonstrate compliance with particular aspects of the criteria under this BREEAM issue. Please also note that BSRIA has produced a BREEAM New Construction Soft landings interpretation note[7] for clients and design teams.

The Government Soft Landings (GSL) is a version of the Soft Landings concept tailored for use on public sector related projects to link in with the work of the Government's Building Information Modelling Task Group. It is to be mandated in 2016 alongside Building Information Modelling (BIM) Level 2 and is to be implemented by central Government departments. It should be noted that the GSL programme will become compulsory for local Government developments after 2016. Further information is available from: www.bimtaskgroup.org/Government Soft Landings.

Health and wellbeing

Summary

This category encourages the increased comfort, health and safety of building occupants, visitors and others within the vicinity. Issues in this section aim to enhance the quality of life in buildings by recognising those that encourage a healthy and safe internal and external environment for occupants.

Category summary table

Issue	Credits	Credit summary
Hea 01 Visual comfort	Up to 6 credits	— The potential for disabling glare has been designed out of all relevant building areas. — Good practice daylighting levels have been met. — Floor space in the relevant building areas has an adequate view out to reduce eye strain and provide a link to the outside. — Internal and external lighting systems are designed to avoid flicker and provide appropriate illuminance (lux) levels. — Internal lighting is zoned to allow for occupant control.
Hea 02 Indoor air quality	5	— Minimising sources of air pollution through careful design, specification and planning. — Building ventilation strategy is designed to be flexible and adaptable to potential future building occupant needs and climatic scenarios.
Hea 03 Safe containment in laboratories	2	— Production of an objective risk assessment of the proposed laboratory facilities. — Containment devices such as fume cupboards meet best practice safety and performance requirements and objectives. — Containment level 2 and 3 laboratory facilities to meet best practice safety and performance criteria where specified.
Hea 04 Thermal comfort	3	— Thermal modelling carried out to appropriate standards. — Projected climate change scenarios considered as part of the thermal model. — The thermal modelling analysis has informed the temperature control strategy for the building and its users.

Hea 05 Acoustic performance	Up to 4 credits	— The building meets appropriate acoustic performance standards and testing requirements in terms of:
		  — Sound insulation
		  — Indoor ambient noise levels
		  — Reverberation times.

Issue	Credits	Credit summary
Hea 06 Accessibility	2	— Provision of effective measures which support safe access to and from the building. — Security needs are understood and taken into account in the design and specification.
Hea 07 Hazards	1	— Risk assessment for natural hazards that may affect the building and the implementation of measures to mitigate any risks.
Hea 08 Private space	1	— Provision of outdoor space which gives privacy and a sense of wellbeing.
Hea 09 Water quality	1	— Reduction of water contamination risk and provision of clean fresh sources of water.

Hea 01 Visual comfort

(all buildings)

Number of credits available	Minimum standards
Building type dependent	Yes (criterion 1 only)

Aim

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

Assessment criteria

This issue is split into five parts:

- Prerequisite
- Glare control (1 credit)
- Daylighting (up to 4 credits - building type dependent)
- View out (1 credit)
- Internal and external lighting (1 credit)

The following is required to demonstrate compliance:

Prerequisite

1 All fluorescent and compact fluorescent lamps are fitted with high frequency ballasts.

One credit - Glare control

2 The potential for glare has been designed out of all relevant building areas using a glare control strategy, either through building form and layout or building design measures (see compliance note CN3.1 on page 91).

3 The glare control strategy avoids increasing lighting energy consumption by ensuring that:

3.a The glare control system is designed to maximise daylight levels under all conditions while avoiding disabling glare in the workplace or other sensitive areas. The system should not inhibit daylight from entering the space under cloudy conditions, or when sunlight is not on the façade

AND

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

Up to four credits - Daylighting (building type dependent)

4 Daylighting criteria have been met using either of the following options:

4.a The relevant building areas meet good practice daylight factors and other criteria as outlined in Table 10 on the next page and Table 11 on page 86

OR

4.b The relevant building areas meet good practice average and minimum point daylight illuminance criteria as outlined in Table 12 on page 86.

Table 10: Minimum values of average daylight factor required

Building or area type	Average daylight factor required by latitude (degrees)						Minimum area (m²) to comply		Other requirements
	≤ 40	40-45	45-50	50-55	55-60	≥ 60	1 credit	2 credits	
Education buildings (up to 2 credits available)									
Preschools, schools - occupied spaces	1.5%	1.7%	1.8%	2.0%	2.1%	2.2%	-	80%	EITHER (a) OR {(b) and (c)} in Table 11 on page 86
Universities, colleges and higher education - occupied spaces	1.5%	1.7%	1.8%	2.0%	2.1%	2.2%	60%	80%	
Residential institutions (1 credit available*)									
Kitchen	1.5%	1.7%	1.8%	2.0%	2.1%	2.2%	80%	-	EITHER (a) OR (c) in Table 11 on page 86
Living rooms, dining rooms, studies (including workspaces in hotel bedrooms or suites)	1.2%	1.3%	1.4%	1.5%	1.6%	1.6%		-	
Non-residential or communal occupied spaces	1.5%	1.7%	1.8%	2.0%	2.1%	2.2%		-	
Residential dwellings (4 credits available)**									
Kitchen	1.5%	1.7%	1.8%	2.0%	2.1%	2.2%	-	80%	(b) in Table 11 on page 86
Living rooms, dining rooms, studies (including home offices)	1.2%	1.3%	1.4%	1.5%	1.6%	1.6%	-	80%	
Retail buildings (2 credits available)**									

Building or area type	Average daylight factor required by latitude (degrees)						Minimum area (m^2) to comply		Other requirements
	≤ 40	40-45	45-50	50-55	55-60	≥ 60	1 credit	2 credits	
Sales areas	1.5%	1.7%	1.8%	2.0%	2.1%	2.2%	35%	-	-
Other occupied areas	1.5%	1.7%	1.8%	2.0%	2.1%	2.2%	80%	-	EITHER (a) OR {(b) and (c)} in Table 11 on the next page
Industrial, office, and all other building types (1 credit available*)									
Internal association or atrium area	2.3%	2.5%	2.8%	3.0%	3.1%	3.2%	80%	-	EITHER (a) OR {(b) and (c)} in Table 11 on the next page
Teaching, lecture and seminar spaces	1.5%	1.7%	1.8%	2.0%	2.1%	2.2%		-	
All occupied spaces, unless indicated in Relevant definitions on page 95	1.5%	1.7%	1.8%	2.0%	2.1%	2.2%		-	
Notes: * All spaces must comply to achieve 1 credit. ** Each space can be awarded credits independently.									

Table 11: Daylighting uniformity criteria

Ref	Criteria
(a)	A uniformity ratio of at least 0.3 or a minimum point daylight factor of at least 0.3 times the relevant average daylight factor value in Table 10 on page 84. Spaces with glazed roofs, such as atria, must achieve a uniformity ratio of at least 0.7 or a minimum point daylight factor of at least 0.7 times the relevant average daylight factor value in Table 10 on page 84.
(b)	At least 80% of the room has a view of sky from desk or table top height (0.85m in residential buildings and residential institutions, 0.7m in other buildings).
(c)	The room depth criterion d/w +d/HW < 2/(1-RB) is satisfied. Where: d = room depth. w = room width. HW = window head height from floor level. RB = average reflectance of surfaces in the rear half of the room. Note: Table 16 on page 90 gives maximum room depths in metres for different room widths and window head heights of side-lit rooms.

Table 12: Space type and illuminance requirements - both criteria (average illuminance and minimum point illuminance) should be met

Area type	Minimum area to comply		Average daylight illuminance (averaged over entire space)	Minimum daylight illuminance at worst lit point
	1 credit	2 credits		
Education buildings (up to 2 credits available)				
Preschools, schools - 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
Universities, colleges and higher education - occupied spaces	60%			
Residential institutions (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
Living rooms, dining rooms, studies (including home offices)		-	At least 100 lux for 3450 hours per year or more	At least 30 lux for 3450 hours per year or more

Area type	Minimum area to comply 1 credit	Minimum area to comply 2 credits	Average daylight illuminance (averaged over entire space)	Minimum daylight illuminance at worst lit point
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
Residential dwellings (4 credits 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
Living rooms, dining rooms, studies (including home offices)	-	100%	At least 100 lux for 3450 hours per year or more	At least 30 lux for 3450 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	
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
Industrial and Office 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
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 Relevant definitions on page 95		-	At least 300 lux for 2000 hours per year or more	At least 90 lux for 2000 hours per year or more
Notes: * All spaces must comply to achieve 1 credit. ** Each space can be awarded credits independently.				

One credit - View out

5 Where 95% of the floor area space within relevant building areas are within X metres of a window or permanent opening that provides an adequate view out, as outlined in Table 13 below

6 In addition, the building type criteria in Table 14 below are applicable to view out criteria.

Table 13: 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 (in m) from window to workspace or desk (X)	Window or opening size (as % of surrounding wall area)
7m or less	20%
8m–11m	25%
11m–14m	30%
14m or more	35%

Table 14: View out building specific requirements

Building type	View out requirements
Residential buildings and residential institutions	**Self-contained flats - living rooms** **Sheltered housing - communal lounges, individual bedrooms and bedsits** All positions within relevant areas are to be within 5m 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.

One credit - Internal and external lighting levels, zoning and control

Internal lighting

7 Internal lighting in all relevant areas of the building is designed to provide an illuminance (lux) level appropriate to the tasks undertaken, accounting for building user concentration and comfort levels. This can be demonstrated through a lighting design strategy that provides illuminance levels in accordance with national best practice lighting guides (see CN3.10 on page 93).

8 The uniformity of illuminance due to electric lighting is as per the recommendation in the approved local standard.

9 For areas where computer screens are regularly used, confirmation is required that the lighting has been designed to limit the potential for glare in accordance with a numerical glare limit specified within national best practice lighting guides . These should include:

- 9.a Limits to the luminance of the luminaires to avoid screen reflections. Manufacturers' data for the luminaires should be sought to confirm this
- 9.b For 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
- 9.c Recommendations for direct lighting, ceiling illuminance, and average wall illuminance.

External lighting

10 All external lighting located within the construction zone is designed to provide illuminance levels that enable users to perform outdoor visual tasks efficiently and accurately, especially during the night. To demonstrate this, external lighting provided is specified in accordance with EN 13201 series Road Lighting and EN 12464-2:2014 Light and lighting - Lighting of work places - Part 2: Outdoor work places.

Zoning and occupant control

11 Internal lighting is zoned to allow for occupant control (see Relevant definitions on page 95) in accordance with the criteria below for relevant areas present within the building:
- 11.a In office areas, zones of no more than four workplaces
- 11.b Workstations adjacent to windows or atria and other building areas separately zoned and controlled
- 11.c Seminar and lecture rooms: zoned for presentation and audience areas
- 11.d Library spaces: separate zoning of stacks, reading and counter areas
- 11.e Teaching space or demonstration area
- 11.f Whiteboard or display screen
- 11.g Auditoria: zoning of seating areas, circulation space and lectern area
- 11.h Dining, restaurant, café areas: separate zoning of servery and seating or dining areas
- 11.i Retail: separate zoning of display and counter areas
- 11.j Bar areas: separate zoning of bar and seating areas
- 11.k Day rooms, waiting areas: zoning of seating and activity areas and circulation space with controls accessible to staff
- 11.l Hotel bedrooms: separate zoning of hallway, bathroom, desk and sleeping area (where present in the room).

12 Areas used for teaching, seminar or lecture purposes have lighting controls specified in accordance with the size and use of the space, but a typical auditorium or lecture theatre with stepped seating and a formal lectern or demonstration or performance area would typically be expected to have lighting controls as follows:
- 12.a Full normal lighting (to allow for entry and exit, cleaning etc.)
- 12.b 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)
- 12.c All lighting off (for the projection of tone slides, colour slides, and for the purposes of visual demonstrations or performances)
- 12.d Separate localised lectern lighting.

13 In addition the building type criteria in Table 15 below (where relevant).

Table 15: Internal and external lighting building specific 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.

Checklists and tables

Reflectance for maximum room depths and window head heights

Table 16 on the next page gives maximum room depths in metres for different room widths and window head heights of side-lit rooms.

Table 16: Reflectance for maximum room depths (m) and window head heights

Reflectance (RB)	0.4		0.5		0.6	
Room width (m)	3	10	3	10	3	10
Window head height (m)						
2.5	4.5	6.7	5.4	8.0	6.8	10.0
3.0	5.0	7.7	6.0	9.2	7.5	11.5
3.5	5.4	8.6	6.5	10.4	8.1	13.0

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	**Prerequisite: criterion 1 on page 83** Both options: This criterion is not applicable. **Glare control: criteria 2 and 3 on page 83** Both options: These criteria are not applicable. **Daylighting: criterion 4 on page 83** Both options: All criteria relevant to the building type and function apply. **View out: criteria 5 and 6 on page 88** Both options: All criteria relevant to the building type and function apply. **Internal lighting, zoning and occupant control: criteria 7 to 9 on page 88, 11 to 13 on the previous page** Both options: These criteria are not applicable. **External lighting: criterion 10 on page 88** Both options: All criteria relevant to the building type and function apply. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
CN1.1	View out	Both options 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.
Residential - Partially fitted and fully fitted		

Ref	Terms	Description
CN2	Applicable assessment criteria - Single and multiple dwellings	**Prerequisite: criterion 1 on page 83** Both options: This criterion is not applicable. **Glare control: criteria 2 and 3 on page 83** Both options: These criteria are not applicable. **Daylighting: criterion 4 on page 83** Both options: All criteria relevant to the building type and function apply. **View out: criteria 5 and 6 on page 88** Both options: These criteria are not applicable. **Internal lighting, zoning and occupant control: criteria 7 to 9 on page 88, 11 to 13** Partially fitted: These criteria are not applicable. Fully fitted: All criteria relevant to the building type and function apply. **External lighting: criterion 10 on page 88** Partially fitted: These criteria are not applicable. Fully fitted: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN3	Building location (choosing the most appropriate daylight factors)	The average daylight factor and uniformity criteria Table 10 on page 84 and Table 11 on page 86. For hot or sunny locations with predominantly clear skies, especially those at latitudes much less than 40 degrees, it is better to use the daylight illuminance criteria in Table 12 on page 86 instead. The daylight illuminance calculation should include the additional light available from clear and partly cloudy skies and reflected sunlight. In these locations, using the criteria in Table 10 on page 84 and Table 11 on page 86 may result in excessive solar heat gain.
Glare control		
CN3.1	Compliant forms of glare control - curtains as glare control	Compliant shading measures for meeting glare control criteria include: — Building integrated measures (e.g. low eaves) — Occupant controlled devices such as blinds (where transmittance value is less than 0.1 (10%) — Bioclimatic design — External shading or brise soleil. Glare control must provide shading from both high level summer and low level winter sun where relevant to the country of assessment (for example, latitudes of 40 degrees or more). Where using fixed systems, design studies can be used to demonstrate that sunlight is prevented from reaching building occupants during occupied hours. Curtains (where used without other forms of shading) do not meet the criteria for the glare control criteria, as they do not provide sufficient control to optimise daylight into the space. Furthermore, the use of curtains to control glare is likely to cause occupants to rely more on artificial lighting.

Ref	Terms	Description
Daylighting		
CN3.2	Percentage of assessed area. See criterion 4 on page 83.	Where the criteria specify that a percentage of floor area must be adequately illuminated by daylight, this refers to the percentage of the total floor area of all the rooms that must be assessed, i.e. the compliant area. If for example, a development has six rooms that must be assessed, each 150m² (total area 900m²) and 80% of this floor area must meet the criterion, then 720m² must comply with the criterion; this is equal to 4.8 rooms. The number of rooms that must comply must always be rounded up; therefore in this example, five rooms must have an average daylight factor of 2% or more (plus meet the other criteria) to achieve the credit.
CN3.3	External obstructions	In calculating minimum and average daylight factors and daylight illuminances, external obstructions should be taken into account. For illuminance calculations, the reflectance of external obstructions should be taken as 0.2 unless on site measurements of external reflectance have been made.
CN3.4	Dirt factors when calculating daylight	Daylight calculations should include a maintenance factor for dirt on the windows. An example is given in British Standard Code of Practice for daylighting, BS 8206 Part 2, appendix A1.3.
CN3.5	Borrowed light	For areas where borrowed light is used to demonstrate compliance with daylighting criteria, calculations or results from appropriate lighting design software must be provided to demonstrate that such areas meet the BREEAM criteria (if the light from these sources is required in order for the room to comply). Examples of borrowed light include: light shelves, clerestory glazing, sun pipes or internal translucent or transparent partitions (such as those using frosted glass).
CN3.6	Room depth criterion - rooms lit from two opposite sides	For rooms lit by windows on two opposite sides, the maximum room depth that can be satisfactorily illuminated by daylight is twice the limiting room depth (d) (measured from window wall to window wall; CIBSE Lighting Guide LG10[8]. The reflectance of the imaginary internal wall should be taken as 1.
CN3.7	Uniformity with rooflights	The room depth criteria cannot be used where the lighting strategy relies on rooflights. In such areas either appropriate software has to be used to calculate the uniformity ratio or, in the case of a regular array of rooflights across the whole of the space, figure 2.36 (page 37) within CIBSE Lighting Guide LG10 can be used to determine the uniformity ratio.
CN3.8	Daylighting - uniformity ratio calculation	The uniformity ratio calculation, minimum point daylight factor and minimum daylight illuminance can exclude areas within 0.5m of walls. Areas within 0.5m are not regarded as part of the working plane for this purpose, although they are included in the average daylight factor and average daylight illuminance calculations.

Ref	Terms	Description
CN3.9	View of sky requirement. See criterion 4 on page 83.	To comply with the view of sky criteria (ref (b)) in Table 11 on page 86, at least 80% of the room that complies with the average daylight factor requirement must receive direct light from the sky, i.e. it is permissible for up to 20% of the room not to meet the view of sky requirement and still achieve a compliant room.
Internal and external lighting levels or zoning and control		
CN3.10	National best practice lighting guides	Please refer to the country-specific reference sheet to locate the appropriate best practice lighting guidance in the country of assessment. Alternatively the minimum requirements as set out in the Approved standards and weightings list are covered by the proposed documents. Where appropriate lighting guides do not exist for a country, the design team should demonstrate compliance with the European standards EN 12464-1 Light and lighting - Lighting of workspaces, 2011 and EN 12464-2 Lighting of work places - Part 2: Outdoor work places, 2007.
CN3.11	Occupancy and workstation layout unknown	Where occupancy or workstation layout is not known, lighting control can be zoned on the basis of $40m^2$ grids, i.e. an assumption of 1 person or workspace per $10m^2$.
CN3.12	Small spaces	Buildings consisting entirely of small rooms or spaces (less than $40m^2$) which do not require any subdivision of lighting zones or control will meet the zoning criteria by default.
CN3.13	Zones of four workspaces	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 personable work area. The relevant design team member, e.g. a lighting consultant, should set out how this is to be achieved in such an instance.
CN3.14	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 or demonstration or performance area would typically be expected to have lighting controls as follows: 1. Full normal lighting (to allow for entry and 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.

Ref	Terms	Description
CN3.15	No 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 and the credit can be awarded on the basis of compliance with the internal lighting criteria. 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).
CN3.16	Zoning rooms not listed	For zoning rooms or spaces not listed within criteria 11 and 12 on page 89, 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.
CN3.17	Lighting levels for areas where computer screens are regularly used	Projects can specify 300 lux instead of what is prescribed in EN 12464:2011. This is as per CIBSE Lighting Guide 7.
Building type specific		
CN4	Education (preschools) and acute special educational needs controls for children	Where child care or acute special educational needs spaces are included within the scope of the assessment, controls should be provided for the teacher or member of staff, i.e. it is not a necessity for the controls to be accessible to the children. Where nursery spaces are included within the scope of the assessment, controls should be provided for the member of staff, not the nursery school children.
CN4.1	Hotels - 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.

Methodology

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
Daylighting		
All	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.	BREEAM Assessor's site inspection report and photographic evidence OR As-built drawings and calculations OR Confirmation from the design team that daylighting is in accordance with national best practice daylighting guidelines or BREEAM requirements.
View out and glare requirements		
All	Design drawings. Relevant section or clauses of the building specification or contract. Window schedule.	BREEAM Assessor's site inspection report and photographic evidence. As-built drawings. Formal confirmation of compliance from the contractor or design team.
Internal and external lighting		
All	Design drawings or room data sheets or schedules. Relevant section or clauses of the building specification or contract OR A letter of formal confirmation of compliance from the relevant design team member.	BREEAM Assessor's site inspection report and photographic evidence. As-built drawings. Formal confirmation of compliance from the contractor or design team.

Additional information

Relevant 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 (1.2–1.3m) within the relevant building areas and should ideally be through an external window. A view into an internal courtyard or atrium will comply provided the distance from the opening to the back wall of the courtyard or atrium is at least 10m (therefore allowing enough distance for the eyes to refocus). The view cannot be an internal view across the room, as this is likely to become obstructed by partitions, filing cabinets etc.

Average daylight factor

The average daylight factor is the average indoor illuminance (from daylight) on the working plane within a room, expressed as a percentage of the simultaneous outdoor illuminance on a horizontal plane under an unobstructed CIE Standard Overcast Sky.

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, and 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.

Point daylight factor

A point daylight factor is the ratio between the illuminance (from daylight) at a specific point on the working plane within a room, expressed as a percentage of the illuminance received on an outdoor unobstructed horizontal plane. This is based on an assumed overcast sky, approximated by the 'CIE (Commission Internationale de l'Eclairage) overcast sky'. The minimum point daylight factor is the lowest value of the daylight factor on the working plane at a point that is not within 0.5m of a wall. Similarly the minimum illuminance is calculated at the worst lit point on the working plane that is not within 0.5m of a wall. These points will usually be close to a rear corner of the room. Computer simulations are the most appropriate tools to allow for point daylight factors and illuminances to be calculated.

Relevant building areas:

Daylighting

For the purpose of BREEAM this is defined as areas within the building where good daylighting is considered to be of benefit to the building users (typically those areas occupied continuously for 30 minutes or more). This includes the following (where occupied continuously for 30 minutes or more) 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 at all times
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.

Glare control

For glare control include areas of the building where lighting and resultant glare could be problematic for users, e.g. those areas that have been designed to contain or use workstations, projector screens etc. and sports halls. Spaces in the categories described above, for which daylight and view out are excluded, should not be assessed against the glare control criteria.

Internal and 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 and the credit can be awarded on the basis of compliance with the internal lighting criteria. 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).

Reflectance

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

Separate zoning 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.

Surrounding wall area

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

Uniformity

The uniformity is the ratio between the minimum illuminance (from daylight) on the working plane within a room (or minimum daylight factor) and the average illuminance (from daylight) on the same working plane (or average daylight factor).

View of sky

Areas of the working plane have a view of sky when they receive direct light from the sky, i.e. when the sky can be seen from working plane height.

View out

BREEAM defines relevant building areas requiring a view out to include areas of the building where:

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. A view out is deemed to be of benefit to the building occupants, e.g. in spaces where occupants are likely to spend a significant amount of time.

Excluded areas for each of these might include:

- Conference rooms, lecture theatres, sports halls, acute SEN and also any spaces where the exclusion or limitation of natural light is a functional requirement, e.g. laboratories, media spaces, etc.

Working plane

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

Other information

None.

Hea 02 Indoor air quality

(all buildings)

Number of credits available	Minimum standards
Building type dependent	Yes (criterion 1 below)

Aim

To recognise and encourage a healthy internal environment through the specification and installation of appropriate ventilation, equipment and finishes.

Assessment criteria

This issue is split into three parts:

- Prerequisite - avoidance of asbestos
- Minimising sources of air pollution (4 credits)
- Adaptability - potential for natural ventilation (1 credit)

The following is required to demonstrate compliance:

Prerequisite

1 Materials containing asbestos are prohibited from being specified and used within the building.

Minimising sources of air pollution

One credit - Indoor air quality (IAQ) plan

2 An indoor air quality plan has been produced and implemented, with the objective of facilitating a process that leads to design, specification and installation decisions and actions that minimise indoor air pollution during the design, construction and occupation of the building. The indoor air quality plan must consider the following:
 2.a Removal of contaminant sources
 2.b Dilution and control of contaminant sources
 2.c Procedures for pre-occupancy flush out
 2.d Third party testing and analysis
 2.e Maintaining indoor air quality in-use

One credit - Ventilation

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

3 Criterion 2 above has been achieved.

4 Provide fresh air into the building in accordance with the criteria of the national best practice standard for ventilation.

5 The location of fresh air intakes are designed to minimise the entry of air pollutants into the building, as follows:
 5.a In air-conditioned and mixed-mode buildings or spaces:

5.a.i The location of the building's air intakes and exhausts, in relation to each other and external sources of pollution, is designed in accordance with EN 13779:2007[9] Annex A2 (see CN3 on page 106 for alternative methods of compliance).

OR

5.a.ii Where EN 13779:2007[10] Annex A2 is not followed, the building's air intakes and exhausts are over 10m of horizontal distance apart and intakes are over 10m of horizontal distance from sources of external pollution.

5.b In naturally ventilated buildings or spaces: openable windows or ventilators are at least 10m of horizontal distance from sources of external pollution (including the location of any building related air exhausts).

6 Where present, HVAC systems must incorporate suitable filtration to minimise external air pollution, as defined in EN 13779:2007 Annex A3.

7 Areas of the building subject to large and unpredictable or variable occupancy patterns have carbon dioxide (CO_2) or air quality sensors specified and:

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

7.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.

8 In countries where smoking within buildings is not prohibited by law, one of the following is specified:

8.a A smoking ban covering all public and staff areas of the building is implemented, and 'No Smoking' signs are located in appropriate areas clearly visible to all occupants (i.e. common areas, offices and building entrances) OR

8.b Where smoking is permitted in dedicated smoking rooms only and smoking is banned in all other areas with 'No Smoking' signs located in appropriate areas clearly visible to all occupants and where:

8.b.i Ventilation rates in the dedicated smoking room are in accordance with national best practice standards for ventilation

8.b.ii A separate ventilation system prevents recirculation within the room and the smoking room is separated from all other occupied areas by a lobby

8.b.iii Air intakes or exhausts or openable windows or ventilators are positioned to minimise recirculation of smoke (see criterion 5 on the previous page).

One credit - Emissions from building products

9 Criterion 2 on the previous page has been achieved.

10 At least four of the five product types listed in Table 17 on page 101 meet the emission limits, testing requirements and any additional requirements listed in Table 17 on page 101 or refer to CN3.5 on page 106.

One credit - Post-construction indoor air quality measurement

11 Criterion 2 on the previous page has been achieved.

12 The formaldehyde concentration in indoor air is measured post-construction (but pre-occupancy) and does not exceed 100µg/m³, averaged over 30 minutes[11].

13 The formaldehyde sampling and analysis is performed in accordance with ISO 16000-2[12] and ISO 16000-3[13] .

14 The total volatile organic compound (TVOC) concentration in indoor air is measured post-construction (but pre-occupancy) and does not exceed 300µg/m³, averaged over 8 hours with [14].

15 The TVOC sampling and analysis is performed in accordance with ISO 16000-5[15] and ISO 16000-6[16] or ISO 16017-1[17] .

16 Where levels are found to exceed these limits, the project team confirms the measures that have, or will be undertaken in accordance with the IAQ plan, to reduce the TVOC and formaldehyde levels to within the above limits.

17 The measured concentration levels of formaldehyde (µg/m³) and TVOC (µg/m³) are reported, via the BREEAM scoring and reporting tool, for the purpose of confirming criteria 12 to 15 above.

Adaptability - Potential for natural ventilation

One credit

18 The building ventilation strategy is designed to be flexible and adaptable to potential building occupant needs and climatic scenarios. This can be demonstrated as follows:
   18.a Occupied spaces of the building are designed to be capable of providing fresh air entirely via a natural ventilation strategy. The following are methods deemed to satisfy this criterion dependent upon the complexity of the proposed system:
      18.a.i The openable window area in each occupied space is equivalent to 5% of the gross internal floor area of that room or floor plate. For room or floor plates between 7m-15m depth, the openable window area must be on opposite sides and evenly distributed across the area to promote adequate cross-ventilation; OR
      18.a.ii The design demonstrates that the natural ventilation strategy provides an adequate cross flow of air to maintain the required thermal comfort conditions and ventilation rates.

   For a strategy which does not rely on openable windows, or which has occupied spaces with a plan depth greater than 15m, the design must demonstrate that the ventilation strategy can provide adequate cross flow of air to maintain the required thermal comfort conditions and ventilation rates.

19 The natural ventilation strategy is capable of providing at least two levels of user control on the supply of fresh air to the occupied space (see CN3.12 on page 108 for further details).

Note: Any opening mechanisms must be easily accessible and provide adequate user control over air flow rates to avoid draughts. Relevant industry standards for ventilation can be used to define 'adequate levels of fresh air' sufficient for occupancy and internal air pollution loads relevant to the building type.

Note: Residential buildings and residential institutions with self-contained flats and individual bedrooms must have a degree of openable window function. This does not need to provide two levels of user control (as required in criteria 18 and 19 above), but must be occupant controlled.

Exemplary level criteria

One credit

20 Criterion 2 on page 98 has been achieved.

21 At least four of the five product types listed in Table 18 on page 102 meet the emission limits, testing requirements and any additional requirements listed in Table 18 on page 102

Two credits

22 Criterion 2 on page 98 has been achieved.

23 All product types meet the emission limits, testing requirements and any additional requirements listed in Table 18 on page 102.

Checklists and tables

Table 17: Emission criteria by product type

Product type (see CN3.1)	Emission limit* For-malde-hyde	Total volatile organic compounds (TVOC)	Category 1A and 1B carcinogens	Testing requirement (see CN3.2 and CN3.3)	Additional requirements
Interior paints and coatings	≤ 0.06 mg/m³	≤ 1.0 mg/m³	≤ 0.001 mg/m³	EN 16402 [18] or ISO 16000-9 [19] or CEN/TS 16516 [20] or CDPH Standard Method v1.1 [21]	Meet TVOC content limits (Table 19 on page 104). Paints used in wet areas (e.g. bathrooms, kitchens, utility rooms) should protect against mould growth (see CN3.4 on page 106).
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 [22] or CEN/TS 16516 [23] or CDPH Standard Method v1.1 [24] or EN 717-1 (formaldehyde emissions only) [25]	N/A
Flooring materials (including floor levelling compounds and resin flooring)	≤ 0.06 mg/m³	≤ 1.0 mg/m³	≤ 0.001 mg/m³	ISO 10580 or ISO 16000-9 or CEN/TS 16516 or CDPH Standard Method v1.1	N/A
Ceiling, wall, and acoustic and thermal insulation materials	≤ 0.06 mg/m³	≤ 1.0 mg/m³	≤ 0.001 mg/m³		N/A

Product type (see CN3.1)	Emission limit*			Testing requirement (see CN3.2 and CN3.3)	Additional requirements
	Formaldehyde	Total volatile organic compounds (TVOC)	Category 1A and 1B carcinogens		
Interior adhesives and sealants (including flooring adhesives)	≤ 0.06 mg/m³	≤ 1.0 mg/m³	≤ 0.001 mg/m³	EN 13999 (Parts 1-4) [26, 27, 28, 29] or ISO 16000-9 or CEN/TS 16516 or CDPH Standard Method v1.1	N/A
* Compliance with emission limits shall be demonstrated after 28 days in an emission test chamber or earlier as stipulated by the relevant testing requirements standard.					

Table 18: Exemplary level emission criteria by product type

Product type (see CN3.1)	Emission limit*					Additional requirement
	Formaldehyde	Total volatile organic compounds (TVOC)	Total semi-volatile organic compounds (TSVOC)	Category 1A and 1B carcinogens	Testing requirement (see CN3.2 and CN3.3)	
Interior paints and coatings	≤ 0.01 mg/m³	≤ 0.3 mg/m³	≤ 0.1 mg/m³	≤ 0.001 mg/m³	EN 16402 [30] or ISO 16000-9 or CEN/TS 16516 or CDPH Standard Method v1.1	Meet VOC content limits (Table 19 on page 104). Paints used in wet areas (e.g. bathrooms, kitchens, utility rooms) should protect against mould growth (see CN3.4 on page 106).

Product type (see CN3.1)	Emission limit*					Additional requirement
	Formaldehyde	Total volatile organic compounds (TVOC)	Total semi-volatile organic compounds (TSVOC)	Category 1A and 1B carcinogens	Testing requirement (see CN3.2 and CN3.3)	
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 v1.1 or EN 717-1 (formaldehyde emissions only) [31]	N/A
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 v1.1	N/A
Ceiling, wall, and acoustic and thermal insulation materials	≤ 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 v1.1	N/A
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) [32, 33, 34, 35] or ISO 16000-9 or CEN/TS 16516 or CDPH Standard Method v1.1	N/A

* Compliance with emission limits shall be demonstrated after 28 days in an emission test chamber or earlier as stipulated by the relevant testing requirements standard.

Table 19: Maximum TVOC content for paints and coatings

Product category	Free TVOC content of ready-to-use product (g/l)	Testing requirements (see CN3.3)
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	

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	**Prerequisite: criterion 1** Both options: All criteria relevant to the building type and function apply. **Indoor air quality: criterion 2** Both options: This criterion is not applicable. **Ventilation: criteria 3 to 8** Shell only: These criteria are not applicable. Shell and core: Criteria 4 and 5 on page 98 are applicable **Emissions levels: criteria 9 to 17 and 20 to 23** Both options: These criteria are not applicable. **Adaptability - Potential for natural ventilation: criteria 18 to 19** Both options: All criteria relevant to the building type and function apply. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
CN1.1	Ventilation systems. See criteria 4 and 5 on page 98	Shell and core: 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.
Residential - Partially fitted and fully fitted		
CN2	Applicable assessment criteria - Single and multiple dwellings	**Prerequisite: criterion 1** Both options: All criteria relevant to the building type and function apply. **Indoor air quality plan: criterion 2** Both options: This criterion is not applicable. **Ventilation: criteria 3 to 8** Both options: Criteria 4 to 6 on page 99 are applicable. **Emissions from building products: criteria 9 to 10** Both options: Criterion 10 on page 99 is applicable. **Post-construction indoor air quality measurement: criteria 11 to 17** Both options: These criteria are not applicable. **Adaptability - Potential for natural ventilation: criteria 18 to 19** Both options: All criteria relevant to the building type and function apply. **Exemplary: criteria 20 to 23** Both options: These criteria are not applicable. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.

Ref	Terms	Description
General		
Minimising sources of air pollution		
CN3	Alternative methods for demonstrating compliance with the air intake and exhaust criteria	Compliance with the criteria can be demonstrated using alternative methods (e.g. wind tunnel studies, computational fluid dynamics (CFD) modelling), if such methods demonstrate that the proposed location of intakes and exhausts prevents significant recirculation of exhaust air under typical wind conditions.
CN3.1	Non-VOC emitting products	Inherently non-VOC emitting products such as brick, natural stone, concrete, ceramic tile, glass, metal surfaces, etc. do not need to be assessed and can be deemed fully compliant with the criteria, unless organic-based coatings, binders, or sealants are used in their production or finishes.
CN3.2	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 17 and Table 18 on page 102. BREEAM Assessors must submit details of any alternative standards to BRE Global for approval prior to awarding any credits for this issue.
CN3.3	Accreditation of organisations performing sampling or laboratory analysis	All organisations used for sampling and analysis of indoor air or for analysis of emissions from building products must be accredited to ISO/IEC 17025[36] with specific accreditation covering: — Sampling: Pumped sampling for formaldehyde in air; Pumped sampling for VOCs in air — Chemical analysis: Determination of formaldehyde; Determination of VOCs. Sampling and chemical analysis of indoor air can be performed by separate organisations, but both must be accredited.
CN3.4	Paints used in wet areas	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 [37] and EN 15458 [38].
CN3.5	BREEAM recognised alternative schemes for emission levels from building products	Guidance Note 22, available on the BREEAM website, provides a list of approved alternative schemes recognised by BREEAM that can be used to demonstrate compliance for the emission from building products 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.

Ref	Terms	Description
CN3.6	Products used in small quantities for ad hoc purposes	All products specified for a project that fall within one of the product types listed in Table 17 and Table 18 on page 102 must be assessed under this issue. However, it is 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.
CN3.7	Self-declaration of emission levels from building products	Self-declaration, by manufacturers, of emission levels from building products is acceptable if testing has been performed by an accredited laboratory in accordance with CN3.3 on the previous page or where the manufacturer declares that the product contains no formaldehyde or VOC emitting substances.
CN3.8	Number of product types required to comply	Where four 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 four products are present, three must comply — Where three products are present, two must comply — Where two or fewer products are present, all must comply.
CN3.9	Scope of assessment for product types installed or applied within a building	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, vapour or waterproof membrane or, where not present, inside of the inner surface of the building envelope's interior facing thermal insulation layer.
CN3.10	Furnishings	The scope of the VOC credits does not extend to furnishings, e.g. desks or shelving, it focuses on the key internal finishes and fittings integral to the building.
Adaptability - Potential for natural ventilation		
CN3.11	Mechanically ventilated or cooled buildings. See criteria 18 and 19 on page 100.	Buildings that employ a mechanically ventilated or cooled strategy are still able to achieve this credit provided it can be demonstrated that the features required by the criteria can be made easily available to the building user, e.g. windows fixed shut for an air-conditioned strategy can be modified to be opening windows. The aim of the potential for natural ventilation criteria is to ensure that a building is capable of providing fresh air using a natural ventilation strategy. Where the building is predominantly naturally ventilated, but mechanical ventilation is necessary to boost ventilation during peak conditions, (i.e. either maximum occupancy, peak temperature conditions or both) due to the function or specific usage patterns of the building, the potential for the natural ventilation credit can still be awarded provided calculations or modelling demonstrate that the mechanical ventilation system will be required for ≤ 5% of the annual occupied hours in the occupied spaces for the adopted building design or layout.

Ref	Terms	Description
CN3.12	Levels of ventilation. See criterion 19 on page 100.	The two levels of ventilation must be able to achieve the following: — Higher level: higher rates of ventilation achievable to remove short term odours or prevent summertime overheating — Lower level: adequate levels of draught-free fresh air to meet the need for good indoor air quality throughout the year, sufficient for the occupancy load and the internal pollution loads of the space.
CN3.13	Industrial buildings without offices	If the building does not contain any office areas, only the prerequisite within this issue applies.
CN3.14	Retail buildings without offices	The Adaptability - Potential for natural ventilation credit applies only to office areas. If the building does not contain any office areas, this credit is filtered out.

Methodology

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
Prerequisite		
1	The relevant section or clauses of the building specification or contract or appropriate legislation. Design drawings.	Manufacturers' literature. BREEAM Assessor's site inspection report and photographic evidence or 'as-built' drawings, specification and calculations OR A formal letter from the design team or principal contractor confirming no changes have occurred since the design stage.
Minimising indoor air pollution		
2–7	A copy of the indoor air quality plan. Relevant section or clauses of the building specification or contract. Design drawings.	A copy of the indoor air quality plan. BREEAM Assessor's site inspection report and photographic evidence or 'as-built' drawings. For a naturally ventilated building, a letter from the design team or principal contractor 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.

Criteria	Interim design stage	Final post-construction stage
9–10	A copy of the indoor air quality plan. Relevant section or clauses of the building specification or contract.	A copy of the indoor air quality plan. Letter from or copies of the manufacturer's literature confirming testing standards and emissions achieved.
11–17	A copy of the indoor air quality plan. Commitment to carry out necessary testing post-construction.	A copy of the indoor air quality plan. Confirmation from the project team that the recommendations are still relevant and have been implemented. Testing results for formaldehyde and TVOCs.
Potential for natural ventilation		
18–19	Relevant section or clauses of the building specification or contract. A formal letter from the design team with details of the ventilation strategy and calculations or results from appropriate software modelling tools.	Manufacturers' or suppliers' literature. BREEAM Assessor's site inspection report and photographic evidence* or 'as-built' drawings, specification and calculations OR A formal letter from the design team or principal contractor confirming no changes have occurred since design stage. * A random spot check of a selection of occupied spaces is sufficient. The assessor is not required to check each opening in all spaces or rooms.

Additional information

Relevant definitions

Areas with a large and unpredictable occupancy

The following are examples of these types of space:

- Auditoria
- Gyms
- Retail stores or malls
- Cinemas
- Waiting rooms.

Where the assessed building does not have any areas deemed to be large with an unpredictable pattern of occupancy, the criterion does not apply.

Category 1A and 1B carcinogens

Carcinogenic compounds detectable by the VOC emission testing requirements in Table 1 and Table 2 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[39],which are listed as *Carcinogenic VOCs* in Annex G.2 of prEN 16516 (draft)[40].

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.[41]

Occupied spaces

See relevant definition provided in issue Hea 01 Visual comfort on page 83. The following building areas, where relevant to the building type, can be excluded from the definition of occupied spaces for the potential for natural ventilation criteria:

1. Ancillary building areas, e.g. WCs, corridors, stairwells, store rooms, plant rooms
2. Swimming or hydrotherapy pools
3. Sauna, steam room or hammam (for hotel building type only)
4. Catering and small staff kitchens
5. Washrooms or changing areas
6. Laboratory or other areas where strictly controlled environmental conditions are a functional requirement
7. Operational, shop floors or ancillary areas in industrial buildings.

Occupied spaces requiring local exhaust ventilation, e.g. laboratories, workshops and food technology rooms, must still demonstrate that they meet the criteria for potential for natural ventilation (unless listed as an exempted area in this definition).

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).

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.

Other information

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[42] and ISO 16000-5 provide guidance on sampling strategies for formaldehyde and VOCs, respectively. Sampling should be performed in rooms that will be occupied for long periods of time 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 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). 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 1m to 2m from a wall and at a height of between 1m to 1.5m.

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.

Hea 03 Safe containment in laboratories

(non-residential buildings only)

Number of credits available	Minimum standards
Building type dependent	No

Aim

To recognise and encourage a healthy internal environment through the safe containment and removal of pollutants.

Assessment criteria

The following is required to demonstrate compliance:

One credit - Laboratory containment devices and containment areas

1 An objective risk assessment of the proposed laboratory facilities has been carried out prior to completion of the Developed design to ensure potential risks are considered in the design of the laboratory.

2 Where containment devices such as fume cupboards are specified, their manufacture and installation is carried out in accordance with national best practice standards for safety and performance requirements in laboratory containment devices, or are manufactured and installed in accordance with the following standards:
- 2.a General purpose fume cupboards: EN 14175 Parts 1-7 (as appropriate)[43]
- 2.b Recirculatory filtration fume cupboards
- 2.c Microbiological safety cabinets: EN 12469:2000[44] (for manufacture)
- 2.d Clean air hoods, glove boxes, isolators and mini-environments: EN ISO 14644-7:2004[45]
- 2.e Articulated extension arms: PD CEN/TR 16589[46]

Or, for schools, universities and higher education buildings with laboratories and fume cupboards:

- 2.f Where laboratory containment devices that are ducted to discharge externally are specified, the guidance in the National Annex of EN 14175-2 must be followed to ensure an appropriate discharge velocity is achieved.

One credit - Buildings with containment level 2 and 3 laboratory facilities

3 Where containment level 2 and 3 laboratory facilities are specified or present they must meet best practice safety and performance criteria and objectives. This is demonstrated as follows:
- 3.a Criterion 1 abovehas been achieved
- 3.b Ventilation systems comply with national best practice guidance. Where there is no national best practice guidance, it shall follow the best practice guidance set out in 'DRAFT HSE Biological Agents and Genetically Modified Organisms (Contained Use) Regulations 2010'[47] in relation to ventilation systems
- 3.c Filters for all areas designated as containment level 2 and 3 are located outside the main laboratory space for ease of cleaning or replacement, and the filters are easily accessible by maintenance staff or technicians.

4 The design team demonstrate that the individual fume cupboard location and stack heights have been considered in accordance with national best practice guidance. Where national best practice guidelines do not exist then the stack height shall be calculated following the HMIP Technical Guidance Note (Dispersion) D1[48].

Checklists and tables

None.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	Both options: This issue is not applicable. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - Partially fitted and fully fitted		
CN2	Applicable assessment criteria - Single and multiple dwellings	Both options: This issue is not applicable. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN3	National best practice standards and relevant industry standards	Please refer to the Approved Standards and Weightings list (ASWL) to locate the appropriate national best practice standards in the country of assessment. Alternatively, standards deemed equivalent by the project team can be submitted as per the process outlined in the Assessor Operations manual. Where appropriate standards do not exist for a country, the design team should demonstrate compliance with the British or European standards as listed in each relevant country reference sheet.
CN3.1	Building contains no laboratory containment devices	Please note that the laboratory and containment device criteria and credits only apply where laboratory space, fume cupboards or other containment devices are present within the assessed building.

Methodology

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
All	A copy of the proposed laboratory facilities risk assessment. The relevant section or clauses of the building specification or contract or a formal letter from the design team. Design drawings.	BREEAM Assessor's site inspection report and photographic evidence or as-built drawings. Correspondence from the design team confirming installation of a compliant system. A copy of the manufacturers' or suppliers' literature or a letter from these parties confirming their cupboards and cabinets are manufactured and installed in accordance with the relevant standards.

Additional information

Relevant definitions

Containment Levels

Containment Levels 2 and 3 are defined in The Management, Design and Operation of Microbiological Containment Laboratories 2001, ACDP.

Fume cupboard or safety cabinet

Scientific equipment designed to limit a person's exposure to hazardous fumes or biological material. Air is drawn through the enclosure of the cupboard conducting the contaminated air away from the experimental area and those using the equipment.

Risk assessment

For the purpose of the relevant laboratory criteria in this issue, a risk assessment is a systematic consideration of any activity in which there is a hazard, followed by decisions on the substances, equipment and procedures used, and on the restrictions and precautions needed to make the risk acceptably low. Below is a list of useful resources:

1. ISO 15189:2012, Medical laboratories - requirements for quality and competence
2. CWA 15793:2011 (Management system for laboratory biosafety and biosecurity).

Other information

EN 14175 Fume cupboard discharge velocity: Part 2 states that the discharge velocity from fume cupboard extracts should be at least 7m/s, but that a figure of 10m/s is preferable to ensure that the discharge will not be trapped in the aerodynamic wake of the stack. Higher discharge velocities may be required, especially in windy locations, but higher rates may cause noise problems.

Compliance in the EU would be demonstrated by meeting the following directives depending on the type of laboratory:

- EC directives 2000/54/EC
- Directive 98/81/EC
- Directive 2005/83/EC.

Hea 04 Thermal comfort

(all buildings)

Number of credits available	Minimum standards
3	No

Aim

To ensure that appropriate thermal comfort levels are achieved through design, and controls are selected to maintain a thermally comfortable environment for occupants within the building.

Assessment criteria

The following is required to demonstrate compliance:

One credit - Thermal modelling

1 Thermal modelling (or an analytical measurement or evaluation of the thermal comfort levels of the building) has been carried out using the predicted mean vote (PMV) and predicted percentage of dissatisfied (PPD) indices in accordance with ISO 7730:2005[49] taking full account of seasonal variations.

2 Local thermal comfort criteria have been used to determine the level of thermal comfort in the building, in particular internal winter and summer temperature ranges will be in line with the recommended comfort criteria within ISO 7730:2005, with no areas falling within the levels defined as representing local dissatisfaction.

3 Thermal comfort levels in occupied spaces meet the Category B requirements set out in Table A.1 of Annex A of ISO 7730:2005.

4 For air-conditioned buildings, the PMV and PPD indices based on the above modelling are reported via the BREEAM assessment scoring and reporting tool.

One credit - Adaptability for a projected climate change scenario

5 Criteria 1 to 4 above are achieved.

6 The thermal modelling demonstrates that the relevant requirements set out in criterion 3 above are achieved for a projected climate change environment (see Relevant definitions on page 118).

7 Where thermal comfort criteria are not met for the projected climate change environment, the project team demonstrates how the building has been adapted, or designed to be easily adapted in the future using passive design solutions in order to subsequently meet the requirements under criterion 6 above

8 For air-conditioned buildings, the PMV and PPD indices based on the above modelling are reported via the BREEAM assessment scoring and reporting tool.

One credit - Thermal zoning and controls

9 Criteria 1 to 4 above are achieved.

10 The thermal modelling analysis (undertaken for compliance with criteria 1 to 4 above) has informed the temperature control strategy for the building and its users.

11 The strategy for proposed heating or cooling systems demonstrates that it has addressed the following:

11.a Zones within the building and how the building services could efficiently and appropriately heat or cool these areas. For example, consider the different requirements for the central core of a building compared with the external perimeter adjacent to the windows

11.b The degree of occupant control required for these zones, based on discussions with the end user (or alternatively the building type or use specific design guidance, case studies, feedback) considers:

- 11.b.i User knowledge of building services
- 11.b.ii Occupancy type, patterns and room functions (and therefore the appropriate level of control required)
- 11.b.iii How the user is likely to operate or interact with the systems, e.g. are they likely to open windows, access thermostatic radiator valves (TRVs) on radiators, change air-conditioning settings etc.
- 11.b.iv The user expectations (this may differ in the summer and winter) and degree of individual control (i.e. obtaining the balance between occupant preferences, for example some occupants like fresh air and others dislike drafts).

11.c How the proposed systems will interact with each other (where there is more than one system) and how this may affect the thermal comfort of the building occupants

11.d The need or otherwise for an accessible building user actuated manual override for any automatic systems.

Checklists and tables

None.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	**Thermal modelling: criteria 1 to 4 on the previous page** Shell only: This issue is not applicable. Shell and core: All criteria relevant to the building type and function apply. **Adaptability - for projected climate change: criteria 5 on the previous page to 8 on the previous page** Shell only: These criteria are not applicable. Shell and core: All criteria relevant to the building type and function apply. **Thermal zoning and controls: criteria 9 on the previous page to 11 on the previous page** Both options: These criteria are not applicable. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
CN1.1	Thermal model - thermal modelling. See criteria 1 to 4 on the previous page.	Shell and core: Where assumptions are required for the purpose of the thermal model, these must be reasonable and represent typical use patterns and loads given the parameters and function of the building. Note that thermal modelling may need to be completed on the basis of a typical notional layout.

Ref	Terms	Description
CN1.2	Thermal model - adaptability. See criteria 5 to 8 on page 114.	Shell and core: Where assumptions are required for the purpose of the thermal model, these must be reasonable and represent typical use patterns and loads given the parameters and function of the building. Note that thermal modelling may need to be completed on the basis of a typical notional layout.
Residential - Partially fitted and fully fitted		
CN2	Applicable assessment criteria - Single and multiple dwellings	Both options : All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN3	Typical occupancy and use 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 Tra 04 Maximum car parking capacity: Table 38 on page 240can be used to determine a default number of users. Where the typical use patterns are also unknown, Tra 01 Public transport accessibility: Table 33 on page 220can 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.
CN3.1	Alternative to criterion 3 on page 114	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. Criterion 4 on page 114 still requires PMV and PPD to be reported and Annex D of ISO 7730:2005 includes the code of a BASIC program that converts these design parameters into PMV and PPD. By using this program it is possible to obtain the PMV and PPD figures and show direct compliance with Table A.1.
CN3.2	National or local alternative to ISO standard	It is possible to use a national or local equivalent to ISO 7730:2005; however this must be approved by BRE Global. The Approved standards and weightings list can be used to check for previously approved standards or to propose a new national or local standard.

Ref	Terms	Description
CN3.3	Buildings with less complex heating or cooling systems. See criterion 11 on page 114.	For buildings with less complex heating or cooling systems the thermal comfort strategy need only comply with criteria 11.a on page 115.and 11.b on page 115 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. Note: The distance requirement for smaller buildings is approximate; however, the assessor must use sound judgment considering fully 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[50].
Building type specific		
CN4	Industrial: Industrial unit with no office space	Where an industrial unit contains no office space and only an operational or storage area, this BREEAM issue does not apply.
CN4.1	Education: Occupant controls. See criterion 11 on page 114.	In this issue, occupant controls are intended to be for staff use only.

Methodology

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
1–4	The relevant section or clauses of the building specification, or contract or correspondence (e.g. letter, email or meeting minutes) from the design team. Thermal modelling, measurements and evaluation results with confirmation that these are within the required limits. PMV/PPD data from the design team.	Thermal modelling, measurement and evaluation results reflecting any changes to the design and resultant PMV/PPD data with confirmation that these are within the required limits.

Criteria	Interim design stage	Final post-construction stage
6–8	Thermal modelling and evaluation results with confirmation that these are within the required limits. PMV/PPD data from the design team.	Thermal modelling and evaluation results reflecting any changes to the design and resultant PMV/PPD data with confirmation that these are within the required limits.
10–11	Thermal comfort strategy and software results highlighting the points that have been considered and decisions taken accordingly. Confirmation that the modelling software is BREEAM compliant. The relevant section or clauses of the building specification or contract. Design drawings.	As design stage. BREEAM Assessor's site inspection report and photographic evidence.* *For large buildings it would not be expected that the assessor check every individual occupied space, but a random selection of spaces that confirm compliance.

Relevant definitions

Occupied space

Refer to Hea 01 Visual comfort on page 83, however for the purpose of BREEAM issue Hea 04 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.

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 and 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. See Other information on the facing page for the seven-point thermal sensation scale.

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, thermally dissatisfied people are those who will feel hot, warm, cool or cold. See the seven-point thermal sensation scale in Other information on the facing page.

Projected climate change environment

Dynamic thermal simulation software packages currently provide the facility for building designs to be assessed under external climatic conditions specific to geographic location. Industry standard weather data should be sought from an appropriate local or national best practice standard in the form of Test Reference Years (TRYs) and Design Summer Years (DSYs).

The weather data enables thermal analysis of building designs under current climatic conditions, yet no account is normally taken of the projected variations in weather data that will occur during the building's life cycle as a result of climate change. To demonstrate compliance, weather data should be used based upon a projected climate change scenario. 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
- Emissions scenario: Medium (A1B)

Mechanically Ventilated or Mixed Mode Buildings

- Time period: 15 years after construction is complete
- Emissions scenario: Medium (A1B)

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. This should be sought from a recognised local or national best practice standard or organisation. Verification should be sought from BRE Global prior to using any such standards in an assessment.

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 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 and is '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. 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.

Other information

Projected climate change weather data

The Intergovernmental Panel on Climate Change (IPCC) 5th Assessment Report outlines future climate change scenarios that can be used to project a range of alternative probabilistic weather data. These weather data should be used to evaluate the impact of varying climate change scenarios for the country to influence building design performance for the building throughout its life cycle. Projected climate change weather data should be sourced in TRYs and DSYs.

While not internationally applicable, reference can be made to the UK PROMETHEUS project at Exeter University that produced a number of future weather files specific to different locations across the UK, created using the UK Climate Projection 2009 (UKCP09) weather generator. Weather files produced under the PROMETHEUS project are available at the following location:

emps.exeter.ac.uk/engineering/research/cee/research/prometheus/downloads/

Hea 05 Acoustic performance

(all buildings)

Number of credits available	Minimum standards
Building type dependent	No

Aim

To ensure the building's acoustic performance, including sound insulation meets the appropriate standards for its purpose.

Assessment criteria

This issue is split into two parts:

- Prerequisite
- Acoustic performance standards (up to 4 credits)

The following is required to demonstrate compliance:

Prerequisite

1 A suitably qualified acoustician (SQA) (see Relevant definitions on page 130) is appointed by the client at the appropriate stage in the procurement process (but no later than completion of outline design) to provide early design advice on:
 1.a External sources of noise impacting the chosen site
 1.b Site layout and zoning of the building for good acoustics
 1.c Acoustic requirements for users with special hearing and communication needs
 1.d Acoustic treatment of different zones and façades.

Acoustic performance standards for all building types except residential buildings and long-term stay residential institutions

One credit - indoor ambient noise and sound insulation

2 All unoccupied spaces comply with the indoor ambient noise level targets as detailed in the more rigorous of criteria 2.a or 2.b below:
 2.a Indoor ambient noise level targets within national building regulations or other appropriate good practice standards
 2.b Where national building regulations or good practice standards do not exist for the building type or do not provide indoor ambient noise targets, the indoor ambient noise levels comply with 'good practice' criteria levels outlined in Table 20 on page 122

3 A SQA carries out ambient noise measurements to ensure that the relevant spaces achieve the required levels. Where the measurements identify that spaces do not meet the standards, remedial works are carried out and the measurements repeated to confirm that the levels are achieved prior to handover and occupation.

4 The sound insulation between acoustically sensitive rooms and other occupied areas comply with the privacy index, as detailed in the more rigorous of criteria 4.a or 4.b on the facing page:
 4.a Sound insulation between acoustically sensitive rooms and other occupied areas comply with targets within national regulations or other appropriate good practice standards

4.b Where relevant national regulations or good practice standards do not exist for the building type or do not provide sound insulation performance targets, the sound insulation between acoustically sensitive rooms and other occupied areas complies with the following privacy index: Dw + $L_{\mathrm{Aeq}T}$ > 75. Where privacy is viewed to be critical by the client or design team (e.g. doctor's consulting room, consulting room within a bank) or where the room is adjacent to a noisy space such as a music room, the area should comply with an enhanced privacy index: Dw + $L_{\mathrm{Aeq}T}$ > 85.

— Dw is the weighted sound level difference between the two spaces
— $L_{\mathrm{Aeq}T}$ is the measured indoor ambient noise level in the acoustically sensitive room (for the purposes of awarding design stage credits, the design ambient noise level can be used).

5 The source and receive room sound pressure levels from which Dw is determined are measured in accordance with (EN) ISO 140-4:1998 and rated in accordance with (EN) ISO 717-1:1996. Measurements must be based on finished, but unfurnished rooms, accounting for, and to include the effect of, any carpets and acoustically absorbent ceilings specified.

Education buildings only

6 Teaching and learning spaces with lightweight roofs and roof glazing demonstrate that the reverberant sound pressure levels in these rooms are not more than 25 dB above the appropriate limits given in Table 20 on the next page

One credit - reverberation times

7 Rooms or areas used for speech (including meeting rooms and rooms for public speaking) or rooms used for music performance and rehearsal, achieve reverberation times as detailed in the more rigorous of criteria 7.a or 7.b and 7.c:

7.a Demonstrate that the reverberation time or equivalent absorption area for relevant spaces complies with targets within relevant national regulations or other appropriate good practice standards

7.b Where relevant national regulations or good practice standards do not require the control of reverberation time, achieve reverberation times compliant with Table 21 on page 123

7.c In addition, if relevant to the assessed building, all areas used for teaching, training and educational purposes achieve reverberation times compliant with Table 22 on page 123

Up to four credits - Acoustic performance standards for residential buildings and long term stay residential institutions

8 The building meets the acoustic performance standards and testing requirements as detailed in the more rigorous of EITHER:

8.a Airborne and impact sound insulation values comply with the performance improvement standards, as compared to the relevant national regulations outlined in Table 23 on page 124

8.b Airborne and impact sound insulation levels comply with the performance standards outlined in Table 24 on page 124 unless otherwise stated within these criteria.

9 A programme of pre-completion testing is carried out by a compliant test body EITHER:

9.a Based on the normal programme of testing described in the relevant national regulations for every group or sub-group of rooms for residential purposes; this must demonstrate that the performance standards detailed within this issue are achieved OR

9.b Where there are no relevant national regulations in place, or they require laboratory measurements to demonstrate compliance, the programme of on site pre-completion testing must be carried out based on the 'Frequency of testing required' guidance (see calculation procedures in Methodology on page 128) for every group or sub-group of rooms.

10 The number of credits awarded will depend on improvement to the national regulations determined according to Table 23 on page 124 or Table 24 on page 124. Where commercial space is below the residential space, only airborne sound insulation tests will be required.

Checklists and tables

Table 20: A selection of good practice indoor ambient noise level targets in unoccupied spaces

Function of area	Indoor ambient noise level*
General spaces (staffrooms, restrooms)	≤ 40 dB $L_{\mathrm{Aeq}T}$
Single occupancy offices	≤ 40 dB $L_{\mathrm{Aeq}T}$
Multiple occupancy offices	40-50 dB $L_{\mathrm{Aeq}T}$
Meeting rooms	35-40 dB $L_{\mathrm{Aeq}T}$
Receptions	40-50 dB $L_{\mathrm{Aeq}T}$
Spaces designed for speech, e.g. teaching, seminar or lecture rooms	≤ 35 dB $L_{\mathrm{Aeq}T}$
Concert hall, theatre or auditoria	≤ 30 dB $L_{\mathrm{Aeq}T}$
Informal café or canteen areas	≤ 50 dB $L_{\mathrm{Aeq}T}$
Catering kitchens	≤ 50 dB $L_{\mathrm{Aeq}T}$
Restaurant areas	40-55 dB $L_{\mathrm{Aeq}T}$
Bars	40-45 dB $L_{\mathrm{Aeq}T}$
Retail areas	50-55 dB $L_{\mathrm{Aeq}T}$
Manual workshops	≤ 55 dB $L_{\mathrm{Aeq}T}$
Sound recording studios	≤ 30 dB $L_{\mathrm{Aeq}T}$
Laboratories	≤ 40 dB $L_{\mathrm{Aeq}T}$
Sports halls or swimming pools	≤ 55 dB $L_{\mathrm{Aeq}T}$
Library areas	40-50 dB $L_{\mathrm{Aeq}T}$
Hotel bedrooms	< 35 dB $L_{\mathrm{Aeq}T}$
* Where ranges of noise levels are specified and privacy is not deemed by the final occupier to be an issue, it is acceptable to disregard the lower limit of the range and consider the noise level criteria to be lower than or equal to the upper limit of the range[51].	

Table 21: Guide to reverberation time, T, at 500 Hz in unoccupied rooms for speech and music

Room volume m^3	Reverberation time T* s	
	Speech	**Music**
50	0.4	1.0
100	0.5	1.1
200	0.6	1.2
500	0.7	1.3
1000	0.9	1.5
2000	1.0	1.6

*Where the reverberation times stated above or in the referenced documents are not appropriate for the type of space or building being assessed, the acoustician must confirm why this is the case. In addition, the acoustician must set alternative appropriate reverberation times at the design stage and provide these to demonstrate compliance.

Table 22: Performance standards for reverberation in teaching and study spaces - mid-frequency reverberation time, Tmf, in finished but unoccupied and unfurnished rooms

Type of room (receiving room)	Tmf (seconds)*
Open plan Teaching areas Resource areas	< 0.8 < 1.0
Lecture rooms Small (fewer than 50 people) Large (more than 50 people)	< 0.8 < 1.0
Recording studio	0.6-1.2
Control room for recording	< 0.5
Libraries	< 1.0
Audio-visual, video conference rooms	< 0.8

*Tmf is the arithmetic average of the reverberation times in the 500 Hz, 1 kHz and 2 kHz octave bands[52].

Table 23: Airborne and impact sound insulation performance improvement standards for national legislation or standards

Credits	Credits awarded according to improvement over national legislation, standard or other defined baseline	
	Airborne sound insulation dB	Impact sound insulation dB
Individual bedrooms & self-contained dwellings		
1	Insulation values are at least 3dB higher	Insulation values are at least 3dB lower*
3	Insulation values are at least 5dB higher	Insulation values are at least 5dB lower*
4	Insulation values are at least 8dB higher	Insulation values are at least 8dB lower*
*The index used to express impact sound insulation is usually based on the level of transmitted impact sound, such that a lower measured value indicates greater resistance to impact sound transmission. If the converse for the locally defined national index is true, the credit award will be based on the same performance increase as detailed for the airborne sound insulation and an accompanying statement from a SQA.		

Table 24: Airborne and impact sound insulation performance standards

Credits	Credits awarded according to sound insulation performance standards	
	Airborne sound insulation DnT,w + Ctr dB (minimum values)	Impact sound insulation L'nT,w dB (maximum values)
Individual bedrooms & self-contained dwellings		
1	48	59
3	50	57
4	53	54

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	**Indoor ambient noise criteria:** Both options: All criteria relevant to the building type and function apply (an alternative method to demonstrate compliance applies in this instance, refer to CN1.1 below for further information). **Sound insulation and reverberation criteria:** Both options: These criteria are not applicable. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
CN1.1	Alternative means of demonstrating compliance	The basic built form has a large impact on the acoustic performance of the building, and in the case of a shell only or shell and core development, this aspect of the build would be outside the control of the tenant. A SQA must carry out a quantifiable assessment of the specification of the build form, construction and any external factors that are likely to affect the indoor ambient noise levels. From this assessment, the SQA must confirm that given a typical arrangement and fit-out specification for the building type, the development is likely to meet the levels required to demonstrate compliance with the BREEAM criteria. Where the specific room functions and areas within the building are yet to be defined, the acoustician must base their assessment on the most sensitive room type likely to be present in the building, as a worst case. For example, in a retail assessment, where there are likely to be offices, the acoustician should make an assessment based on this scenario. One credit can be awarded where this has been achieved.
Residential - Partially fitted and fully fitted		
CN2	Applicable assessment criteria - Single and multiple dwellings	Both options: Criteria 1 and 8 to10 on page 121 only apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
CN2.1	Single dwelling default case - Applies to detached dwellings	Four credits are available where there are no attached dwellings.

Ref	Terms	Description
CN2.2	Attached multiple dwellings where separating walls or floors occur only between non-habitable rooms	Three credits are available. Note: these criteria apply only to walls, floors and staircases that perform a dwelling to dwelling separating function. Internal partitions are beyond the scope of this issue.
Country-specific		
CN3	Other appropriate good practice standards or regulations	As detailed in the assessment criteria it is possible to use a national or local equivalent to the BREEAM requirements stated; however this must be approved by BRE Global. The Approved standards and weightings list can be used to check for previously approved standards or to propose a new national or local standard.
CN3.1	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 'reverberation times' criteria. In these instances, the credit available for reverberation can be awarded by default where the building complies with the indoor ambient noise level and sound insulation criteria.
CN3.2	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 spaces or rooms (where specified): 1. Single and multiple occupancy offices 2. Meeting, interview, consulting or treatment rooms 3. Rooms used for public speaking or seminars 4. Any other room or space the design team or client deems to be acoustically sensitive for the purposes of privacy.
CN3.3	Remedial works	Where a programme of pre-completion testing identifies that spaces do not meet the standards, remedial works must be carried out prior to handover and occupation, and the spaces retested to ensure compliance. Remedial works must be carried out to all affected and potentially affected areas, including rooms or spaces previously untested of a similar construction and performance requirement. 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 criterion 3 and Methodology on page 128 section, and include the relevant pass or fail criteria.
CN3.4	Privacy index	To increase the ambient noise level, where privacy is required or the ambient targets include a minimum as well as maximum limit, an artificial sound source or sound masking system may be required. Any artificial sound source or sound masking system should be installed and in operation at the time of the acoustic testing to demonstrate compliance.

Ref	Terms	Description
CN3.5	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.
CN3.6	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.
Building type specific		
CN4	Long term stay residential institutions. Rooms not covered by residential criteria.	Long term stay 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 floor area of the assessed building includes 'non-residential' areas, these areas do not need to be assessed, hence only the residential spaces need to be assessed against the residential criteria to demonstrate compliance with criterion 8 on page 121. Where more than 5% of the floor area of the assessed building includes areas other than self-contained dwellings or rooms for residential purposes: — If awarding 1 credit, only the self-contained dwellings or rooms for residential purposes need to be assessed to demonstrate compliance. — If awarding 3 or 4 credits the 'non-residential' areas must meet the relevant criteria for their function, and the self-contained dwellings or rooms for residential purposes need to be assessed to demonstrate compliance. The calculation for the percentage of floor area that is 'non-residential' should only include occupied spaces (as defined in BREEAM issue Hea 01 Visual comfort on page 83).
CN4.1	Hotel type - Sound insulation	Bedrooms in hotels must be considered acoustically sensitive rooms. Sound insulation (DnT,w) for partitions and floors between rooms and between rooms and corridors should be > 50dB.
CN4.2	Residential only - Acoustic testing	Testing should be between habitable rooms on the ground floor and at higher storey levels, if applicable. Where there are not enough suitable separating walls or floors in a development to carry out the number of tests specified in the relevant national regulations or standards, all of the available suitable separating walls or floors must be tested. Note: separating walls can be defined as those walls which separate dwellings.

Ref	Terms	Description
CN4.3	Residential only - Mixed use developments	For mixed use developments where commercial premises share a separating wall or floor with residential spaces, a SQA shall propose an appropriate baseline performance making reference to national or international guidance, or good practice.
CN4.4	Residential only - Commercial space	Where a commercial space is separated from a dwelling or room for residential purposes by a separating wall or floor, testing shall be carried out between the commercial space and dwelling, with the commercial space being used as the source room irrespective of the volume.
CN4.5	Residential only - Pre-completion testing	No pre-completion testing is required where separating walls or floors only occur between non-habitable rooms, or non-habitable rooms and other spaces. In such cases, three credits can be awarded following an assessment by a SQA confirming that the constructions detailed would be capable of achieving the relevant performance requirements. No pre-completion testing is required where the dwellings are detached. In such cases, four credits can be awarded by default.
CN4.6	Residential only - Measurement procedures	Additional information on page 130 outlines the requirements for carrying out measurements and calculations to demonstrate compliance with this BREEAM issue. The appointed acoustician must confirm that the acoustic performance has been measured or calculated in accordance with these procedures. Where the acoustician has felt it necessary to deviate from these procedures, they must give justifiable reasons why they have done so.

Methodology

Testing, measurement and calculation procedures; non-residential only

Where specific guidance on testing, measurement 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 the ISO 16283 series. For measurements of reverberation time, the relevant principles of ISO 354:2003 should be used and the guidance provided in ISO 16283-1:2014 should be followed in respect of the number of source and microphone positions, and decay measurements. 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, and, where windows are openable as part of the ventilation strategy, these should be assumed to be open for the purposes of calculations and open for measurements. If openable windows are not part of the background or permanent ventilation strategy, then these should be assumed to be closed for the purposes of calculation and closed for 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 1 in 10 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_{AeqT} 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 can be used. In this case, measurements should be made when external noise levels are representative of normal conditions throughout the day.
8. Measurement periods of 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. Where relevant, measurement of airborne sound insulation between teaching spaces should be conducted between one in four pairs of adjacent rooms (or teaching spaces) of each room type or performance requirement category and construction type.
11. Where relevant, measurement of impact sound pressure level should be conducted in one in four teaching spaces (separated from rooms above) of each room type or performance requirement category and construction type.
12. 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 measurements 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.

Testing, measurement and calculation procedures; residential buildings and long term stay residential institutions only

Frequency of testing

When the country does not have legislation regarding frequency of testing, the following guidance below sets out the number of airborne or impact sound insulation tests to be conducted on each group or sub-group. A unit is either a flat or a house. Where units contain a single habitable room, i.e. bedsits, the number of tests required is halved.

The following guidance and examples on how to define groups and sub-groups is provided:

- The number of units within each group or sub-group shall be rounded up to the nearest 10.
- For every 10 units within the same group or sub-group a minimum of one set of tests shall be undertaken.

Table 25: Composition of test set

Type of testing	Houses	Apartments
	Number of tests	
Airborne sound insulation test of separating walls between units	2	2
Airborne sound insulation test of separating floors between units	N/A	2
Impact sound insulation tests of separating floors between units	N/A	2

Example of testing series and compliance

Example 1

If a development consists of three houses; one set of tests will be required:

— Two airborne sound insulation tests of separating walls between house units.

Example 2

If a development comprises 42 houses and 59 apartments; then five sets of tests between houses and 6 sets of tests between apartments will be required:

— 10 airborne sound insulation tests of separating walls between houses units
— 12 airborne sound insulation tests of separating walls between apartments
— 12 airborne sound insulation tests of separating floors between apartments
— 12 impact sound insulation tests of separating floors between apartments

Evidence

Criteria	Interim design stage	Final post-construction stage
All (non-residential type)	Professional report or study and calculations from the acoustician. Letter of appointment or other confirmation demonstrating when the acoustician was appointed. The relevant section or clauses of the building specification or contract, or a formal letter from the project team regarding commitments.	Professional field report or study and calculations from the acoustician post-construction demonstrating compliance with the relevant credit criteria. Evidence, such as a formal letter from the acoustician or their test report confirming that they meet BREEAM's definition of a SQA. Where remediation works have been carried out, a professional field report or study and calculations from the acoustician post-completion of the works demonstrating compliance with the credit requirements.
All (residential buildings and residential institutions)	Where pre-completion testing will be carried out, a letter from the developer confirming the intent to: 1. Meet the relevant sound insulation performance levels 2. Use a compliant test body to complete testing.	Copies of the sound insulation field test results or a letter of confirmation that the required sound insulation performance standards as detailed in the assessment criteria have been achieved AND Evidence that the tests have been carried out by a compliant test body.

Additional information

Relevant 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. Cellular 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.

Compliant test body

A compliant test body is defined as:

1. Organisations who are accredited by a member of the International Accreditation Forum (IAF: www.iaf.nu) to the appropriate scope OR
2. Organisations who can provide evidence that they follow the relevant principles of ISO/IEC 17024 (Conformity assessment - General requirements for bodies operating certification of persons)[53] in relation to BREEAM requirements.

Dw Weighted level difference

Single number quantity that characterises airborne sound insulation between rooms, but which is not adjusted to reference conditions. Note: Weighted level difference is used to characterise the insulation between rooms in a building as they are; values cannot normally be compared with measurements made under other conditions (see (EN) ISO 717-1).

Groups

Grouping should be carried out according to the following criteria; rooms for residential purposes should be considered as three separate groups. In addition, if significant differences in construction type occur within any of these groups, sub-groups should be established accordingly.

Sub-groups

Rooms for residential purposes; sub-grouping should be by type of separating floor and type of separating wall. The construction of flanking elements (i.e. elements above, below and on either side of the space, for example walls, floors, cavities) and their junctions are also important. Where there are significant differences between flanking details, further sub-grouping will be necessary. Sub-grouping may not be necessary for rooms for residential purposes that have the same separating wall or separating floor construction, with the same associated flanking constructions, and where the room dimensions and layouts are broadly similar. Some rooms for residential purposes may be considered to have unfavourable features; an example could be apartments with large areas of flanking wall without a window at the gable end. It would be inappropriate for these to be included as part of a group and these should form their own sub-groups.

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 to concentrate or rest. Such rooms are bedrooms, living rooms, dining rooms, studies, as well as kitchen-dining and kitchen-living rooms.

Lightweight roofs

Roofs that have a mass per unit area less than 150kg/m²

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.

Non-habitable rooms

For the purpose of this issue, non-habitable rooms include any room that is not considered a habitable room (as defined above). This includes rooms such as kitchens, bathrooms, toilets, hallways, garages and laundry rooms.

Occupied spaces

Refer to Hea 01 Visual comfort on page 83 and note that for this BREEAM issue (Hea 05 Acoustic performance) there is a specific, unrelated, definition of Unoccupied spaces on the next page with reference to acoustic testing and measurement - see Compliance notes on page 125 for details.

Pre-completion sound testing

Tests should be carried out once the build is essentially complete, but may be carried out prior to or post-decoration. In the case of dwellings, unless stated otherwise within relevant national building regulations or standards, the impact sound insulation tests should be carried out before floor finishes such as carpets, wood flooring or vinyl coverings have been installed.

Room for residential purposes

A room, or a 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. It includes a room in a hostel, hotel, boarding house, hall of residence or residential home, whether or not the room is separated from or arranged in a cluster group with other rooms, but does not include a room in a hospital, or other similar establishment, used for patient accommodation.

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. Holds a degree, PhD or equivalent qualification in acoustic or sound testing.
2. 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.
3. An individual who holds a recognised acoustic qualification and membership of an appropriate professional body.

Where a 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 sound 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 a SQA is required.

Single occupancy offices

Cellular office space designed to accommodate one or two desk spaces or workstations (typically no greater than 10m²).

Unoccupied spaces

Where the term 'unoccupied space' is referenced in this BREEAM issue it refers to the nature of the space for the purpose of carrying acoustic calculations or measurements, i.e. such measurements must be carried out when the space is unoccupied and therefore devoid of any sources of noise.

Weighted standardised level differences ($D_{nT,w}$)

HTM 08-01 defines this as the 'unit for rating airborne sound insulation on-site'.

Weighted standardised impact sound pressure level ($L_{nT,w}$)

HTM 08-01 defines this as the 'unit for rating impact airborne sound insulation on-site'.

Other information

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.

Hea 06 Accessibility

(all buildings)

Number of credits available	Minimum standards
Building type dependent	Yes (residential only)

Aim

To recognise and encourage effective measures that promote safe and secure use, and access to and from the building.

Assessment criteria

The following is required to demonstrate compliance:

One credit - Safe access

1 Dedicated cycle lanes are provided which meet the following minimum width dimensions:
- 1.a Where pedestrian and cycle routes are shared, the minimum total width of the combined path is 3.0m
- 1.b Where the cycle lane is segregated from both the pedestrian route and carriageway, the minimum width of the cycle path is 2.0m and the pedestrian path is 1.5m
- 1.c Where the cycle route forms a part of the carriageway, the minimum width of the lane is 1.5m.

2 Dedicated cycle paths provide direct access from the site entrances to any cycle storage provided, without the need to deviate from the cycle path and, if relevant, connect to off-site cycle paths (or other appropriate safe route) where these run adjacent to the development's site boundary.

3 Footpaths on site provide direct access from the site entrances to the building entrances and connect to public footpaths off-site (where existing), providing practical and convenient access to local transport nodes and other off-site amenities (where existing).

4 Where provided, drop-off areas are designed off, or adjoining, the access road and provide direct access to pedestrian footpaths, therefore avoiding the need for the pedestrian to cross vehicle access routes.

5 Dedicated pedestrian crossings are provided where pedestrian routes cross vehicle access routes, and appropriate traffic calming measures are in place to slow traffic down at these crossing points.

6 For large developments with a high number of public users or visitors, pedestrian footpaths must be signposted to other local amenities and public transport nodes off-site (where existing).

7 The lighting for access roads, pedestrian routes and cycle lanes is compliant with the external lighting criteria defined in Hea 01 Visual comfort on page 83, i.e. in accordance with the national best practice road lighting guide.

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

8 Delivery areas are not directly accessed through general parking areas and do not cross or share pedestrian and cyclist routes, and other outside amenity areas accessible to building users and the general public.

9 There is a dedicated parking or waiting area for goods vehicles with appropriate separation from the manoeuvring area and staff and visitor car parking.

10 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.

11 There is a dedicated space for the storage of refuse skips and pallets away from the delivery vehicle manoeuvring area and staff or visitor car parking (if appropriate given the building type or function).

Inclusive and accessible design (all buildings except residential)

One credit

12 The building is designed to be fit for purpose, appropriate and accessible by all potential users.

13 An access strategy is developed in line with Checklist A3 on page 428. The access strategy addresses, as a minimum, access to and throughout the development for all users, with particular emphasis on the following:
- 13.a Disabled users; addressing and proposing design solutions that remove obstacles that define disability
- 13.b People of different age groups, genders, ethnicity and fitness levels
- 13.c Parents with children (where appropriate to building use or type).

14 Facilities are provided for future building occupants and users (see Compliance notes below) including, where relevant, facilities that can be shared and are accessible to members of the public or community without gaining uncontrolled access to other parts of the building (unless security processes and procedures prohibit this).

Inclusive and accessible design (residential only)

Two credits

15 Where there are national best practice standards or local legislation in place that cover (as a minimum) the Lifetime Homes checklist requirements (see Checklist A4 on page 430), the assessed development must ensure compliance with these standards or legislation.

16 Where the country of assessment does not have a compliant local standard the developer or designer must confirm (using Checklist A4 on page 430) that the assessed development meets all of the Lifetime Homes criteria.

Checklists and tables

None.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	Both options: All criteria relevant to the building type and function apply. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - Partially fitted and fully fitted		

Ref	Terms	Description
CN2	Applicable assessment criteria - Single dwellings	**Safe access: criteria 1 to 11 on the previous page** Both options: These criteria are not applicable. **Inclusive and accessible design (non-residential only): criteria 12 to 14 on the previous page** Both options: These criteria are not applicable. **Inclusive and accessible design (residential only): criteria 15to 16 on the previous page** Both options: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
CN2.1	Applicable assessment criteria - Multiple dwellings	**Safe access: criteria 1 to 11 on the previous page** Both options: All criteria relevant to the building type and function apply. **Inclusive and accessible design (non-residential only): criteria 12 to 14 on the previous page** Both options: These criteria are not applicable. **Inclusive and accessible design (non-residential only): criteria 15 to 16 on the previous page** Both options: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN3	Development does not have any external site areas. See criteria 1 to 11 on the previous page.	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 of whether or not 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, i.e. there is no on site vehicle access and parking areas, then the criteria concerning safe access are not applicable. In such instances the two available credits must be assessed and awarded based on compliance with the Inclusive and accessible design criteria.
CN3.1	Covered parking area. See criteria 2 to 11 on the previous page.	Where the assessed building has no external areas but does have a covered parking facility, and cyclists or 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.
CN3.2	Delivery access through parking areas (smaller sites and deliveries). See criteria 2 to 11 on the previous page (apart from 8 on page 133).	Criterion 8 on page 133 (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 that all deliveries to the building will be made by small vans and not heavy goods vehicles.

Ref	Terms	Description
CN3.3	No vehicle delivery and manoeuvring areas. See criteria 2 to 7 on page 133.	The criteria concerning vehicle delivery access are not applicable where dedicated delivery access and drop-off areas do not form part of the assessed development.
CN3.4	Dedicated footpaths from car parking spaces	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.
CN3.5	Shared facilities	No criteria have been set in this respect as the types of space or facilities will vary according to the building size, type, use and consultation feedback. Typical facilities that could be shared with others might include: 1. Sports facilities 2. Meeting and conference rooms 3. Amenity space for staff or visitors (internal or external).
CN3.6	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.
CN3.7	Potential users of shared facilities	Potential users of shared facilities are identified as appropriate and can include all or any of the following (if relevant to the building type and use): 1. Extra-curricular users and uses 2. Local authority or other provider of local community services 3. Local residents 4. Adult education 5. Volunteer groups 6. Local businesses 7. Operators or members of clubs and community groups.

Methodology

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
1–11	Design drawings (including a scaled site plan), or relevant sections of the specification highlighting all necessary compliant features and dimensions. Where applicable, confirmation that the minimum requirements as set out in the Approved standards and weightings list are met.	Assessor's building or site inspection and photographic evidence confirming compliance or 'as-built' site plan and design details.
12–14	The access strategy. Design drawings, or relevant section or clauses of the building specification or contract.	BREEAM Assessor's site inspection report and photographic evidence.
15–16	A completed Checklist A4 on page 430 indicating commitment to comply with all applicable points from 1–16, signed by the developer. Drawings or a copy of the specification confirming compliance with items in Checklist A4 on page 430.	A completed as-built Checklist A4 on page 430 indicating compliance with all applicable points from 1–16. BREEAM Assessor's site inspection report and photographic evidence or as-built drawings.

Additional information

Relevant definitions

External site areas

Areas external to the assessed building, but within the development's site boundary, which contain vehicle or pedestrian access roads or pathways to the building, parking, unloading and drop-off areas.

Other information

None.

Hea 07 Hazards

(all buildings)

Number of credits available	Minimum standards
1	No

Aim

To reduce or negate the impact of a natural hazard on the building.

Assessment criteria

The following is required to demonstrate compliance:

One credit

1 A risk assessment is carried out at the outline proposal or Concept Design stage by an appropriate person, or persons, to identify any potential natural hazards in the region of the development.

2 Where a potential hazard is identified, mitigation measures appropriate to the level of risk should be identified by an appropriate person and implemented.

Checklists and tables

None.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	Both options: All criteria relevant to the building type and function apply. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - Partially fitted and fully fitted		

Ref	Terms	Description
CN2	Applicable assessment criteria - Single and multiple dwellings	Both options: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN3	Where no risk is identified or where flooding is identified as the only risk	Where no risks are identified, this issue will not be included in the assessment. Where flooding is the only risk identified, this issue will not be included in the assessment as flooding is addressed in BREEAM issue Pol 03 Surface water run-off on page 378.

Methodology

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
1 on the previous page–2 on the previous page	A copy of the natural hazards risk assessment. A letter from the appropriate person confirming their compliance with the definition of an appropriate person. Confirmation of the timing of the natural hazard assessment within the plan of works.	As design stage.
2 on the previous page	Where applicable, a copy of the natural hazard risk assessment detailing the mitigation measures appropriate to the level of risk for the site AND EITHER A copy of the relevant section of the specification requiring the principal contractor to implement the mitigation measures identified OR A letter from the client or design team member confirming that the specification will require the principal contractor to implement the appropriate person's recommendations.	Assessor's building inspection or site inspection (or as-built drawings) and photographic evidence confirming that the mitigation measures have been implemented in line with the appropriate person's recommendations and specification.

Additional information

Relevant definitions

Appropriate persons

An individual (or individuals) with relevant technical and professional experience suitable to:

- Determine the potential for natural hazards in the region of the development
- Determine the likely impacts on the site, building and locality, and subsequently identify appropriate mitigation measures.

This may be a member (or members) of the design team or a specialist, independent to the design and construction process. This (or these) individuals should practice to, and abide by, a professional code of conduct or similar.

Natural hazard

Natural processes or phenomena occurring in the biosphere or crust that may constitute a damaging event. The list below is not intended to be exhaustive, but provides an indication of the type of hazards that should be considered to meet the definition. Other natural hazards may be relevant under this issue. Relevance will be dependent on local geography, geology, hydrology and climate factors and the assessor should be satisfied that appropriate local expertise has been sought by the client or design team to identify these fully:

1. Floods (addressed in Pol 03 Surface water run-off on page 378)
2. Natural disasters of geological origin such as volcanic eruptions, earthquakes and landslides
3. Natural disasters of climatic or meteorological origin such as droughts, avalanches, wave surges including tsunamis and tidal waves, and wind storms including cyclones, hurricanes, tornadoes, tropical storms, and typhoons
4. Wildfires.

Natural disaster

A serious disruption of the functioning of a community or a society, causing widespread human, material, economic or environmental losses which exceed the ability of the affected community or society to cope using its own resources.

Other information

Please note that this issue is not attempting to define all possible risks and hazards that may be present, but instead encouraging the process of risk identification, assessment and mitigation.

Natural hazard, natural disaster, and risk assessment: The definitions used within this issue are sourced from www.unisdr.org.

Hea 08 Private space

(residential only)

Number of credits available	Minimum standards
1	Yes

Aim

To provide an external space which gives occupants privacy and a sense of wellbeing.

Assessment criteria

The following is required to demonstrate compliance:

One credit

1 The outdoor space (private or semi-private) must comply with the following requirements:
- 1.a Is of a size that allows all occupants to sit outside
- 1.b Is accessible for all occupants, including wheelchair users
- 1.c Is accessible only to occupants of designated dwellings.

2 The outdoor spaces need to be adjacent, or in close proximity to the dwellings and meet the minimum size requirements (see Compliance notes below).

Checklists and tables

None.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	Both options: This issue is not applicable. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - Partially fitted and fully fitted		

Ref	Terms	Description
CN2	Applicable assessment criteria - Single and multiple dwellings	Both options: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN3	Extensions to existing buildings	There are no additional or different requirements to those outlined above specific to extension projects.
CN3.1	Minimum space requirements	Subject to any higher requirements arising from national regulations or established national best practice, these are to be set at a level which is compliant with the following: 1. For private space: 1.5m² per bedroom 2. For semi-private space, i.e. shared access by all dwelling occupants: 1.0m² per bedroom.
CN3.2	Outdoor spaces	The following are representative examples of outdoor spaces: 1. A private garden 2. A communal garden or courtyard, providing a pleasant and secluded environment large enough for all occupants of designated dwellings to share and designed in a way that makes it clear that the space is only to be used by occupants of designated dwellings 3. Balconies 4. Terraces (roof or other) 5. Patios.
CN3.3	Non-compliant outdoor space	'Juliet' balconies generally do not comply with the criteria as they are too small to provide an external space. Enclosed areas, such as conservatories, do not comply with the criteria.
CN3.4	Accessible only to occupants of designated dwellings	The design of the space, its boundaries and its relationship with the designated dwelling should make it clear that the space is only for the use of occupants.

Methodology

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
All	Drawings or a copy of the specification confirming: The number of bedrooms served by the outdoor space That the outdoor space meets the minimum size requirements and is located adjacent or close to the dwelling AND Where a shared outdoor space is provided, details of the security and control arrangements for access.	BREEAM Assessor's site inspection report and photographic evidence or 'as-built' drawings.

Additional information

Relevant definitions

None.

Other information

None.

Hea 09 Water quality

(all buildings)

Number of credits available	Minimum standards
1	Yes (criterion 1 only)

Aim

To minimise the risk of water contamination in building services and ensure the provision of clean, fresh sources of water for building users.

Assessment criteria

The following is required to demonstrate compliance:

One credit

Building services water systems: Minimising risk of contamination

1 All water systems in the building are designed in compliance with the measures outlined in the relevant national health and safety best practice guides or regulations to minimise the risk of microbial contamination, e.g. legionellosis.

2 Where humidification is required, a failsafe humidification system is provided.

Building occupants: Provision of fresh drinking water (excluding residential and residential institutions - long term stay)

3 A wholesome supply of accessible potable drinking water is supplied as follows in the permanently staffed areas:
  - 3.a Point-of-use water coolers
  - 3.b Provision in each staff kitchenette, or in a suitable location on each floor level, and in a staff canteen (if provided).

Additional for residential institutions - short term stay

4 A wholesome supply of accessible potable drinking water is supplied in public areas:
  - 4.a Provision in the foyer or lobby and gym or fitness suite, where present
  - 4.b If potable water is available in each bedroom, a point-of-use water cooler is accessible from all key public spaces, i.e. bar, lounge, lobby, entrance hall or reception, restaurant
  - 4.c If potable water is not available in each bedroom, a point-of-use water cooler is accessible from all key public spaces, i.e. bar, lounge, lobby, entrance hall or reception, restaurant AND specified in public areas next to key access points (lifts and stairwells) to each bedroom floor or area.

Checklists and tables

None.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	**Building services water systems: Minimising risk of contamination, criteria 1 and 2 on the previous page** Shell only: These criteria are not applicable. Shell and core: All criteria relevant to the building type and function apply. **Building occupants: Provision of fresh drinking water, criterion 3 on the previous page** Both options: These criteria are not applicable.
Residential - Partially fitted and fully fitted		
CN2	Applicable assessment criteria - Single and multiple dwellings	**Building services water systems: Minimising risk of contamination, criteria 1 and 2 on the previous page** Both options: All criteria relevant to the building type and function apply. **Building occupants: Provision of fresh drinking water, criterion 3 on the previous page** Both options: These criteria are not applicable. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN3	National health and safety best practice guides	Please refer to the Approved Standards and Weightings List (ASWL) to find the appropriate health and safety best practice guides in the country of assessment. Alternatively, please demonstrate applicability as follows: — The minimum requirements as set out in the Approved standards and weightings list are covered by the proposed documents — Where no appropriate reference document exists for a country, the design team should demonstrate compliance using the UK alternative as listed in each relevant country reference sheet.
CN3.1	Failsafe humidification system	A failsafe humidification system is one where failure of the system that sterilises the water vapour results in the entire humidification system initiating a shut down. This shut down, therefore, avoids any risk of building users being exposed to untreated and potentially contaminated water until the systems failure is corrected. Steam humidification is an example of a failsafe system.

Ref	Terms	Description
CN3.2	New build extensions to existing buildings	If the new-build extension and existing building will share the same services or water systems, then the existing systems must be assessed against the criteria regardless of whether the existing building forms a part of the assessment or not. If the extension is served by independent systems, only these need be assessed against the assessment criteria. If it is the intention that building users of the new extension will use water systems in the existing building, then it must be confirmed that the existing systems comply with the criteria.
CN3.3	Microbial contamination and the BREEAM Assessor's reporting responsibility	The BREEAM Assessor is not required to confirm that the design is compliant with the relevant standards; this is the responsibility of the design team. The assessor is simply required to record, for the purposes of validation, whether or not the design team confirms it has complied.
CN3.4	Non-compliant point-of-use water dispensers	The following types of water dispensers do not comply with the criteria of this BREEAM issue: 1. Drinking water fountains, as they are difficult to keep in a hygienic condition, and do not encourage users to consume adequate fluid intake 2. Mains fed taps in toilet areas (note: taps in kitchen areas are compliant) 3. Bottled water from vending machines or over the counter.

Methodology

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
1–2	The relevant section or clauses of the building specification or contract.	A formal letter of declaration from the design team, principal contractor or installer of the relevant systems confirming compliance. BREEAM Assessor's site inspection report and photographic evidence or as-built drawings.
3	Design drawings.	BREEAM Assessor's site inspection report and photographic evidence or as-built drawings.

Additional information

Relevant definitions

Legionnaires' disease

A type of pneumonia caused by the bacterium Legionella pneumophilia. People catch Legionnaires' disease by inhaling small droplets of water suspended in the air, which contain the bacteria.

Point-of-use water cooler

Water coolers that are plumbed directly into the mains water supply and drainage. The advantage of water coolers is twofold: their appearance is modern and appealing to users and most offer both chilled and ambient temperature water.

Potable water

Water suitable for human consumption that does not contain any micro-organism, parasite or substance at a concentration or value which would constitute a potential danger to human health.

Water systems

For the purpose of this issue, this refers to:

1. Cooling towers
2. Evaporative condensers
3. Domestic hot and cold water systems
4. Other plant and systems containing water which is likely to exceed 20°C and which may release a spray or aerosol during operation or when being maintained, for example:
    a. Humidifiers and air washers
    b. Spa baths and pools
    c. Car or bus washes
    d. Wet scrubbers
    e. Indoor fountains and water features.

Other information

None.

Energy

Summary

This category encourages the specification and design of energy efficient building solutions, systems and equipment that support the sustainable use of energy in the building and sustainable management in 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.

Category summary table

Issue	Credits	Credit summary
Ene 01 Reduction of energy use and carbon emissions	13	— Recognise improvements in the energy performance of the building above national building regulations in relation to heating and cooling energy demand, primary energy consumption and carbon dioxide emissions. — Encourage steps taken to reduce energy demand through building design and systems specification. — Predict operational energy consumption by end use and promote monitoring and management of risks through construction and commissioning.
Ene 02a Energy monitoring	2	— Energy metering systems are installed to enable energy consumption to be assigned to end uses. — Sub-meters are provided for areas with high or variable energy load, including tenanted areas.
Ene 02b Energy monitoring	2	— Specification of energy display devices.
Ene 03 External lighting	1	— Specification of energy efficient light fittings for external areas of the development and controls to prevent use during daylight hours or when not needed.
Ene 04 Low carbon design	3	— Analysis of the proposed building design and development is undertaken to identify opportunities for and encourage the adoption of passive design solutions. — A feasibility study has been carried out to establish the most appropriate on-site or near-site low or zero carbon (LZC) energy sources for the building or development.
Ene 05 Energy efficient cold storage	3	— The refrigeration system, its controls and components have been designed, installed and commissioned in accordance with appropriate codes and standards and demonstrates a saving in greenhouse gas emissions (kg CO_2-eq) over the course of its operational life.

Issue	Credits	Credit summary
Ene 06 Energy efficient transport systems	3	— An analysis of the transport demand and usage patterns is undertaken to determine the optimum number and size of lifts, escalators, or moving walkways. — Energy efficient installations are specified.
Ene 07 Energy efficient laboratory systems	5	— Client engagement to determine occupant requirements and define laboratory performance criteria to optimise energy demand of the laboratory facilities. — Specification of best practice energy efficient equipment and measures as appropriate.
Ene 08 Energy efficient equipment	2	— Identification of the building's energy-consuming equipment that has a major impact on the total energy demand. — Demonstrate a meaningful reduction in energy demand.
Ene 09 Drying space	N/A	
Ene 10 Flexible demand side response	1 exemplary credit	— The building contains one or more appliances or systems that vary their operation in response to external signals from electricity suppliers.

Ene 01 Reduction of energy use and carbon emissions

(all buildings)

Number of credits available	Minimum standards
13	Yes

Aim

To recognise and encourage buildings designed to minimise operational energy demand, primary energy consumption, and CO_2 emissions.

Assessment criteria

This issue is split into the following parts:

- Energy performance
  - Standard route: Use of approved building energy calculation software (up to 9 credits)
  - Basic route: Energy efficient design features (up to 4 credits)
- Prediction of operational energy consumption (4 credits)
- Exemplary level criteria (up to 5 credits)

The following is required to demonstrate compliance:

Energy performance

Up to nine credits – Standard route (option 1): Use of approved building energy calculation software

1 Calculate the Energy Performance Ratio for International New Construction (EPR_{INC}). Compare the EPR_{INC} achieved with the benchmarks in Table 26 below and award the corresponding number of BREEAM credits.

Table 26: Ene 01 EPR_{INC} benchmark scale

		Minimum standards	
BREEAM credits	EPR_{INC}	Rating	Minimum requirements
1	0.1	-	To achieve one or more credits requires an improvement on minimum energy performance reference building level as defined in CN3.3 on page 154.
2	0.2		
3	0.3		

		Minimum standards	
BREEAM credits	**EPR_{INC}**	**Rating**	**Minimum requirements**
4	0.4	Excellent	**Standard route (option 1)**: EPR_{INC} of 0.4 or above. OR 4 credits for prediction of operational energy consumption (where operational energy performance has been substantially improved). **Basic route (option 2):** 4 credits
5	0.5		
6	0.6	Outstanding	EPR_{INC} of 0.6 or above. AND 4 credits for prediction of operational energy consumption.
7	0.7		
8	0.8		
9	0.9		

A description of how the EPR_{INC} is calculated from a building's modelled energy demand, primary energy consumption and CO_2 emissions is provided in the Methodology on page 157.

Up to four credits – Basic route (option 2): Energy efficient design features

No NCM

Where there is no NCM available, and the design team decide against an alternative modelling approach (see CN3.2 on page 154), the energy performance of the building can be determined using Checklist A5 on page 433.

Up to four credits

2 A Suitably qualified energy modelling engineer or accredited professional has used Checklist A5 on page 433 to determine the number of credits awarded for this issue.

3 The Suitably qualified energy modelling engineer or accredited professional has confirmed the items selected within Checklist A5 are appropriate to the building type and local climatic conditions to award up to four credits.

Prediction of operational energy consumption

Four credits – Prediction of operational energy consumption

4 Involve relevant members of the design team in an energy design workshop focusing on operational energy performance at the concept design stage (see Methodology).

5 Undertake additional energy modelling during the design and post-construction stage to generate predicted operational energy consumption figures (see Prediction of operational energy consumption on page 158).

6 Report predicted energy consumption targets by end use, design assumptions and input data (with justifications).

7 Carry out a risk assessment to highlight any significant design, technical, and process risks that should be monitored and managed throughout the construction and commissioning process.

Exemplary level criteria

The following outlines the criteria to achieve up to five exemplary credits for this BREEAM issue:

Up to three exemplary credits – Beyond zero net regulated carbon

8 The building achieves nine credits under the standard route (option 1).

9 The building has been modelled using the standard route (option 1) and the modelling demonstrates that 100% of the building's service energy use plus a percentage of the building's equipment energy use requirements is generated by recognised on-site or near-site LZC technologies with a direct physical connection to the building (see CN3.7 on page 155).

10 Award the exemplary credits based on the percentage of equipment energy use that is met by recognised LZC sources (see Table 27 below).

Table 27: Exemplary performance credits for beyond zero net regulated carbon

Exemplary credits	Percentage of equipment energy use that is met by LZC sources
1	≥ 10%
2	≥ 50%
3	> 100%

Two exemplary credits – Post-occupancy stage

11 Achieve maximum available credits in Ene 02a Energy monitoring on page 165 or Ene 02b Energy monitoring on page 172. In addition, preschools, primary schools, law courts, prisons and multi-residential buildings must meet the requirements of the second credit for sub-metering by functional or tenanted areas.

12 The client or building occupier commits funds to pay for the post occupancy stage. This requires an assessor to be appointed and to report on the actual energy consumption compared with the targets set in criterion 6.

13 The energy model (criterion 5) is saved so that it can be rerun post occupancy. This can be achieved by either:
13.a Submitting the model to BRE.
13.b The model being retained by the building owner or a named third party.

Checklists and tables

None.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institution only)		
CN1	Applicable assessment criteria	**Energy performance, criterion 1** Shell only: Calculate an Energy Performance Ratio just for the building's heating and cooling energy demand only (EPR_{ED}). Use the EPR_{ED} achieved as the EPR_{INC} in Table 26 on page 150. **Prediction of operational energy consumption, criteria 4 to 7** Shell only: These criteria are not applicable. Shell and core only: All assessment criteria relevant to the building type and function apply. Refer to Appendix D – Shell and core project assessments on page 409 of this Scheme Document for further description of the above options.
CN1.1	Applicable assessment criteria - Shell only and Shell and core	Where the building services efficiencies are unknown the minimum energy efficiency standards or backstop levels required by the relevant national building regulations should be used. For example, this might occur when the building services are not within the remit of the shell and core developer.
CN1.2	Green fit-out agreement	When modelling Shell only and Shell and core assessments, worst-case assumptions are normally used for the performance of speculative systems where their performance is unknown. These assumptions are based on minimum energy efficiency standards as defined in the national building regulations, or worst-case performance data. Where a Green fit-out agreement on page 162 is used, these worst-case assumptions can be replaced with performance specifications required in the fit-out agreement. The agreement must be contractually binding. Any speculative areas not covered by the agreement must still use worst case assumptions.
CN1.3	Shell only - Installation of building services	In shell only projects, even where installed system(s) will improve the primary consumption and/or CO_2 EPR metrics, only the EPR demand metric will be used. (KBCN00078)
CN1.4	Shell only - No energy demand metric	For Shell only buildings just the energy demand metric is assessed. However, where the NCM is unable to provide the energy demand metric, the available remaining metrics can be used instead. (KBCN0576)
Residential - Partially fitted and fully fitted		

Ref	Terms	Description
CN2	Applicable assessment criteria - Single and multiple dwellings	Both options: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN3	Extensions to existing buildings	For an extension that uses the existing building's services, the energy modelling and percentage of improvement must be based on the building fabric of the extension and the building services that will service the extension. This includes any existing, shared, and new plants that will serve the extension. The energy modelling does not have to consider the existing building fabric where it will be out of the scope of the BREEAM assessment. Nor does it have to consider existing service systems not supplying the extension.
CN3.1	Suitably qualified energy modelling engineer or accredited expert	Where a National Calculation Methodology (NCM) requires accredited experts to undertake the energy performance calculations, these accredited professionals are also required to demonstrate compliance with this BREEAM issue. If the NCM does not require accredited experts, or alternative approved building energy calculation software is used, then a Suitably qualified energy modelling engineer or accredited professional must carry out the modelling.
CN3.2	Hierarchy of options	Where there is a NCM in the country of assessment, then the standard route (option 1) must be used to demonstrate compliance with this issue. Where there is no National Calculation Method (NCM) in place OR where the NCM does not allow the design team to undertake an analysis of issues such as lighting or renewable energy generation, the design team may undertake a more thorough analysis of the performance of the building using alternative approved building energy calculation software (see CN3.3 below). The basic route (option 2) is available for design teams if they choose not to carry out energy modelling of their building and where there is no NCM in place. However, because energy modelling is the preferred way to demonstrate that a building is energy efficient, only a maximum of 4 credits are available using the basic route.
CN3.3	Generating a reference building	The reference building will be generated using either: 1. Local building regulations or standards. OR 2. Appendix G Performance Rating Method of ASHRAE Standard 90.1 (for all buildings except low rise residential buildings) or ASHRAE Standard 90.2 (for low rise residential buildings). OR 3. A reference building as defined in the UK's NCM. This option is only available where the building is located in a temperate climate (Köppen Geiger climatic zone Cfb). Options 2 and 3 above are only available in countries where the local regulation is less rigorous than Appendix G of ASHRAE Standard 90.1 or the UK's NCM.

Ref	Terms	Description
CN3.4	Performance metrics	All three performance metrics - demand, primary energy consumption and CO_2-generated by the approved building modelling software should be entered into the BREEAM scoring and reporting tool to calculate the Ene 01 score, even if there are no mandatory requirements related to a particular metric in the country of assessment. For example, if the local building regulations only set a target with respect to primary energy consumption, but the approved software also reports figures for energy demand, both the figures for primary energy consumption and energy demand should be reported in the BREEAM scoring and reporting tool.
CN3.5	Countries with a NCM that does not report on all three performance metrics	The output documents generated by the approved software may not include all three performance metrics required by BREEAM. Where this is the case, all the metrics that are available must be entered into the scoring and reporting tool.
CN3.6	Internal lighting not calculated using approved building energy calculation software	If internal lighting is not included within the modelling calculations, the credits available from modelling will be reduced and the remaining credits awarded for complying with the lighting criteria within Checklist A5 on page 433 as follows: 1. Seven credits will be available for residential buildings, with up to two additional credits available for compliance with the residential lighting criteria within Checklist A5. a. One credit for compliance with criteria 3 and 4. b. Two credits for compliance with criteria 3 to 6. 2. Eight credits will be available for non-residential buildings, with one additional credit available for compliance with the non-residential lighting criteria within Checklist A5 (criteria 1 and 2).
CN3.7	Building assessed as part of a larger development	Where the building under assessment forms part of a larger development and either a new or existing Recognised low or zero carbon (LZC) technologies installation is provided for the whole site, then the amount of LZC energy generation counted for in this issue, and subsequent CO_2 emissions saved, should be proportional to the building's energy consumption compared to the total energy consumption for the site. See On-site LZC – whole site shared connection on page 159.
CN3.8	Energy consumption and carbon emissions of untreated spaces	Where the assessment contains a mix of treated and untreated spaces, untreated spaces can be excluded, and the performance based on the treated spaces only. Where the entire assessment is untreated, the whole of the structure(s) must be assessed on the basis that this issue is critical for certification. (KBCN00049)
CN3.9	Parts of the building not subject to national thermal regulations	Where parts of the assessed building are not subject to national thermal regulations then these should be omitted from the EPR calculation. (KBCN0534)

Ref	Terms	Description
CN3.10	Energy performance assessment for part of a whole 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 comply, especially if the non-assessed parts of the building were of a different use. (KBCN0596)
Building type specific		
CN4	Residential buildings - Calculation procedure for multiple dwellings	The Ene 01 calculation should be completed for each dwelling or each energy type or each energy group (see CN4.1 below). The energy performance ratio (EPR_{INC}) should then be area averaged for the whole development using the calculation procedure in the Methodology on the facing page for either the standard route (option 1) or the basic route (option 2). Where the advised averaging method is deemed unsuitable for the approved building energy methodology, a new calculation can be approved; please contact BRE Global for guidance. An example is where a NCM considers energy consumption in communal areas as well as per dwelling.
CN4.1	Residential buildings - Energy type	A set of residences on a development are of the same 'energy type' if they have the same approved building energy calculation software outputs for performance data as outlined in the Methodology on the facing page. They will exhibit each of the following: 1. Approximately the same size, built form and construction details. 2. The same space heating, hot water system, and controls. 3. The same orientation and level of over-shading or sheltering. 4. The same assumed or actual air permeability and ventilation system.
CN4.2	Residential buildings - Energy groups	Energy groups only apply when a building contains multiple flats, apartments within the same building envelope, or adjoined dwellings. The performance data outlined in the Methodology on the facing page can be averaged across the whole building provided that the same building services strategy is adopted throughout. These dwellings are defined as an energy group: 1. Where varying servicing strategies (including the provision of renewable energy systems) are adopted in the building, dwellings should be grouped by strategy 2. Each energy group must be treated separately for the purposes of assessment and an average Actual building emission rate and Reference building emission rate are used to calculate the percentage improvement. It is the BREEAM Assessor's choice whether or not to use the energy groups averaging method or to complete the calculation for each individual dwelling. Note: This averaging rule cannot be applied to single dwellings.

Ref	Terms	Description
CN4.3	Non-residential buildings - Energy modelling, BREEAM building use and tenancy arrangement	The legislative criteria for energy modelling may vary according to building size, use, services, and tenancy arrangement. In some instances, modelling may be undertaken for the whole building; in others, modelling may be undertaken for each individual unit or tenanted area within a building. The scope of a BREEAM assessment typically covers the whole building, regardless of whether that building consists of several units to be sublet. Where energy modelling is required for each unit refer to Ene 01 Reduction of energy use and carbon emissions on page 150. Where the development contains conditioned shared or landlord spaces, the area of these spaces, unless otherwise accounted for, should be divided and attributed among the separate units. The proportion of shared areas attributed to each unit must be equivalent to the ratio of each unit as a proportion of the total area of all units. All units, heating systems, and common areas within the assessed building must be included in the assessment of Ene 01.
CN4.4	Retail – shell only – glazing not within scope	Where a retail building envelope is not complete and glazing will be provided by the future tenant(s), there are two options available: 1. Follow the approach of CN1.2 on page 153. 2. The assessment can be based on worst permissible performance under the relevant national building regulations. (KBCN0937)

Methodology

Ene 01 calculation methodology using the standard route (option 1)

The methodology for the EPR_{INC} calculation considers three metrics of modelled building performance when determining the number of credits achieved for this issue. The three metrics are:

1. The building's heating and cooling energy demand
2. The building's primary energy consumption
3. The total resulting CO_2-eq emissions

These three metrics for the actual modelled building performance are compared against the relevant national building regulations compliant standard (i.e. a baseline) and each is expressed as a percentage improvement. The percentage improvements are then compared against modelled building stock and translated into a ratio of performance for each metric. These ratios are weighted for each metric and added together to determine the overall Energy Performance Ratio (EPR_{INC}).

The calculation is determined using the following performance data:

— Building floor area (m^2)
— Reference building heating and cooling energy demand (MJ/m^2)
— Actual building heating and cooling energy demand (MJ/m^2)
— Reference building primary energy consumption (kWh/m^2)
— Actual building primary energy consumption (kWh/m^2)
— Reference building emission rate (kg CO_2-eq/m^2)
— Actual building emission rate (kg CO_2-eq/m^2)

The performance data is extracted from annual energy modelling of the building's specified or designed regulated fixed building services and fabric, as undertaken by an accredited energy assessor or a member of the design team using approved building energy calculation software.

The necessary energy modelling data required to determine building performance is sourced from National Calculation Method compliant energy modelling software, used by the design team to demonstrate building regulation compliance. This data is then entered into the BREEAM Ene 01 calculator to determine the EPR_{INC} and number of credits achieved. The Ene 01 calculator is within the BREEAM assessment scoring and reporting tool, in the Energy section.

The methodology is described in detail in Guidance Note 48, which can be downloaded from the BREEAM website.

Calculating EPR where there are multiple modelling outputs

Where more than one modelling output is produced for a development that is registered as a single assessment, an area-weighted average should be used to calculate the number of credits to be awarded. This does not apply where the 'similar buildings' approach is used.

Each of the energy performance outputs from the documents (actual kg CO_2-eq/m², reference kg CO_2-eq/m² etc.) must be area-weighted to produce area weighted average values which are entered into the scoring and reporting tool. When applying this method, please include your area-weighting calculations and outputs as supporting evidence.

Prediction of operational energy consumption

The Energy Prediction and Post-occupancy guidance defines a methodology to use for design stage energy modelling and subsequent in-use validation to obtain the Ene 01 credits. The aim of the methodology is to incentivise better understanding of energy modelling techniques and reward more accurate predictions of energy use at early stages to support better design and construction of new buildings.

The suitably qualified energy modeller must model several scenarios creating a range of predicted consumptions, informed by a risk assessment of the building energy uses.

These scenarios will consider:

- Weather
- Operating hours for systems
- Occupancy hours
- Management factors

For more information, please refer to Guidance Note 32 *Energy Prediction and Post Occupancy Assessment* provided on the BREEAM website. The purpose of this Guidance Note is to describe the energy performance prediction and subsequent post occupancy monitoring methodology. It relates specifically to the prediction of operational energy consumption criteria (four credits) and the post-occupancy stage criteria (two exemplary credits).

Estimating equipment energy demand for building systems or processes

Where credits have been sought for prediction of operational energy consumption, and operational energy modelling has been carried out (criterion 5), the output of this modelling should be used to estimate the equipment energy demand.

Where such outputs are not available, the following guidance applies:

At present there is no standard or national calculation methodology for modelling equipment energy demands in a building. To demonstrate compliance with the 'exemplary level criteria' the building's modelled operational service energy consumption may be used as a proxy for its equipment energy demand, i.e. equipment energy equals 100% of service energy. While not accurate, this approach enables BREEAM to assess and award credits for buildings that meet a proportion of its energy demand for the building can be accurately predicted, this data can be used to determine the percentage of equipment energy demand met via renewable energy sources. Equipment energy demand can be estimated based on metered data from a similar or the same building type with the same unregulated system or process loads or by using the methodology described in CIBSE TM54 'Evaluating operational energy performance of buildings at the design stage', 2013.

Energy design workshop focusing on operational energy performance

The energy design workshop should focus on setting an energy performance target for the building and considering how the intended energy performance of the building will be maintained from design through to occupation and rating measurement. It should also consider how the energy performance of the building will be affected by future weather patterns, changes of use and variations in the expected usage of the building and consider the resilience of building systems.

Post-occupancy stage

Where the exemplary credits are achieved and the post occupancy stage will be followed, the building owner will need to:

- Report energy consumption for the first 12 months of normal occupancy for all relevant end uses.
- Report energy consumption for the first 12 months, broken down into monthly intervals, for all relevant end uses (see Man 05 Aftercare on page 74).
- Compare reported energy consumption figures with targets set in criterion 6 on page 151.
- Identify causes of discrepancies and the remediation actions required.

On-site LZC – whole site shared connection

To be recognised in BREEAM, the on-site low or zero carbon (LZC) technology must have a direct physical connection to the assessed building.

OR

Where the LZC technology is:

- located on the same site,
- is owned and managed by the same organization as the assessed building, and
- where it is impractical to physically connect the assessed building to the system

It is acceptable to allocate the energy generated from this technology to the assessed building proportionally as a calculation of the building's predicted energy consumption compared to the total energy consumption of the whole site.

To allocate renewable electricity by proportional consumption follow these steps:

1. Obtain the total amount of annual renewable electricity generated on-site.
2. Exclude all renewable electricity which has been exported to the grid.
3. Determine the respective electricity consumption of all buildings on the whole site (predicted for new builds, measured for existing buildings).

Where consumption data is missing, renewable electricity must not be allocated to the assessed building. In this case, it must be assumed that all electricity consumed is sourced from the grid.

Evidence

<table>
<tr><th>Criteria</th><th>Interim design stage</th><th>Final post-construction stage</th></tr>
<tr><td>1</td><td>A copy of the report and output documents generated by the approved software for the assessed building at the design stage illustrating:
1. The actual building and reference building performance data.
2. Name of the approved software used to carry out the modelling for calculating the energy performance
3. Confirmation of the expertise and experience of the individual carrying out the modelling in compliance with the requirements of the local building regulations
AND
Where appropriate, a letter from the person carrying out the modelling confirming:
4. Data used to model the reference building is taken from local building regulations, Appendix G of ASHRAE Standard 90.1, or the UK's National Calculation Methodology.
The output documents must be based on the 'as designed' stage of analysis.</td><td>Third party documentation, as follows:
1. Actual building energy performance certificate and the output documents of the approved software. This is required as part of demonstrating the as-built building complies with local building regulations, Appendix G of ASHRAE Standard 90.1, or the UK's National Calculation Methodology.
2. As-built drawings to demonstrate that the specification used and modelled at the design stage matches the specification of the completed building
3. Calculations associated with averaging, where it has occurred. The final rating must account for any changes to the specification during construction.</td></tr>
<tr><td>2–3</td><td>A completed copy of Checklist A5.
The relevant specification clauses confirming details of compliance with each requirement.
A letter from the building services engineer confirming items selected from the checklist are appropriate for the building type and local climatic conditions.</td><td>As-built drawings and specification demonstrating compliance with the criteria.</td></tr>
<tr><td>4</td><td>Workshop minutes, agreed outcomes.</td><td>As per interim design stage.</td></tr>
<tr><td>5–7</td><td>Predicted energy consumption values, design assumptions, input data and risk assessments reported as detailed in the Energy Prediction and Post-occupancy guidance available from the BREEAM website. Confirmation of suitably qualified energy modeller’s qualifications and experience.</td><td>As per interim design stage. Where changes to design assumptions and input data have occurred at post-construction stage, the energy modelling should be re-run to consider those changes.</td></tr>
</table>

Criteria	Interim design stage	Final post-construction stage
8–10	A copy of a report, calculations or outputs from the manufacturer, supplier, engineer or software modelling confirming: 1. The total energy generation from recognised LZC sources (kWh/year) 2. The sources of the LZC energy 3. The calculated estimate of the 'Equipment energy' consumption from systems or process (kWh/year). 4. The calculated estimate of exported energy surplus.	As required for criteria 1–3 and as per interim design stage.
11–13	The client's commitment to proceed to the post occupancy stage and report the energy consumption. Where the energy model is retained by the building owner or third party, details of the organisation and specific references for the energy model.	As per interim design stage.

Additional information

Relevant definitions

Actual building emission rate

This is the predicted building's CO_2 emission rate that is expressed as kg CO_2-eq/m²/year and calculated by the approved building energy calculation software.

Approved building energy calculation software

Software approved for the purpose of demonstrating compliance with the energy efficiency and carbon emission requirements of the building regulations (and in turn compliance with the Energy Performance of Buildings Directive, EPBD). In countries with an existing National Calculation Methodology (NCM), the tools approved for use under the NCM can be approved as building energy modelling software automatically. These will be confirmed by BRE as part of the Approved standards and weightings list process. Where the design team wishes to use an alternative modelling software package for assessing this issue, please request the Approval for Energy Software from BRE Global to determine whether the software package meets the minimum requirements in terms of the minimum capabilities, design features and testing results. Where those minimum requirements are met, approval from BRE Global will be required (via the Approved standards and weightings list process) before the package can be used for the purposes of demonstrating compliance with Ene 01.

Building regulations

Building regulations set standards for the design and construction of buildings to ensure the safety and health of people in or about those buildings. They also include requirements to ensure that fuel and power is conserved and facilities are provided for people, including those with disabilities, to access and move around inside buildings.

Direct physical connection to the building

To qualify for this issue, the LZC technology must have a direct connection to the building (for electricity, this is often referred to as private wire arrangement). If electricity is generated which is surplus to the instantaneous demand of the building, this electricity may be fed back to the national grid. The carbon benefit associated with any electricity fed into the grid in this manner can only be allocated against an individual installation or building. In cases where a building is supplied by a communal installation, no carbon benefit can be allocated to buildings which are not connected to the communal installation.

Dynamic simulation model (DSM)

A software tool that models energy inputs and outputs for different types of buildings over time.

Energy demand

The building energy provided for end uses in the building such as space heating, hot water, space cooling, lighting, fan power and pump power. Energy demands are the same as room loads. One of the outputs from the modelling is for heating and cooling energy demand only, not for any other building energy uses. Heating and cooling energy demands are influenced by factors including building fabric heat loss, air permeability, glazing and shading.

Energy Performance Ratio for International New Construction (EPR_{INC})

A metric that is unique to BREEAM and calculated by the BREEAM Ene 01 calculator tool using outputs from the approved building energy calculation software. It is a ratio that defines the performance of an assessed building in terms of its service energy demand, primary energy consumption, and CO_2-eq emissions. This measure of performance is used to determine the number of Ene 01 credits a building achieves in the BREEAM assessment. A description of how the (EPR_{INC}) is defined and calculated is provided in the Methodology on page 157.

Equipment energy

Building energy consumption resulting from systems or processes within the building, other than Service energy (see definition below). This may include energy consumption from systems integral to the building and its operation, e.g. lifts, escalators, refrigeration systems, ducted fume cupboards; or energy consumption from operational-related equipment, e.g. servers, printers, computers, mobile fume cupboards, cooking and other appliances.

Green fit-out agreement

A green fit-out agreement is a formal, legally binding agreement between a building developer or owner and their tenants. As such, a green fit-out agreement (or 'green' clauses or sections in a lease agreement) can be evidence for demonstrating compliance with the relevant BREEAM issue criteria at the interim design and final post-construction stages of assessment. The agreement should refer to the specification requirements or levels claimed and defined in this technical manual.

BREEAM aims to encourage a mutually beneficial relationship between the shell and core developer or owner of a building and its future tenants to ensure the fully fitted operational building achieves performance against the highest possible environmental standards. When an agreement is provided as evidence and it commits the tenant's fit-out to meet the criteria of this BREEAM issue, credits are available to be awarded.

National Calculation Method (NCM)

A National Calculation Methodology (NCM) enables quantification of building operational energy consumption and CO_2-eq emissions resulting from building services or systems and fabric performance. Within Europe, a country's NCM is the methodology used for demonstrating compliance with the EU Energy Performance of Buildings Directive.

Near-site LZC

A recognised LZC source of energy generation located near to the site of the assessed building. The source is most likely to be providing energy for all or part of a local community of buildings, including the assessed building, e.g. decentralised energy generation linked to a community heat network or renewable electricity sources connected via a private wire arrangement.

On-site LZC

A recognised LZC source of energy generation which is located on the same site as the assessed building.

Primary energy consumption

This measures the primary energy content of delivered fuel or other energy sources. It takes account of the energy associated with fuel production, energy transformation (e.g. electricity generation) and distribution processes, including losses, in addition to the inherent energy content of the fuel or energy source.

Recognised low or zero carbon (LZC) technologies

Technologies eligible to contribute to achieving the requirements of this issue must use energy from the following sources:

- Wind
- Solar radiation (solar thermal and solar photovoltaic)
- Geothermal and hydrothermal energy sources
- Hydropower
- Biomass from waste and biofuels derived from second generation biomass feedstock or waste sources, including landfill gas and sewage treatment gas (see CN5.7 and CN5.8 in Ene 04 Low carbon design)
- Waste heat (see CN5.4 in Ene 04 Low carbon design)
- Heat or electricity from waste incineration (see CN5.6 in Ene 04 Low carbon design)

Reference building

A hypothetical building of the same size, shape, orientation and shading as the actual building, with the same activities, zoning and system types and exposed to the same weather data, but with predefined specified properties for the building fabric, fittings and services.

Reference building emission rate

The reference building emission rate is the minimum energy performance requirement for a new building (kg CO_2-eq/m²/year) as defined by local building regulations or international standards. This is calculated in accordance with approved building energy calculation software and is expressed in terms of the mass of CO_2-eq emitted per year per square metre of total useful floor area of the building (kg CO_2-eq/m²/year).

Service energy

Building energy consumption resulting from fixed internal lighting systems, fixed heating or cooling, hot water service or mechanical ventilation.

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.

This can be someone operating as a sole trader or employed by public or private enterprise bodies.

Other information

Energy model submitted to BRE

The energy model will be submitted to BRE to assist with the quality assurance of the post occupancy stage and the ongoing development of BREEAM. BRE will keep the models secure in our systems and will only release them if required for the post-occupancy stage assessment.

Approved software submission

In countries with an existing National Calculation Methodology (NCM), the tool(s) approved for use under the NCM can be used as approved building energy calculation software without our prior approval, provided that the software conforms the following modelling requirements as set out in Directive 2002/91/EC on the energy performance of buildings (16 December 2002):

1. Thermal characteristics of the building (shell and internal partitions, etc.) which may also include air-tightness;
2. Heating installation and hot water supply, including their insulation characteristics;
3. Air-conditioning installation;
4. Ventilation;
5. Built-in lighting installation;

6. Position and orientation of buildings, including outdoor climate;
7. Passive solar systems and solar protection;
8. Natural ventilation;
9. Indoor climatic conditions, including the designed indoor climate.

Where the design team wishes to use an alternative modelling software package, the assessor should first check the Approved Standards and Weightings List to see if the software is listed there. If the software cannot be found in the ASWL, please download, and fill out the Ene 01 Approval for Energy Software form from BREEAM Projects and submit this to the technical team via the query webform on BREEAM Projects, along with the appropriate evidence.

Ene 02a Energy monitoring

(non-residential, plus residential institutions)

For residential buildings, see Ene 02b Energy monitoring on page 172.

Number of credits available	Minimum standards
Building type dependent	Yes

Aim

To encourage the installation of energy sub-metering to allow monitoring of operational energy consumption. To allow managers and consultants post-handover to compare actual performance with targets in order to inform ongoing management and reduce any performance gap.

Assessment criteria

This issue is split into two parts:

- Sub-metering by end-use (1 credit)
- Sub-metering by functional or tenanted areas (1 credit)

Please note:

- The first credit is applicable to all building types.
- The second credit is not applicable to preschools, primary schools and residential institutions - long-term stay.

The following is required to demonstrate compliance:

One credit - Sub-metering by end-use

1 Energy meters are installed that allow at least 90% of the estimated annual energy consumption of each fuel or energy supply to be assigned to an end-use category (see Methodology on page 168).

2 The energy metering system is appropriate for the size for the building:
  2.a For buildings with a gross internal area greater than or equal to 1000m², the energy meters are part of an energy monitoring and management system (see Relevant definitions on page 170).
  2.b For buildings with a gross internal area less than 1000m², the energy meters are either:
    2.b.i Part of an appropriate energy monitoring and management system.
    2.b.ii Accessible meters with pulsed outputs or other open protocol communication outputs.

3 Building users can identify the end-use category covered by each meter (for example, through labelling).

One credit - Sub-metering by functional or tenanted areas

4 Energy meters are installed that allow energy consumption to be assigned to:
  4.a Tenanted areas (see Methodology on page 168)
  4.b Relevant functional areas (see Methodology on page 168)

5 The energy metering system is appropriate for the size for the building:
  5.a For buildings with a gross internal area greater than or equal to 1000m², the energy meters are part of an energy monitoring and management system (see Relevant definitions on page 170).
  5.b For buildings with a gross internal area less than 1000m², the energy meters are either:

5.b.i Part of an appropriate energy monitoring and management system.
5.b.ii Accessible meters with pulsed outputs or other open protocol communication outputs.

6 Building users can identify the end-use category covered by each meter (for example, through labelling).

Checklists and tables

Table 28: Examples of relevant functional areas for different building types

Building type	Relevant functional areas
Office buildings	1. Office areas, by floor 2. Catering
Retail buildings	1. Sales area 2. Storage and warehouse 3. Cold storage 4. Offices 5. Catering 6. Tenant units
Industrial units	1. Office areas 2. Operational area 3. Ancillary areas (e.g. canteens)
Hotel buildings	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 buildings	1. Kitchens (excluding small staff kitchens and food technology rooms) 2. Workshops 3. Lecture halls 4. Conference rooms 5. Drama studios 6. Swimming pools 7. Sports halls 8. Process areas 9. Laboratories 10. High containment suites within laboratories 11. Controlled environment chambers 12. Animal accommodation areas 13. IT server rooms 14. IT work and study rooms (including IT-equipped library space and any space with provision of more than one computer terminal per 5m²) Note: Individual sub-metering of standard classrooms or seminar rooms is not required.

Building type	Relevant functional areas
Hospitals and other healthcare facilities	1. Medical physics facilities 2. Rehabilitation when including hydrotherapy pools 3. Central sterile supplies departments (or equivalent) 4. Process areas (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 less than 1000m²) that have no functional areas with a high energy load.
Other buildings	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.
Notes: 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.	

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	**Sub-metering by end use, criteria 1 to 3 on page 165** Shell only: These criteria are not applicable. Shell and core: All criteria relevant to the building type and function apply. **Sub-metering of high energy load and tenancy areas, criterion 4 to 6 on the previous page** Shell only: These criteria are not applicable. Shell and core: All criteria relevant to the building type and function apply, subject to the following: Meters must be installed on the energy supply to each separate tenanted unit or floor plate within the assessed development. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - Partially fitted and fully fitted		
CN2	Applicable assessment criteria - Single and multiple dwellings	Both options: This issues does not apply to residential dwellings. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.

Ref	Terms	Description
General		
CN3	Extensions to existing buildings	Where an existing building is being extended and it has existing building services plant and systems that will be common to both the new extension and existing building, the criteria only apply to the extension. In this case, energy services supplying energy-consuming systems from the existing building shall, as a minimum, be metered at the entry points to the extension, e.g. hot water, chilled water, gas and electricity. However, the best practice approach would usually be to ensure that the energy metering covers the entire building.
Building type specific		
CN4	Buildings situated on campus developments	The systems for 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 shall be metered at the entry points to the assessed building, e.g. hot water, chilled water, gas and electricity. Provision of a pulsed or other open protocol communication output is not sufficient to award the credit for these building types.

Methodology

Overall metering strategy

The overall metering strategy should be developed in line with the guidance for new buildings available in CIBSE TM39 Building energy metering[54].

As described in the guidance, energy consumption does not necessarily need to be separately monitored if the cost to install the monitoring equipment is expected to exceed the likely benefits and savings achieved.

Sub-metering by end-use

The annual energy consumption of each end-use must be estimated and end-uses that collectively account for 90% of the total energy consumption (for each fuel or energy supply) must be covered by sub-meters.

Where a given end use will clearly account for less than 10% of the total annual energy consumption for the fuel type in question , a simple hand calculation or use of benchmark data to demonstrate this is acceptable.

Where it is unclear whether an end use would account for less than 10% of the annual energy consumption for a given fuel type or not, more detailed calculations should be provided, and energy consumption should be estimated based on actual energy consumption. For example, by using the methods described in CIBSE TM54 Evaluating operational energy performance of buildings at the design stage[55]. This should use actual operational inputs (rather than those used for building regulations calculations) and weather data for the local area.

The data on water consumption from Wat 01 Water consumption may be used as inputs for evaluating the energy use of domestic hot water.

Typical energy end-use categories include:

1. Space heating generation
2. Space cooling generation
3. Hot water generation
4. Mechanical ventilation

5. Fans for distributing space heating
6. Fans for distributing space cooling
7. Pumps for space heating
8. Pumps for cooling
9. Pumps for hot water
10. Commercial scale refrigeration or cold storage
11. Internal lighting
12. External lighting
13. Controls and telecommunications
14. IT equipment and small plug in loads
15. Internal transport (lifts and escalators)
16. Other user defined

End-use categories can be combined for sub-metering purposes (see below).

For a worked a worked example of determining end-use categories to be sub-metered, see General Information Leaflet 65: Metering energy use in new non-domestic buildings [56].

Combining end-use categories

End-use categories may be combined for sub-metering purposes where:

- Separate metering is technically unfeasible.
- The cost to install the monitoring equipment is expected to exceed any likely benefits and savings that could be achieved during the operation of the building.

Some common examples of end uses that can be 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 boiler systems** -- Modular boiler systems can be monitored as a whole. A modular boiler system consists of a series of boilers that are linked together to meet a variety of heating demands. They are generally composed of several identical boiler units, sometimes stacked, although a mix of condensing and conventional boilers could be used. They operate in increments of capacity, each at around their full capacity and their peak efficiency, so that the overall part load efficiency is greater than it would be for a single boiler.
- **Multiple fans** – multiple fans may be monitored together (for example, where there are multiple fans within an air handling unit (AHU).

Sub-metering by functional or tenanted areas

Sub-meters must be provided to monitor energy consumption by area when a building has areas with:

- Significantly different energy loads, controls, occupation, or usage patterns.
- Different tenant organisations.
- A single, large, homogenous function that can be split into smaller, discrete, logical areas.

Not every energy end-use category must be sub-metered by area. The sub-metering strategy should prioritise significant energy uses that are controlled by area or vary by area.

For a building with only a single functional area and no tenanted or additional functional areas to be sub-metered, both credits (where applicable to the building type) can be awarded if the first credit has been achieved.

Sub-metering functional areas

All relevant functional areas (see Table 28 on page 166), and any high energy load areas, must be considered when determining the sub-metering strategy for the building.

In large buildings of single occupancy/tenancy where there is only one homogeneous function (e.g. hotel bedrooms, offices), sub-metering should be provided per floor plate or by core (or other similar beneficial grouping). A sub-metering strategy not based on a by-floor-plate basis, is acceptable provided that:

- It provides an equivalent, or more useful level of detail than sub-metering by floor plate.
- It divides the assessment in a logical manner which provides useful information to building management re: energy use.
- The approach does not conflict with requirements for sub-metering other functional areas.

Sub-metering tenanted areas

For tenanted buildings, meters must be installed on the energy supply to each separate tenanted unit or area. For example, by retail unit (in a retail building) or by floor (in an office building).

Sub-metering large functional or tenanted areas

For a development consisting of one or more larger units (gross internal floor area greater than or equal to 250m²) , sufficient sub-metering to allow for monitoring of the relevant functional areas within the unit must be specified, in addition to metering of the unit as a whole.

Sub-metering small functional or tenanted areas by end-use

Small tenanted office, industrial, or retail units do not need additional sub-metering by end-use beyond:

- Heating
- Electricity
- Hot water (where feasible)

For the purpose of this BREEAM issue, a small unit is defined as a unit with a gross internal floor area less than 250m² .

Evidence

Criteria	Interim design stage	Final post-construction stage
All	Relevant section or clauses of the building specification or contract. Design drawings.	BREEAM Assessor’s site inspection report and photographic evidence.

Additional information

Relevant definitions

Accessible meters

Energy meters located in an area of the building that allows for easy access to facilitate regular monitoring and readings by the building occupants or facilities manager. Typically this will be the plant room, main distribution room or control room (where a building energy management system (BEMS) is installed).

Building users

The building users are those responsible for monitoring the building's energy consumption (tenants, facility managers, building owner).

Common areas

Developments that have several tenant units, particularly large retail developments, may also share common facilities and access that is not owned or controlled by any one individual tenant, but used by all. Common areas are typically managed and maintained by the development's owner, i.e. landlord or their managing agent. Examples of common areas include an atrium, stairwells, main entrance foyers or reception or external areas, e.g. parking.

Energy meters

Energy meters measure the amount of energy used on a circuit where energy is flowing. Primary meters measure the main incoming energy 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 the second tier including heat and steam meters and secondary meters installed to measure consumption by specific items of plant or equipment, or to discrete physical areas, e.g. individual buildings, floors in a multi-storey building, tenanted areas, function areas.

Energy monitoring and management system

Examples include Automatic Meter Reading systems (AMR) and Building Energy Management systems (BEMS). Automatic monitoring and targeting (aM&T) is an example of a management tool that includes automatic meter reading and data management.

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 as a result of the use of, and operations within, each relevant area.

Other information

None.

Ene 02b Energy monitoring (residential only)

For non-residential buildings and residential institutions, see Ene 02a Energy monitoring on page 165.

Number of credits available	Minimum standards
2	No

Aim

To recognise and encourage monitoring of energy consumption through the use of energy display devices.

Assessment criteria

The following is required to demonstrate compliance:

One credit

1 Current electricity OR primary fuel consumption data are displayed to occupants through a compliant energy display device.

Two credits

2 Current electricity AND primary fuel consumption data are displayed to occupants through a compliant energy display device.

Checklists and tables

None.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	Both options: This issue is not applicable. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - Partially fitted and fully fitted		

Ref	Terms	Description
CN2	Applicable assessment criteria - Single dwellings	Partially fitted: This issue is not applicable Fully fitted: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
CN2.1	Applicable assessment criteria - Multiple dwellings	Partially fitted: This issue is not applicable Fully fitted: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN3	Utility company energy monitoring equipment	Energy meters installed by a utility company that can provide the future homeowner or tenant with accurate and regular energy usage information per dwelling, can comply with this issue.
CN3.1	Electricity is the primary fuel	Where the primary fuel is electricity and current electricity consumption data are displayed to occupants through a compliant energy display device, which includes heating or cooling, two credits can be awarded.
CN3.2	Community heating, cooling or solid fuel systems	If it is not possible to measure the energy consumption based on the incoming mains supply using a compliant energy display device, a heat meter is required to be installed to measure the heat energy. The heat meter must calculate the energy consumption in kilowatt hours (kWh) which can then be transmitted to a compliant energy display device.

Evidence

Criteria	Interim design stage	Final post-construction stage
All	Relevant section or clauses of the building specification or contract. Design drawings.	BREEAM Assessor's site inspection report and photographic evidence of the installed and functioning meter.

Additional information

Relevant definitions

Compliant energy display device

This is a system comprising a self-charging sensor fixed to the incoming mains supply or supplies, to measure and transmit energy consumption data to a visual display unit in an accessible location. As a minimum the visual display unit must be capable of displaying the following information:

1. Local time
2. Current (real time) energy consumption (kilowatts and kilowatt hours)
3. Current (real time) estimated emissions (g/kg CO_2)
4. Current (real time) tariff

5. Current (real time) cost (per hour)
6. Visual presentation of data (i.e. non-numeric) to allow consumers to easily identify high and low levels of usage
7. Historical consumption data so that consumers can compare their current and previous usage in a meaningful way. This should include cumulative consumption data in all of the following forms: day, week or month billing period. The data must be stored internally for a minimum of two years or be connected to a separate device with automatic upload from the energy display device.

Primary fuel

The fuel used to provide the majority of heating or cooling to the dwelling under assessment.

Self-charging sensor

A sensor or transmitter powered by the mains supply to the building that transmits energy consumption data to a visual display unit. Long-life batteries, with a minimum life expectancy of seven years, can be used in place of a self-charging sensor or transmitter where the functionality of the system is demonstrated to be maintained by the assessor.

Other information

None.

Ene 03 External lighting

(all buildings)

Number of credits available	Minimum standards
1	No

Aim

To recognise and encourage the specification of energy efficient light fittings for external areas of the development.

Assessment criteria

The following is required to demonstrate compliance:

One credit

1 The building has been designed to operate without the need for external lighting (which includes on the building, signs and at entrances).

OR

2 The average initial luminous efficacy of all the external light fittings within the construction zone at least 70 luminaire lumens per circuit watt.

3 All external light fittings are automatically controlled for prevention of operation during daylight hours and fitted with presence detection in areas of intermittent pedestrian traffic.

Checklists and tables

None.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	Both options: All criteria relevant to the building type and function apply. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - Partially fitted and fully fitted		

Ref	Terms	Description
CN2	Applicable assessment criteria - Single and multiple dwellings	Both options: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN3	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 external lighting criteria applies only to external new and existing lighting within the construction zone of the assessed building.
CN3.1	Temporary lighting, decorative lighting, and floodlighting	Temporary external lighting (such as theatrical, stage, and local display installations) is excluded from the assessment. Decorative, security, and floodlighting must be included in the assessment.
CN3.2	Lighting for external plant	Manually activated lighting which is only used when maintenance work is being carried out on external plant is excluded from this assessment.
CN3.3	Emergency lighting	Maintained systems featuring emergency light fittings which are also used for normal operation, are assessed for this issue. Non-maintained lighting which is only activated in an emergency can be excluded from the assessment. (KBCN0185)
CN3.4	Automatic controls - External lighting inside wider building	Where the building undergoing assessment is located inside another building, for example a retail unit within a shopping centre, criterion 3 should be applied to prevention of operation outside the occupation hours of the wider shopping centre rather than during daylight hours . Any external lighting located outside of the wider shopping centre should be assessed as stated in the criteria. (KBCN0906)
CN3.5	Automatic controls - Night-time operation	Projects which operate at night-time can adapt or omit the requirement to provide controls or presence detection to align with the building's hours of operation. (KBCN1048)

Methodology

Average initial luminous efficacy of the external light fittings

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

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

Note: LED lamps are typically integral to the luminaire (LED luminaires). As such, the manufacturers' literature will encompass both lamp and luminaire as a whole. For RGB (red, green, blue) LED lamps the average luminaire lumens per circuit watt across all three colours should be used.

Evidence

Criteria	Interim design stage	Final post-construction stage
All	The relevant section or clauses of the building specification or contract. Design drawings.	BREEAM Assessor’s site inspection report and photographic evidence or as-built drawings. Manufacturers' product details.
1	Night-time lighting levels report or any other relevant study.	BREEAM Assessor’s site inspection report and photographic evidence or as-built drawings. Night-time lighting levels report or any other relevant study.

Additional information

Relevant definitions

Automatic control

An automatic external lighting control system that prevents operation during daylight hours through either a time switch or a daylight sensor (a manually switched lighting circuit with daylight sensor or time switch override is also acceptable) in addition to providing presence detection in areas of intermittent traffic.
Note: for external lighting not fitted with presence detectors, time switches must provide automatic switch off of lighting after a specified curfew hour, except in cases where there is a specific requirement for lighting to be left on all night.

Construction zone

For the purpose of this issue the construction zone is defined as the site which is being developed for the BREEAM-assessed building and its external site areas, i.e. the scope of the new works.

Daylight sensor

A type of sensor that detects daylight and switches lighting on at dusk and off at dawn.

Luminous efficacy (in luminaire lumens per circuit watt)

The ratio between the luminous flux produced by an entire luminaire (light fitting) (in lumens) and the total power consumed by the lamps and the control gear contained within the luminaire (in watts).

Presence detector

A sensor that can turn lighting on when a presence is detected in the scanned area, and off after a preset time when no presence is detected. Presence detectors must be compatible with the lamp type used as very frequent switching can reduce the life of some lamp types.

Time switch

A switch with an inbuilt clock which will allow lighting to be switched on and off at programmed times.

Other information

None.

Ene 04 Low carbon design

(all buildings)

Number of credits available	Minimum standards
3	No

Aim

To encourage the adoption of design measures which reduce building energy demand - and associated carbon emissions - and maximize on-site renewables.

Assessment criteria

This issue is split into two parts:

- Passive design (up to 2 credits)
- Low or zero carbon technologies (1 credit)

The following is required to demonstrate compliance:

Passive design

1 The first credit within issue Hea 04 Thermal comfort on page 114 has been achieved to demonstrate the building design can deliver appropriate thermal comfort levels in occupied spaces.

2 The project team carries out an analysis of the site and proposed development during the Concept Design stage and identifies opportunities for the implementation of passive design solutions that reduce building energy demand (see CN3 on page 180).

One credit

3 Passive design measures which reduce the overall building energy demand by at least 5% are implemented, in line with the findings of the passive design analysis.

Two credits

4 Passive design measures which reduce the overall building energy demand by at least 10% are implemented, in line with the findings of the passive design analysis.

Low and zero carbon technologies

One credit - Low zero carbon feasibility study and implementation

5 A feasibility study has been carried out by the completion of the Concept Design stage by an energy specialist (see Relevant definitions on page 186) to establish the most appropriate recognised local (on-site or near-site) low or zero carbon energy sources for the building or development (see CN4 on page 180).

6 One or more local LZC technologies have been specified for the building or development in line with the recommendations of this feasibility study.

Checklists and tables

None.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	**Passive design analysis, criteria 1 to 4** Shell only: All criteria relevant to the building type and function apply. Note: For criterion 1, although Hea 04 is not applicable to Shell only assessments, to achieve Ene 04 Passive design credits, compliance with Hea 04 criteria 1, 2 and 3 must be demonstrated. This should be based on a typical layout and equipment specification for the relevant building type. Where Hea 04 is not applicable to the building type and options selected (for example, an industrial building with no office areas), criterion 1 of Ene 04 is not applicable. **LZC feasibility study, criteria 5 to 6 on the previous page** Shell only: All criteria relevant to the building type and function apply. Note: The LZC feasibility study must be completed as part of the shell only design, based on the expected building use and loads specified in the design brief or, where these are not specified, for likely scenarios. The built form should allow for the future installation of cost effective LZC options and this can be achieved by demonstrating that: sufficient space and clearance for the installation of future LZCs has been considered, the built form is suitably sited, and that mass and orientation are optimised for the future systems. Shell and core: All criteria relevant to the building type and function apply. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - Partially fitted and fully fitted		
CN2	Applicable assessment criteria - Single and multiple dwellings	Both options: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
Passive design analysis		

Ref	Terms	Description
CN3	Passive design analysis - Coverage	As a minimum, the passive design analysis should consider: 1. Site location 2. Site weather 3. Microclimate 4. Building layout 5. Building orientation 6. Building form 7. Building fabric 8. Thermal mass or other fabric thermal storage 9. Building occupancy type 10. Daylighting strategy 11. Ventilation strategy 12. Adaptation to climate change.
CN3.1	Passive design analysis - Approved building energy modelling software	The design team must use a modelling software package that has been approved for assessing this issue, please refer to the Approved Standards and Weightings List (ASWL) to determine whether the modelling software package has already been approved by BRE Global. If the software package has not been approved the assessor will need to submit an approval request on the "Ene 01 Approval for Energy Software" for before the package can be used for demonstrating compliance with Ene 04.
CN3.2	Passive design analysis – Modelling the standard building when existing building elements are retained	In circumstances where an existing building element (e.g., a facade) is being retained it is acceptable to incorporate them into the modelling of the 'standard building' baseline, for the purpose of undertaking passive design analysis. All other building elements should be modelled with fabric performance equivalent to that of the local building regulations reference building and without the passive design measures where feasible, i.e., building orientation is likely to be fixed. (KBCN1270)
LZC feasibility study		
CN4	LZC feasibility study	The LZC study should cover as a minimum: 1. Energy generated from LZC energy source per year 2. Carbon dioxide savings from LZC energy source per year 3. Life cycle cost of the potential specification, accounting for payback 4. Local planning criteria, including land use and noise 5. Feasibility of exporting heat or electricity or both from the system 6. Identification of any available grants 7. All technologies appropriate to the site and energy demand of the development 8. Reasons for excluding other technologies 9. Where appropriate, connecting the building to an existing low carbon community energy scheme.

Ref	Terms	Description
CN4.1	LZC feasibility study - Timing	When undertaking a feasibility study later than the Concept Design stage the report must highlight any local LZC energy sources which could not be included in the project due to late consideration and the reason for their omission. If the feasibility study discounted all local LZC as unfeasible due to the late stage in the project that the study was commissioned, then the credit for the feasibility study must be withheld. If the feasibility study was commissioned at the Concept Design stage or earlier, and in the unlikely event the study concluded that the specification of any local LZC technology was unfeasible, the LZC credit could still be awarded.
CN4.2	LZC feasibility study – LZC energy sources discounted	When sufficient information can be provided to justify that LZC energy sources are not feasible for the development, the LCC analysis, for those LZC sources, do not need to be included in the feasibility study. (KBCN0606)
CN4.3	LZC feasibility study – Planning conditions and restrictions	Where a mandatory planning condition exists (e.g., to attach to a district heating scheme), this will clearly affect the number of options available in a feasibility study. In such cases, compliance can still be achieved where evidence of the planning condition restrictions is provided. The feasibility study will still need to be carried out to cover the remaining energy needs of the building (e.g., electrical and lighting load in the case of a district heating scheme). (KBCN0535)
CN4.4	LZC feasibility study – Comparison of LZC technologies	It is acknowledged that for some LZC technologies the level of information available may differ and it may not always be possible to make a detailed like for like comparison across all feasibility considerations. The feasibility study must make a comparison across all LZC that are feasible for the development (see CN4.2 above) technologies based on the information that is available so that it can be demonstrated, with a reasonable level of certainty, that the chosen LZCs are the most appropriate of those available. (KBCN0563)

Ref	Terms	Description
CN4.5	LZC feasibility study – Energy centre or other LZCs connected at a later stage	If a project specifies LZCs that have been proposed in the feasibility report 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 (as per the BREEAM requirements). 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 must be produced at the final stage - one with the actual interim system installed 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. (KBCN0267)
CN4.6	LZC feasibility study - District heating system using multiple fuels	Where the feasibility study is considering connection to a district heating system and this burns a mixture of fossil and renewable fuels, only the proportion of output generated from eligible renewable fuels (see CN5 on the facing page, recognised LZC energy sources) For instance, a system burning a 25:75 mix of compliant biofuel:fossil fuels, only 25% of heat is considered to be from a LZC technology. As fuel mixes may vary over time, at least one year or more of historical information must be provided to balance out any 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. (KBCN0885)
CN4.7	LZC feasibility study - Countries with national energy strategy heavily based on renewables	One credit can be awarded by default where: The building is located in a country where the energy supply from the mains grid is highly de-carbonised, due to this supply being generated from renewable sources. AND The feasibility study considers the use of energy from the grid in addition to all other fuel types used within the building. AND The feasibility study clearly confirms that the introduction of local LZC technologies on site would have an adverse effect on the overall related emissions.

Ref	Terms	Description
CN4.8	LZC feasibility study - Technologies already available on site	For developments where there is an existing LZC energy source that can supply a compliant percentage of energy to the assessed building, a feasibility study will still have to be carried out to demonstrate that the existing technology is the most appropriate for the assessed building or development. The study should also seek to identify whether any additional LZC energy sources are feasible. To qualify, the energy from existing LZC energy sources must be additional to the energy that is already being supplied to other buildings or infrastructure entities.
LZC technologies		
CN5	LZC technologies - Recognised 'local' LZC technologies	Technologies eligible to contribute to achieving the requirements of this issue must use energy from the following sources: — Wind — Solar radiation (solar thermal and solar photovoltaic) — Geothermal and hydrothermal energy sources — Hydropower — Biomass from waste and biofuels derived from second generation biomass feedstock or waste sources, including landfill gas and sewage treatment gas (see CN5.7 and CN5.8) — Waste heat (see CN5.4) — Heat or electricity from waste incineration (see CN5.6) Note: Heat pumps are now a standard technology and heat from heat pumps is not considered to be an LZC technology for Ene 04.
CN5.1	LZC technologies – Appropriate installation	Where the country of assessment has an independent national certification scheme for installers of local renewable energy systems, these technologies must be certified in accordance with the national scheme. Where independent accreditation schemes do not exist in the country of assessment, the design team must demonstrate they have investigated the competence of the installer selected to install the LZC technology and that they are confident the installers have the skill and competence to install the technology appropriately.

Ref	Terms	Description
CN5.2	LZC technologies – Connection to building	To be recognised in BREEAM, the LZC technologies must have a direct physical connection to the assessed building. OR Where the LZC technology is: — located on the same site — is owned and managed by the same organisation as the assessed building, and — where it is impractical to physically connect the assessed building to the system it is acceptable to allocate the energy generated from this technology to the assessed building proportionally as a calculation of the building's predicted energy consumption compared to the total energy consumption of the whole site. To allocate renewable electricity by proportional consumption follow these steps: 1. Obtain the total amount of annual renewable electricity generated on-site; 2. Exclude all renewable electricity which has been exported to the grid; 3. Determine the respective electricity consumption of all buildings on the whole site (predicted for new builds; measured for existing buildings). Where consumption data is missing, renewable electricity must not be allocated to the assessed building. In this case, it is assumed that all electricity consumed is sourced from the grid. (KBCN1424)
CN5.3	LZC technologies - Other technology not listed	Other systems may be acceptable as part of a LZC strategy under this issue. Acceptability will be dependent on the nature of the system proposed and the carbon benefits achieved. The BREEAM Assessor must confirm acceptability with BRE Global if in doubt.
CN5.4	LZC technologies - Waste heat from a building-related operational process	Waste heat from an operational process that takes place within the assessed building (or on the assessed site) can be considered as 'low carbon' for the purpose of this BREEAM issue provided that the generation of the heat from the process is integral to the assessed building. Examples of operational processes and functions include 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.
CN5.5	LZC technologies - Community and near-site schemes	'Local' does not have to mean on site; community schemes (near site) can be used as a means of demonstrating compliance, providing they meet the direct (private wire) connections requirements.

Ref	Terms	Description
CN5.6	LZC technologies - Waste incineration	Waste heat from an incineration plant can only be considered as low carbon for the purpose of this BREEAM issue under the following circumstances: 1. All other LZC technologies have been considered and discounted in the feasibility study and; EITHER 2. The local authority or region in which the incineration plant is located is demonstrably meeting its annual waste reuse and recycling targets and waste management policies; OR 3. There is no further capacity for reusing and recycling waste in the local authority or region where the incineration plant is located; OR 4. There is a near-site or on-site facility connected to the building, via a private wire arrangement, which is demonstrably removing reusable and recyclable waste material prior to incineration.
CN5.7	LZC technologies - First generation biomass feedstock	BREEAM does not reward building systems fuelled by biofuels manufactured from first generation (food) crop feedstocks, e.g. biofuels manufactured from sugars, seeds, grain, animal fats etc. where these are grown or farmed for the purposes of biofuel production. This is because of the uncertainty over their impact on biodiversity, global food production, and their life cycle greenhouse gas savings.
CN5.8	LZC technologies - Second generation biomass feedstock and biofuels from waste streams	BREEAM *may* recognise systems using biofuels generated from second generation (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. Further details about the biomass source, the supply chain and the installed plant would be required for review by BRE Global prior to confirmation of acceptability. The details provided should include: 1. Type, provenance and sustainability of the biomass feedstock 2. Avoidance or minimisation of fossil fuel use in extracting the biofuel 3. Minimising fossil fuel use in transporting the biomass or biofuel 4. Presence of a supply agreement and a robust supply chain 5. 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 particular application.

Methodology

Passive design analysis

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

To enable a baseline for comparison to be established, a ‘standard building’ must be modelled. The standard building should have the same floor area, be of the same building type, and contain the same mix of functional areas as the actual building. It should be of a construction and layout that is typical for the building type with fabric performance that meets local building regulations. The location and orientation of the standard building on the site, and the distribution of the glazing should be typical for the building type. The building services and occupancy patterns for the standard building must be the same as those for the actual building.

Any savings in energy demand should then be calculated by comparing the respective outputs from the two building models representing the proposed building specification, the actual building, and the 'standard building' specification.

These calculations should be carried out by a building services engineer or by an accredited energy assessor (see Ene 01 Reduction of energy use and carbon emissions – Relevant definitions).

Low and zero carbon feasibility study

The demand reduction from low or zero carbon (LZC) technologies is demonstrated by comparing:

- Regulated carbon dioxide (CO_2) emissions of the actual building including the specified/installed LZC technologies vs.
- Regulated carbon dioxide (CO_2) emissions of the actual modelled building without LZCs.

When the CO_2 savings are compared for different technologies, they may be estimated separately from the building energy model where appropriate, e.g., by using manufacturers' data, simple hand calculations or spreadsheets.

For the specified technologies the demand reductions are modelled using dynamic simulation modelling. The energy supply used for the without case is mains gas and grid electricity. If mains gas were not available at the site, then oil may be used instead. The base case includes any passive design or free cooling measures adopted for the first two credits.

Evidence

Criteria	Interim design stage	Final post-construction stage
1–4	The passive design analysis report. Evidence confirming the meaningful reduction in the building energy demand.	As design stage AND BREEAM Assessor's site inspection report and photographic evidence or as-built drawings.
5–6	Results from a dynamic simulation model demonstrating reductions in CO_2-eq emissions from the specified low and zero carbon technology.	As per interim design stage.

Additional information

Relevant definitions

Energy specialist

An individual who has acquired substantial expertise by undertaking LZC assessments for at least 3 years, a recognised qualification for undertaking assessments, designs and installations of LZC solutions in the building sector and is not professionally connected to a single LZC technology or manufacturer.

Near-site LZC

Refer to Ene 01 Reduction of energy use and carbon emissions – Near-site LZC on page 162.

On-site LZC

Refer to Ene 01 Reduction of energy use and carbon emissions – On-site LZC on page 162.

Payback period

The period of time needed for a financial return on an investment to equal the sum of the original investment.

Suitably qualified energy modelling engineer

Refer to Ene 01 Reduction of energy use and carbon emissions – Suitably qualified energy modelling engineer or accredited professional on page 163.

Other information

Passive design aim

Unlike Ene 01 Reduction of energy use and carbon emissions on page 150 (which is focused on demonstrable and robust performance improvement), Ene 04 Low carbon design aims to encourage project teams to adopt a passive design approach.

In relation to the passive design credit, this is mostly reflected in criterion 2; the passive design analysis which is intended to encourage project teams to proactively consider the ways in which the building could benefit from passive design measures (such as those listed in CN3 on page 180).

However, to ensure that the analysis results in constructive outcomes, a minimum 5% reduction of the overall building energy demand is required to achieve one credit and a 10% reduction is required to achieve two credits.

LZC feasibility study

The LZC feasibility study in BREEAM is intended to encourage the study to be done early in the project, not just before construction starts, so that the most appropriate solutions can be adopted. Also, this credit does not permit technologies that are not best practice or sustainable or cannot be modelled with a robust method.

Ene 05 Energy efficient cold storage (non-residential only)

Number of credits available	Minimum standards
3	No

Aim

To recognise and encourage the installation of energy efficient refrigeration systems, thereby reducing operational greenhouse gas emissions resulting from the system's energy use.

Assessment criteria

The following is required to demonstrate compliance:

One credit - Energy efficient design, installation, and commissioning

1 With respect to the refrigeration system, its controls and components:
- 1.a A strategy for the design and installation has been produced and implemented by a Suitably qualified engineer on page 193 from Concept Design stage onwards. The strategy is multidisciplinary and includes both an aim and a method to achieve the lowest feasible environmental impact including energy use, carbon emissions, and refrigerant impact.
- 1.b The design team has demonstrated that the cold store and the building has been designed to minimise heat loads through high levels of insulation, reduced air infiltration and minimisation of auxiliary heat loads, e.g. fans and pumps, lighting, people and machinery.
- 1.c At least 50% of the relevant energy efficient design features (listed in Table 29 on the facing page) have been specified or installed.
- 1.d Control systems have been installed to minimise refrigerant temperature lifts by providing controls that optimise evaporator temperature levels and avoid head pressure control.
- 1.e Energy sub-metering has been installed to provide adequate central monitoring of operating parameters and collection of data on plant performance, temperature levels and energy consumption. This does not necessarily require the 'energy monitoring' credits to have been awarded.
- 1.f The design has minimised the requirement for manual override of plant controls and equipment in normal operating conditions through the specification of central automatic controls, anti-tamper controls, automatic lighting controls, fixed set-point temperature and temperature dead bands.
- 1.g The design specification details appropriate commissioning and test procedures to be undertaken at completion.
- 1.h The installation adheres to the design specification and any necessary changes have been carried out with the approval of the Suitably qualified engineer and are formally documented.

2 The refrigeration system has been commissioned as follows:
- 2.a In compliance with criteria 5–6 for commissioning outlined in BREEAM issue Man 04 Commissioning and handover on page 66. This does not necessarily require the 'Commissioning' credits to have been awarded
- 2.b Documentation has been provided showing due diligence and compliance with test and commissioning procedures relevant to the installation, such as pressure testing, leakage testing and validation to specification.

One credit - Energy efficiency criteria

3 The refrigeration system uses robust and tested components that meet published energy efficiency criteria (refer to CN3.1 on page 191).

One credit - Reducing lifetime greenhouse gas emissions from energy use

4 Criteria 1 and 2 on the previous page are achieved.

5 The installed refrigeration system demonstrates a saving in greenhouse gas emissions (kg CO_2-eq) compared to a standard system specification. The greenhouse gas emissions have been calculated using the equation defined in the Methodology on page 191.

Checklists and tables

Table 29: Energy efficient design features

Ref	Energy efficient design feature
1	Fit energy efficient lighting with suitable controls and high efficiency fans on evaporators.
2	Minimise loss of cold air through access doors by minimising frequency of door opening or by fitting air curtains, self-closing doors, door strips, etc.
3	Optimise evaporator temperature levels to keep suction or evaporation temperatures as high as possible.
4	Specify high efficiency compressors.
5	Provide controls on anti-sweat heaters on doors to minimise electrical consumption outside of operational hours.
6	Condensing temperatures that are as low as possible, including avoiding head pressure control.
7	Design evaporators and condensers for easy cleaning and safe access.
8	Optimise defrosting methods to minimise energy consumption and avoid electric heater defrost.
9	High evaporating temperature cabinets (large coils) with single evaporating temperatures across the refrigeration pack for supermarket display cases.
10	Provision of heat recovery in the design such as de-superheating to domestic hot water, condensing to hot water for heating. (If specified this must not lead to condensing conditions that are artificially inflated to deliver the heat recovery.)
11	Use of wet condensing-based systems.
12	Use of re-manufactured items that are still of an energy efficient nature where they do not compromise the optimal energy efficiency of the cold storage equipment.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	Shell only: This issue is not applicable. Shell and core: Where cold storage systems are specified or installed, all assessment criteria relevant to the building type and function apply. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - Partially fitted and fully fitted		
CN2	Applicable assessment criteria - Single and multiple dwellings	Both options: This issue is not applicable to residential dwellings. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN3	Scope of this BREEAM issue	This issue is applicable only in instances where commercial or industrial-sized refrigeration and storage systems that are integral to the building are specified, for example: 1. Storage and refrigeration of food in supermarkets. 2. Cold storage facilities in industrial, laboratory, healthcare, and other buildings. The criteria do not apply to: 1. Residential-scale refrigeration. 2. Commercial sized refrigeration for kitchen and catering facilities that consist of self-contained, off-the-shelf units (e.g. large freezers or fridges) and that are delivered and installed with their own refrigeration systems. These types of installation are covered within BREEAM issue Ene 08 Energy efficient equipment on page 204. If the building contains no refrigeration systems (or only refrigeration systems that are not integral to the building and are not served by the building services), then this issue is not applicable to the assessment.

Ref	Terms	Description
CN3.1	Published energy efficiency criteria. See criterion 3 on page 189.	Please refer to the Approved Standards and Weightings List (ASWL) to locate the appropriate published energy efficiency criteria in the country of assessment. If the energy efficiency criteria you wish to use are not listed in the ASWL, you will need to contact BRE Global to get the criteria approved and added. BRE Global assesses energy efficiency criteria on the following points: 1. Is the scale/criteria reviewed and updated annually or every two years? 2. Is the author/owner/assessor of the scale/criteria independent with no ulterior motive? 3. Is the assessment of products and subsequent eligibility and/or rating independent? 4. Is there a clearly defined set of criteria against which a product is tested/judged? 5. Is the scale relevant to cold storage? 6. Is the scheme certified by a third party? This list can also be found in the ASWL document. An example of suitable published energy efficiency criteria is the Energy Technology List (ETL): etl.beis.gov.uk.
CN3.2	Extensions to existing buildings	If the assessed building is an extension to an existing building and there is cold storage plant in the existing building that will serve the new extension, then this plant must meet the criteria in order to achieve any available credits.

Methodology

Calculating lifetime reduction in greenhouse gas emissions from operational energy use

This issue only considers the greenhouse gas emissions from operational energy use. Greenhouse gas emissions from fugitive refrigerants are assessed in Pol 01 Impact of refrigerants on page 362.

The following equation must be used to calculate the lifetime impact of the energy consumption of the system:

$$\text{Lifetime carbon emissions} = n \times E_{annual} \times \beta$$

Where:

Term	Description (and unit)
Lifetime carbon emissions	Total equivalent warming impact (kg CO_2-eq)
n	System operating time (yr)
E_{annual}	Energy consumption (kWh/yr)
β	CO_2 emission factor for the relevant energy source (kg CO_2-eq/kWh).

Calculations must be carried out by a Suitably qualified engineer on the facing page (e.g. a building services engineer), including calculations to justify the assumptions and methodologies for savings in greenhouse emissions.

Energy efficient design features

Where features are excluded from consideration the suitably qualified engineer must provide written justification for determining which are unachievable.

Evidence

Criteria	Interim design stage	Final post-construction stage
1–4	The relevant section or clauses of the building specification or contract or other documentary evidence, such as a letter from the design team. Where not all energy efficient design features are relevant to the project, written justification of why they have been excluded from the suitably qualified engineer.	As design stage.
2–4	Evidence as outlined under BREEAM issue Man 01 Project brief and design on page 44 for the relevant criteria.	As design stage.
3	A letter from the manufacturer or supplier, or copies of their technical literature confirming that the specific components meet published energy efficiency criteria or a print out of the ETL (or equivalent) listing the specific products.	As design stage.
5	Documentary evidence confirming the type of technology specified and estimated savings in indirect greenhouse emissions, including a description of how this saving is achieved. Calculations should be carried out by the suitably qualified engineer including justifications for assumptions and methodologies for savings in indirect greenhouse emissions.	As design stage plus confirmation of installed technology.

Additional information

Relevant definitions

Energy Technology List (ETL)

The Energy Technology List (ETL) is a list of energy efficient equipment that details the energy efficient criteria for each type of technology, and lists those products in each category that meet them. It has been produced by the UK Government and is annually reviewed by the Department for Business, Energy and Industrial Strategy (BEIS).

Greenhouse gas emissions from operational energy use

These are greenhouse gas emissions that result from the production of energy used to power the refrigeration system's cooling plant. This includes the emissions from the production of grid electricity or an on-site source of energy generation (for example, gas CHP).

Suitably qualified engineer

An individual achieving all the following items can be considered to be 'suitably qualified' for the purposes of this BREEAM issue:

1. Has the authority to make decisions on the final design.
2. Holds a degree or equivalent qualification in building services engineering or a relevant related subject.
3. Has a minimum of five years relevant design experience (within the last seven years). Such experience must clearly demonstrate a practical understanding of factors affecting the design of cold storage and include related CPD.

Other information

None.

Ene 06 Energy efficient transport systems (all buildings)

Number of credits available	Minimum standards
3	No

Aim

To recognise and encourage the specification of energy efficient transport systems.

Assessment criteria

The following is required to demonstrate compliance:

One credit - Energy consumption

1 Where lifts, escalators, or moving walkways (transport types) are specified:
- 1.a An analysis of the transport demand and usage patterns for the building has been carried out to determine the optimum number and size of lifts, escalators, or moving walkways.
- 1.b The energy consumption has been estimated in accordance with ISO 25745 Energy performance of lifts, escalators and moving walks, Part 2: Energy calculation and classification for lifts (elevators) or Part 3: Energy calculation and classification for escalators and moving walks, for one of the following:
  - 1.b.i At least two types of system (for each transport type required); OR
  - 1.b.ii An arrangement of systems (e.g. for lifts, hydraulic, traction, machine room-less lift (MRL)); OR
  - 1.b.iii A system strategy which is 'fit for purpose'.
- 1.c The use of regenerative drives should be considered, subject to the requirements in CN6 on page 196
- 1.d The transport system with the lowest energy consumption is specified.

Two credits - Energy efficient features

2 Criterion 1 is achieved.

Lifts

3 For each lift, the following three energy efficient features are specified:
- 3.a The lifts operate in a standby condition during off-peak periods. For example, the power side of the lift controller and other operating equipment such as lift car lighting, user displays and ventilation fans switch off when the lift has been idle for a prescribed length of time.
- 3.b The lift car lighting and display lighting provides an average lamp efficacy (across all fittings in the car) of greater than 70 lamp lumens per circuit watt.
- 3.c The lift uses a drive controller capable of variable speed, variable-voltage, and variable-frequency (VVVF) control of the drive motor.

4 Where the use of regenerative drives is demonstrated to save energy, they are specified.

Escalators or moving walkways

Each escalator or moving walkway complies with at least one of the following:

5 It is fitted with a load sensing device that synchronises motor output to passenger demand through a variable speed drive.

OR

6 It is fitted with a passenger sensing device for automated operation (auto walk), so the escalator operates in standby mode when there is no passenger demand.

Checklists and tables

None.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	Shell only: This issue is not applicable. Shell and core: All criteria relevant to the building type and function apply. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - Partially fitted and fully fitted		
CN2	Applicable assessment criteria - Single and multiple dwellings	Both options: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN3	Scope of this issue	The criteria relating to lifts apply to any lifting device with a rated speed greater than 0.15 m/s, inclusive of goods lifts, vehicle lifts, and passenger lifts. This means that lifts in single dwellings, or those installed in other low-rise buildings, specifically for the use of persons with impaired mobility are usually excluded from the assessment.
CN4	Transport analysis - Disabled access and goods lifts	The transport analysis can be in the form of a written statement justifying the lift selection for the following conditions: where a single lift is provided in a low rise building for the purpose of providing disabled access only; or where a goods lift is selected based on the size of the goods it is intended to carry.
CN4.1	Transport analysis – Carried out by lift manufacturer	BREEAM recognises that lift manufacturers / suppliers are often engaged to provide such specialist advice. Where the assessor is satisfied that the analysis has been carried out correctly, the analysis can be submitted as compliant evidence. (KBCN0232)
CN5	Building has no lifts, escalators, or moving walkways	This issue will be filtered out where a building contains no lifts, escalators or moving walkways with a rated speed greater than 0.15 m/s. Where only one of the transport systems is present, the two credits can be awarded where the one system is compliant with the relevant criteria.

Ref	Terms	Description
CN6	Lifts - Regenerative drives. See criteria 1.c and 4.	A regenerative drive should only be considered where it produces an energy saving greater than the additional standby energy used to support the drives. Regenerative drives will typically be appropriate for lifts with high travel and high intensity use. However, where it can be demonstrated that this is not financially viable, accounting for payback over the service life of the installation, this option can be discounted.
CN6.1	Lifts - Counterbalancing ratio fixed	The requirement to analyse the counterbalancing ratio can be omitted if the project team can provide a statement confirming that it has been set by the manufacturer due to existing standards and to maximise efficiency. The remaining criteria must be met. (KBCN0327)
CN6.2	Lifts - Extending a lift shaft	Where the scope of works regarding a lift only includes extending the lift shaft to other floors, then assessment of this lift is not appropriate. Where changes are made to the lift system, then assessment is required. Where changes to lift systems are made, these lifts need to be included in the assessment to encourage specification of energy efficient transport systems. (KBCN0802)
CN6.3	Lifts - Evacuation lifts	Evacuation lifts, which will be used during an emergency only, can be excluded from the relevant BREEAM criteria. However, if these lifts are used during the normal operation of the building, then they still need to be assessed. (KBCN0437)
CN6.4	Lifts - New build extension using existing lifts	Where the assessment is only of a new build extension (and not the existing building), lifts present in the existing building fall outside the scope of Ene 06 and do not need to be assessed. The applies only when the lifts are not being renewed or undergoing a major refurbishment. (KBCN0444)

Methodology

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
1	Professional report or study of transport analysis or calculations.	As design stage.

Criteria	Interim design stage	Final post-construction stage
3 – 6	The relevant section or clauses of the building specification or contract AND Manufacturer's product details OR A formal letter of commitment from the system's manufacturer or supplier AND Where the regenerative drive unit is to be excluded as an energy efficient feature, written confirmation from the electricity utility supplier and the design team giving reasons for its exclusion.	Manufacturer's product details. BREEAM Assessor’s site inspection report and photographic evidence or as-built drawings.

Additional information

Relevant definitions

Idle condition

A condition when a lift is stationary at a floor following a run before the standby mode is entered (ISO 25745-1: 2012).

Machine room-less lift (MRL)

All equipment is contained in the lift well, not in a separate machine room.

Standby condition - lifts

A condition when a lift is stationary at a floor and may have reduced the power consumption to a lower level set for that particular lift (from ISO 25745-1: 2012). The period between when a lift was last used and when a standby condition is entered is defined in ISO 25745-1 as 5 minutes.

Standby condition - escalators and moving walkways

A condition when the escalator or moving walkway is stationary and powered on, and it can be started by authorised personnel.

Other information

ISO 25745 - Energy performance of lifts, escalators and moving walks

ISO 25745 consists of three parts, under the general title "Energy performance of lifts, escalators and moving walks":

— Part 1: Energy measurement and verification
— Part 2: Energy calculation and classification for lifts (elevators)
— Part 3: Energy calculation and classification for escalators and moving walks.

In Part 1, it has been estimated that approximately 5% of a building's total energy consumption can be attributed to the operation of lifts and a large proportion of this can be attributed to standby mode in many situations.
ISO 25745 Parts 2 and 3 have been prepared in response to the rapidly increasing need to ensure and support the efficient and effective use of energy, providing:

1. A method to estimate energy consumption on a daily and an annual basis for lifts, escalators and moving walks
2. A method for energy classification of new, existing or modernised lifts, escalators and moving walks
3. Guidelines for reducing energy consumption that can be used to support building environmental and energy classification systems.

Ene 07 Energy efficient laboratory systems (non-residential only)

Number of credits available	Minimum standards
Building type dependent	No

Aim

To recognise and encourage laboratory areas that are designed to be energy efficient and minimise the CO_2 emissions associated with their operational energy consumption.

Assessment criteria

This issue is split into three parts:

- Prerequisite
- Design specification (1 credit)
- Best practice energy efficient measures (up to 4 credits, depending on the relative size of the laboratory)

The following is required to demonstrate compliance:

Prerequisite

1 Hea 03 Safe containment in laboratories: Criterion 1 has been achieved.

One credit - Design specification

2 Client engagement is sought through consultation during the preparation of the initial project brief to determine occupant requirements and define laboratory performance criteria. Performance criteria must include as a minimum the following aspects:
- 2.a Description of purpose
- 2.b Occupant or process activities
- 2.c Containment requirements and standards
- 2.d Air change requirements
- 2.e Ventilation system performance and efficiencies
- 2.f Heating and cooling requirements (including heat recovery)
- 2.g Interaction between systems
- 2.h Flexibility and adaptability of laboratory facilities.

3 The design team demonstrates that the energy demand of the laboratory facilities has been minimised as a result of achieving the defined design performance criteria. This has informed the right-sizing (see Relevant definitions on page 202) of the services system equipment (including ventilation supply and extract).

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

4 Fume cupboards and other containment devices have a specification that is compliant with criteria 2 and 3 on page 111 of Hea 03 Safe containment in laboratories on page 111, as appropriate to the containment device specification.

5 Where ducted fume cupboards are newly specified or present:
- 5.a Compliance with item A on the facing page in Table 30 on the facing page

5.b The measurement of volume flow rate should be taken in the exhaust duct (at the boundary of the laboratory) to take account of reductions in (inward) volume flow rate from fume cupboard leakage

5.c A reduction in air flow does not compromise the defined performance criteria and therefore does not increase the health and safety risk to future building occupants.

Up to four credits - Best practice energy efficient measures

The following criteria are applicable where the laboratory area accounts for at least 10% of the total building floor area (see Relevant definitions on page 202).

6 Criteria 1 to 5 on the previous page are achieved (or criteria 1 to 4 on the previous page where ducted fume cupboards are not specified).

7 Laboratory plant and systems are designed, specified and installed to promote energy efficiency, demonstrated through compliance with items B on the next page to L on page 201 in Table 30 below (see 7.a below and 7.b below for how credits are awarded):

7.a Up to two credits: the laboratory area (see Relevant definitions on page 202) accounts for at least 10% (but less than 25%) of the total gross internal floor area of the building; OR

7.b Up to four credits: the laboratory area accounts for 25% or more of the total gross internal floor area of the building.

8 The measures implemented must result in a reduction in the total energy consumption of the laboratory of at least 2%. This must be demonstrated by calculations or modelling.

9 The energy efficient measures specified do not compromise the defined performance criteria, and therefore do not increase the health and safety risk to future building occupants.

Checklists and tables

Table 30: Best practice energy efficient measures in laboratories

Ref	Category	Description	Credits [1]
A	Fume cupboard reduced volume flow rates	An average design air flow rate in the fume cupboards specified no greater than 0.16 m³/s per linear metre (internal width) of fume cupboard workspace.	-
Additional measures			

<table>
<tr><th>Ref</th><th>Category</th><th>Description</th><th>Credits [1]</th></tr>
<tr><td>B</td><td>Fan power</td><td>Specification and achievement of best practice fan power figures (as shown below) for all air handling units (AHUs), laboratory extract systems, local extract ventilation, containment area extracts (where applicable), and fume cupboard extracts (where applicable).
<table>
<tr><th>Laboratory system</th><th>Best practice specific fan power (W/(L/s))</th></tr>
<tr><td>General laboratory supply air AHU with heating and cooling</td><td>1.5</td></tr>
<tr><td>General laboratory extract systems</td><td>1.2</td></tr>
<tr><td>Laboratory local extract ventilation - ducted</td><td>1.0</td></tr>
<tr><td>Containment area extract, without high efficiency particulate absorption (HEPA) filtration</td><td>1.5</td></tr>
<tr><td>Containment area extract, with HEPA filtration</td><td>2.5</td></tr>
<tr><td>Fume cupboard extract</td><td>1.5</td></tr>
</table></td><td>1</td></tr>
<tr><td>C</td><td>Fume cupboard volume flow rates (further reduction)</td><td>An average design air flow rate of < 0.12 m³/s per linear metre (internal width) of fume cupboard workspace.</td><td>0.5</td></tr>
<tr><td>D</td><td>Grouping or isolation of high filtration or ventilation activities</td><td>Minimisation of room air change rates and overall facility ventilation flows by grouping together or isolating activities and equipment with high filtration or ventilation requirements.</td><td>0.5</td></tr>
<tr><td>E</td><td>Energy recovery - heat</td><td>Heat recovery from exhaust air (where there is no risk of cross-contamination) or via refrigerant or water cooling systems.</td><td>0.5</td></tr>
<tr><td>F</td><td>Energy recovery - cooling</td><td>Cooling recovery via exhaust air heat exchangers (where there is no risk of cross-contamination) or via refrigerant or water cooling systems.</td><td>0.5</td></tr>
<tr><td>G</td><td>Grouping of cooling loads</td><td>Grouping of cooling loads to enable supply efficiencies and thermal transfer.</td><td>0.5</td></tr>
</table>

Ref	Category	Description	Credits [1]
H	Free cooling	Specification of free cooling coils in chillers or dry air coolers related to laboratory-specific activities.	0.5
I	Load responsiveness	Effective matching of supply with demand through modularity, variable speed drives and pumps, and other mechanisms.	0.5
J	Clean rooms	Specification of particle monitoring systems, linked to airflow controls.	0.5
K	Diversity	Achievement of high levels of diversity in central plant sizing and laboratory duct sizing, where compatible with safety.	0.5
L	Room air change rates	Reducing air change rates by matching ventilation airflows to environmental needs and demands of containment devices.	0.5
Notes: 1. Only whole credits can be awarded in this issue. Half credits must be rounded down to the nearest whole number. Therefore, to achieve a credit for items C to L (above) the laboratory must comply with at least two of the items.			

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	Both options: All criteria relevant to the building type and function apply. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - Partially fitted and fully fitted		
CN2	Applicable assessment criteria - Single and multiple dwellings	Both options: This issue is not applicable Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN3	Scope of this BREEAM issue	This issue is not applicable for school buildings (primary and secondary level). The laboratory criteria within issue Hea 03 Safe containment in laboratories on page 111 should be followed for assessing laboratories and containment devices in these building types.

Methodology

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
1, 4	Evidence as required for compliance with the relevant Hea 03 Safe containment in laboratories on page 111 criteria.	Evidence as required for compliance with the relevant Hea 03 Safe containment in laboratories on page 111 criteria.
2–3	Agenda or minutes from client consultation meetings. Suitable evidence demonstrating that the design team have considered consultation feedback and any subsequent actions. The relevant section or clauses of the building specification or contract showing defined laboratory facility performance criteria.	BREEAM Assessor's site inspection report and photographic evidence or as-built drawings. Supplier or manufacturers', or design team documentation for as-built specification.
5–9	Drawings, and the relevant section or clauses of the building specification or contract. Modelling results or calculations or manufacturers' information. Formal correspondence from the design team.	As design stage, but for as-built information. BREEAM Assessor's site inspection report and photographic evidence or as-built drawings. A commissioning report or similar demonstrating that the design containment performance and airflows have been achieved..

Additional information

Relevant definitions

Laboratory areas

Laboratory areas are defined as highly serviced (temperature, ventilation, humidity or containment controlled) spaces where physical, biological, chemical processing or testing is carried out. Such areas will have inherently high energy demands. In order to maintain controlled conditions to enable experiments and comply with health and safety standards, typically laboratories:

1. Contain various exhaust and containment devices (such as fume cupboards and microbiological safety cabinets).
2. Are heavily serviced to circulate air and to supply heating, cooling, humidity, and clean air.
3. Often require 24-hour access and failsafe redundant backup systems and uninterrupted power supply or emergency power to enable irreplaceable experiments.

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

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

Teaching and other laboratory workshops with a limited amount of fume cupboards or other containment devices, or no energy intensive process equipment specified are excluded, unless the design team can provide evidence that their consumption is at least 50% higher than a typical office due to the laboratory process-related activities. Benchmarks for general offices can be found in Table 30 on page 199 in CIBSE TM46[57] Energy benchmarks. Typically, in buildings where 40% of the floor area is laboratory related, only 10% will actually constitute laboratory areas as per the BREEAM definition. Different types of laboratories have different requirements for HVAC, plug load for small power equipment and access. This can lead to enormous variations in energy and water requirements. The main types of laboratories include.

1. Wet laboratories - where chemicals, drugs or other material or biological matter are tested and analysed requiring water, direct ventilation and specialised piped utilities. They typically include chemical science laboratories. These laboratories require specially designed facilities.
2. Dry laboratories - contain dry stored materials, electronics, or large instruments with few piped services. They typically include engineering or analytical laboratories that may require accurate temperature and humidity control, dust control, and clean power.
3. Microbiological and clinical laboratories - often involve working with infectious agents. They typically require higher levels of primary containment and multiple secondary barriers including specialised ventilation systems to ensure directional air flow, air treatment systems to decontaminate or remove agents from exhaust air, controlled access zones, airlocks as laboratory entrances, or separate buildings or modules to isolate the laboratory.
4. In vivo laboratories - these require highly controlled environments for the care and maintenance of flora and fauna. The facilities are complex, and expensive to build and to operate. Tight environmental control over the facility is required to avoid the introduction of contaminants or pathogens, and prevent the possibility of infectious outbreaks, and avoid the transmission of odours.
5. Teaching laboratories - unique to academic institutes, they require space for teaching equipment, storage space for student belongings and less instrumentation than research labs.
6. Clean rooms - refers to a controlled environment (air quality, temperature and humidity) which prevent contamination and require the regulating of environmental conditions, to facilitate accurate research and production needs. They are typically used in universities for nanotechnology, medical and pharmaceutical research or studies and microelectronics applications.

Right-sizing

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

Other information

Synergy with BREEAM issue – Reduction of energy use and carbon emissions

This BREEAM issue has been developed to recognise improvements made to new laboratory areas or buildings that are not currently fully recognised in the National Calculation Methodology, used to assess and award credits in Ene 01 Reduction of energy use and carbon emissions on page 150.

Ene 08 Energy efficient equipment

(all buildings)

Number of credits available	Minimum standards
2	No

Aim

To recognise and encourage procurement of energy efficient equipment to ensure optimum performance and energy savings in operation.

Assessment criteria

The following is required to demonstrate compliance:

Two credits

1 Identify energy using equipment that is included within the scope of this issue and estimate its contribution to the total annual equipment energy consumption of the building, assuming a typical or standard specification.

2 Identify the items of equipment and systems that collectively account for a significant proportion of the total annual equipment energy consumption.

3 Demonstrate a meaningful reduction for all equipment that accounts for a significant proportion of the total energy consumption.

Checklists and tables

Table 31: Solutions deemed to comply with the criteria for the reduction of equipment energy load from significantly contributing systems

Ref	Function or equipment	Criteria
A	Small power, plug-in equipment	The following equipment meets the criteria for, or has been awarded with, a rating from a national or international energy efficient equipment scheme: 1. Office equipment on page 209 2. Other small powered equipment 3. Supplementary electric heating. For domestic-scale white goods, the criteria listed in item E on the facing page apply.

Ref	Function or equipment	Criteria
B	Swimming pool	1. Where automatic or semi-automatic pool covers, or 'liquid' pool covers with an automatic dosing system, are fitted to ALL pools, including spa pools and hot tubs (if relevant). 2. The covers envelop the entire pool surface when fully extended. 3. Where the air temperature in the pool hall can be controlled so that it is 1°C above the water temperature.
C	Communal laundry facilities with commercial-sized appliances	At least one of the following can be demonstrated for commercial-sized appliances: 1. Specification of heat recovery from waste water 2. Use of greywater for part of the washing process. This may be recycled from the final rinse and used for the next pre-wash.
D	IT-intensive operating areas	1. Uses a natural ventilation and cooling strategy as standard, with forced ventilation only to be used when the internal temperature exceeds 20°C and active cooling only when the internal temperature exceeds 22°C. 2. There is a mechanism to achieve automatic power down of equipment when not in use, including overnight.
E	Domestic-scale appliances (individual and communal facilities) - see CN3.5	Domestic-scale appliances have the following ratings (or better) under a national or international energy efficient white goods scheme equivalent to the **updated** EU Energy Efficiency Labelling Scheme (March 2021): — Fridges, fridge-freezers: E rating — Washing machines: B rating — Dishwashers: D rating — Washer-dryers and tumble dryers: D rating And for domestic scale air conditioners, the following rating (or better) under a national or international energy efficient white goods scheme equivalent to the **original** EU Energy Efficiency Labelling Scheme — Air conditioners: B rating

Ref	Function or equipment	Criteria
F	Commercial kitchen and catering facilities	The project has incorporated at least two thirds of the energy efficiency measures outlined in the following sections of CIBSE Guide TM50[58] (where relevant to the installation): — Section 8 (Energy controls - specifically controls relevant to appliances) — Section 9 (Drainage and kitchen waste removal) — Section 10 (Water temperatures, taps, faucets and water saving controls) — Section 13 (Appliance specification - not fabrication or utensil specifications) — Section 14 (Refrigeration) — Section 15 (Warewashing: dishwashers and glasswashers) — Section 16 (Cooking appliance selection) Note: Refrigeration for kitchen and catering facilities should be assessed here (not in Ene 05 Energy efficient cold storage on page 188).

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	Both options: This issue is not applicable. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - Partially fitted and fully fitted		
CN2	Applicable assessment criteria - Single dwellings	Partially fitted: This issue is not applicable. Fully fitted: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
CN2.1	Applicable assessment criteria - Multiple dwellings	Partially fitted: This issue is not applicable. Fully fitted: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		

Ref	Terms	Description
CN3	Refrigeration equipment	The criteria in Small power, plug-in equipment on page 204 apply to the following refrigeration equipment (where present): 1. Air-cooled condensing units 2. Cellar cooling 3. Commercial service cabinets 4. Curtains or blinds for refrigerated display cabinets 5. Refrigeration compressors 6. Refrigeration system controls 7. Refrigerated display cabinets.
CN3.1	Cold storage	The criteria apply to commercial kitchen refrigeration, but not to other commercial or industrial-sized refrigeration and cold storage systems (which are covered within the scope of Ene 05 Energy efficient cold storage on page 188).
CN3.2	Lifts, escalators and moving walks	This issue does not apply to lifts, escalators and moving walkways. These systems are covered within the scope of Ene 06 Energy efficient transport systems on page 194.
CN3.3	Laboratory systems	This issue does not apply to laboratory ducted fume cupboards. These systems are covered within the scope of Ene 07 Energy efficient laboratory systems on page 198.
CN3.4	Reuse of equipment	Reuse of electrical equipment does not comply by default, as it may not be the most energy efficient option. However, the credit could be awarded if reusing the equipment would be more energy efficient, over its lifetime, than specifying new equipment.
CN3.5	Equivalent ratings schemes for energy efficient white goods	Energy rating certifications other than the EU labelling scheme will be accepted, providing the energy efficiency performance is equivalent to the EU labelling scheme. This can be any internationally recognised energy efficiency labelling scheme for white goods or a national scheme developed for use in the country of assessment, for example: Energy Label (in the EU), Energy Star (in the USA), or The Appliance Energy Rating Scheme (in Australia). A statement confirming that the scheme is nationally recognised and can be regarded as equivalent to the EU labelling scheme is required for use.
CN3.6	Equipment to be provided later by the tenant/occupier	The efficiency of equipment to be provided as part of a subsequent fit-out falls outside the scope of this issue. Likewise, in a fully fitted but speculative office, where an unknown future tenant will be providing, for example, their own computers, these computers are to be excluded from the assessment. (KBCN0609)
CN3.7	Communal laundry facilities – Domestic or commercial washing machines	For multi-residential projects (or other building types containing laundry facilities), the BREEAM assessor should use their judgement to determine whether the appliance is commercial or domestic, and justification of the category selected must be provided. For instance, commercial and domestic sized washing machines could be defined based on load size or power rating. (KBCN0613)

Ref	Terms	Description
CN3.8	Measures in CIBSE TM50 for kitchen and catering facilities	The measures are listed in the section summaries (blue boxes) in the guide. The sections that follow each summary in the Guide are explanations of the measures. Discount any energy efficiency measures which are not applicable to the project or are specifically excluded in the criteria. Many measures in TM50 require consideration of what is the best option or specification so it must be demonstrated that these measures have been considered by the relevant specialist and have informed the design and specification of the catering facilities. (KBCN0663)
CN3.9	No unregulated energy consumption in the building	Where there are no items contributing to equipment energy consumption in the building, these credits will be filtered out. (KBCN00066)
CN3.10	Office equipment – mobile devices	Mobile devices such as smartphones and tablets, which are generally used without connection to an electrical power source, should be excluded from the assessment of the energy efficient equipment issue. (KBCN00041)
CN3.11	Re-used electrical equipment	If it can be demonstrated that such existing electrical appliances meet the criteria for inclusion in the relevant national or international energy efficient equipment schemes, these can be considered compliant. If new equipment is procured in addition to the re-use of the old equipment, the existing equipment may be excluded from this assessment. In these situations the assessor must be satisfied that the new equipment would make a meaningful reduction to overall unregulated energy consumption. (KBCN0325)

Methodology

Estimating annual equipment energy consumption

A method should be used that estimates actual energy use, based on expected equipment loads and hours of operation. The energy uses may be estimated by using simple hand calculations, benchmark data or by the methods described in CIBSE TM54 Evaluating operational energy performance of buildings at the design stage[59].

Estimating a significant proportion of annual equipment energy consumption

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

Calculating a meaningful reduction in energy consumption

For equipment that makes up a significant proportion of the annual equipment energy consumption, demonstrate that a meaningful reduction in energy consumption has been achieved. Equipment types which met the criteria listed in Table 31 on page 204 are deemed to achieve a meaningful reduction without further justification or calculation.

For equipment types not listed in Table 31, or where alternative solutions are provided for equipment listed in Table 31, calculations must be provided that demonstrate that when combined these lead to a 5% reduction in energy consumption compared to equipment with typical or standard specifications.

Evidence

Criteria	Interim design stage	Final post-construction stage
All	The following where appropriate: — The relevant section or clauses of the building specification or contract. — Manufacturers' product details. — Documentation confirming compliance with the relevant scheme or standard outlined in the criteria. — Design drawings or calculations.	The following where appropriate: — BREEAM Assessor's site inspection report and photographic evidence. — Manufacturers' product details. — Documentation confirming the installed equipment complies with the relevant scheme or standard outlined in the criteria.
3 (for commercial kitchen and catering facilities using TM50)	A letter or document to be produced confirming how each measure has been considered along with justification for how this has informed the specification. Where the measures require training , then relevant training materials could be used as evidence.	Any type of general evidence deemed appropriate by the assessor would be sufficient to confirm the specified measures have been installed

Additional information

Relevant definitions

IT-intensive areas

These include computer areas where more than one computer per 5m² is provided, e.g. training suites, design studios, libraries' IT areas and other areas with a high density of computing devices.

Office equipment

Computer monitors, desktop computers, scanners, photocopiers, printers, workstations etc.

Other energy efficient equipment

For the purpose of this BREEAM issue, the term 'other energy efficient equipment' refers to equipment that is not covered under Ene 03 (external lighting), Ene 05 (cold storage), Ene 06 (transport systems) and Ene 07 (laboratory systems).

The following is a non-exhaustive list of some types of equipment that are covered under this issue:

- Small power loads and plug in equipment
- Domestic scale refrigeration, washing, and drying appliances
- Commercial kitchens
- Swimming pools
- IT-intensive areas
- Communal laundries

White goods and small power equipment

Domestic appliances, for example washing machines, fridges, freezers, fridge-freezers, tumble dryers, washer-dryers, air movement fans or heaters, etc.

Ene 09 Drying space

Not assessed as a standalone issue within BREEAM International New Construction.

Ene 10 Flexible demand side response

(all buildings)

Number of credits available	Minimum standards
1 exemplary credit	No

Aim

To recognise and encourage flexible demand side response capability for electricity. Reducing carbon emissions by enabling electricity demand profiles to better match the availability of renewable electricity generation sources.

Assessment criteria

The following is required to demonstrate compliance:

Exemplary level criteria

The following outlines the exemplary level criteria to achieve one exemplary credit for this BREEAM issue:

One exemplary credit

1 The building is fitted with at least one smart appliance or smart control system that is able to modify the operation of the appliance or system in response to external signals from electricity suppliers.

OR

2 The building incorporates electricity or hot water storage facilities that are able to modify their charging or discharging cycles in response to external signals from electricity suppliers. This energy storage can be at the building level or across multiple buildings.

Checklists and tables

None.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institution only)		
CN1	Applicable assessment criteria	Both options: All criteria relevant to the building type and function apply. Refer to Appendix D – Shell and core project assessments on page 409 of this Scheme Document for further description of the above options.
Residential - Partially fitted and fully fitted		
CN2	Applicable assessment criteria - Single and multiple dwellings	Both options: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN3	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 external new and existing elements within the construction zone of the assessed building.

Methodology

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
All	The relevant section or clauses of the building specification or contract. Design drawings.	BREEAM Assessor’s site inspection report and photographic evidence or as-built drawings. Manufacturers' product details.

Additional information

Relevant definitions

Construction zone

For the purpose of this issue the construction zone is defined as the site which is being developed for the BREEAM-assessed building and its external site areas, i.e. the scope of the new works.

Energy storage

For the purpose of this issue energy storage is defined as systems that store energy during times where there is little demand for energy or an over production of energy, which can then be used later where there is high demand for energy. To qualify for this issue, these systems must be equipped to receive signals from energy suppliers to automatically start or stop storing energy.

Examples of energy storage include, but are not limited to:

- Electric vehicle charging points
- Large scale battery storage
- Liquified air storage systems

Smart appliances

For the purpose of this issue smart appliances are defined as appliances that automatically regulate their energy consumption based on the signals they receive from energy suppliers, also known as demand side response. An example of how they can do this is by reducing their energy demand at peak times.

Examples of smart appliances include, but are not limited to:

- Smart cold storage systems (for example, refrigerators or freezers)
- Smart washing machines
- Smart dish washers

Other information

None.

Transport

Summary

This category encourages better access to sustainable means of transport for building users. Issues in this section focus on the accessibility of public transport and other alternative transport solutions (cyclist facilities, provision of amenities local to a building) that support reductions in car journeys and, therefore, congestion and CO_2 emissions over the life of the building.

Category summary table

Issue	Credits	Credit summary
Tra 01 Public transport accessibility	Up to 5 credits	— Recognition of developments in close proximity to good public transport networks, thereby helping to reduce transport-related pollution and congestion.
Tra 02 Proximity to amenities	Up to 2 credits	— Recognition of developments in close proximity of, and accessible to, local amenities which are likely to be frequently required and used by building occupants.
Tra 03a Alternative modes of transport	Up to 2 credits	— Provision of facilities to encourage travel using low carbon modes of transport and to minimise individual journeys.
Tra 03b Alternative modes of transport		
Tra 04 Maximum car parking capacity	Up to 2 credits	— Recognition of developments that limit car parking capacity.
Tra 05 Travel plan	1	— To promote sustainable reductions in transport burdens by undertaking a site specific travel assessment or statement and developing a travel plan based on the needs of the particular site.
Tra 06 Home office	1	— To provide necessary space and services to be able to work from home and reduce the need to commute to work.

Tra 01 Public transport accessibility

(all buildings)

Number of credits available	Minimum standards
Building type dependent	No

Aim

To recognise and encourage development in proximity of good public transport networks, thereby helping to reduce transport-related pollution and congestion.

Assessment criteria

This issue is split into two parts:

- Accessibility Index (up to 5 credits - building type dependent)
- Dedicated bus service (1 credit)

The following is required to demonstrate compliance:

Up to five credits - Accessibility Index

1 The public transport Accessibility Index (AI) for the assessed building is calculated and BREEAM credits awarded in accordance with the building types, AI benchmarks and BREEAM credits in Table 32 on the next page

2 The Accessibility Index is determined by entering the following information in to the BREEAM Tra 01 calculator:
   2.a The distance (m) from the main building entrance to each compliant public transport node
   2.b The public transport types serving the compliant node, e.g. bus or rail
   2.c The average number of services stopping per hour at each compliant node during the operating hours of the building for a typical day (see compliance notes and Table 33 on page 220

OR

One credit - Dedicated bus service

3 For buildings with a fixed shift pattern, i.e. where building users will predominantly arrive or depart at set times, one credit can be awarded where the building occupier provides, or commits to providing a dedicated bus service to and from the building at the beginning and end of each shift or day.

This credit is only available in cases where a development is unable to achieve any of the available credits using the Accessibility Index criteria (i.e. its location has a low public transport Accessibility Index).

Checklists and tables

Table 32: Credits available for each building type relating to the public transport Accessibility Index (AI) score

Accessibility Index	≥ 0.5	≥ 1	≥ 2	≥ 4	≥ 8	≥ 10	≥ 12	≥ 18
Building type	**BREEAM credits available**							
Offices, Industrial, Long term residential institutions, Other building - Staffed	-	-	1	2	3	-	-	-
Preschool, School	-	-	1	2	3	-	-	-
Retail, Higher education - Off campus, Hotels and short term residential institutions, Other building - Visitors	-	-	1	2	3	3	4	5
Higher education - On campus	-	-	1	2	3	4	5	-
Rural location sensitive buildings, Other buildings - Rural,	-	-	1	2	-	-	-	-
Residential dwellings	1	2	3	4	-	-	-	-

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	Both options: All criteria relevant to the building type and function apply. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - Partially fitted and fully fitted		
CN2	Applicable assessment criteria - Single and multiple dwellings	Both options: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		

Ref	Terms	Description
CN3	Campus developments. See criterion 1 on page 215	Where 80% or more of the buildings on a campus style development, e.g. further or higher education sites, are within 1000m of the campus's main entrance, then the campus main entrance can be used as the reference point for the assessment of distance to compliant public transport nodes for this issue. The campus main entrance is that which is accessed by the majority of the assessed building's staff or students or visitors. A site may have more than one main entrance which between them account for the majority of staff, students and visitors that access the site. In such a case either entrance can be used as the basis for the calculation. Where less than 80% of the buildings on the campus development are within 1000m of the campus main entrance, the assessed building's main entrance must be used as the reference point for the assessment of distance to compliant public transport nodes for this issue. This rule implies that for large campus developments, when distances are too great to be comfortably covered by walking, the needs of the building users would be served better by locating the public transport nodes inside or on the periphery of the campus. Where the building is not part of a centralised campus then its main entrance must be used as the reference point for the assessment of this issue.
CN3.1	Dedicated bus services. See criterion 3 on page 215.	The credit for the provision of a dedicated bus service is available for any building type with a fixed shift pattern; examples could include schools, offices, retail, factories etc. The bus must provide transfer to the local population centre, public transport interchange or be a door-to-door service. The credit is provided as an alternative, where the AI of the building is too low to achieve any BREEAM credits, but where the building users will have the option of a dedicated bus service. However, a dedicated bus service can be included in the public transport Accessibility Index calculation as a means of contributing towards achieving credits via this method (regardless of the shift pattern). Where this is the case, the distance from the main building entrance to the drop-off or pick-up point (the transport node) of the service should be used.
CN3.2	Phased developments. See criterion 3 on page 215.	In the case of a large phased development where new transport facilities will be provided, but at a later stage than the building being assessed, the assessment can consider such facilities provided that a commitment has been made to provide transport facilities within the shortest of the following periods: 1. The transport facilities will be available for use by the time 25% of all phases have been completed and are ready for occupation OR 2. The transport facilities will be available for use within 25% of the total build time for the phase in which the assessed building forms a part, measured from the completion date of that phase. The most appropriate rule for the development in question must be used, ensuring that the time building users have to wait before having use of the transport facilities is as short as possible. Where the transport facilities will not be available for use within a period of five years from occupation of the building, they cannot be considered for determining compliance with the BREEAM criteria.

Methodology

Calculating the average number of services

For the purpose of the calculation, the frequency of public transport is the average number of services per hour. This is calculated by determining the number of stopping services at the node during the peak arrival or departure times for the building or the building's typical day's operating hours (see definition 'operating hours'), divided by the number of hours within that period. For example: the average number of services for an assessment of a building that operates between 08:00 - 19:00 hrs (11 hours) and is within proximity of a bus stop with 35 stopping services during this period is 3.2 (equivalent to an average service frequency of approximately 20 minutes).

Multiple services

Services that operate from more than one node within proximity of the building, i.e. two separate bus stops served by the same bus, must be considered only once; at the node in closest proximity to the building. Different services at the same node can be considered as separate.

Bidirectional routes

Routes will be bidirectional; however for the purpose of calculating the index, consider only the direction with the highest frequency.

Evidence

Criteria	Interim design stage	Final post-construction stage
1, 2	Scale map highlighting the location of the building and all public transport nodes in proximity of the building. Timetables for each service at each public transport node considered. The calculated Accessibility Index below for the building. Where appropriate, information about the dedicated bus service. A completed copy of the Tra 01 calculator.	As design stage. Where relying on a calculation carried out at the design stage to demonstrate compliance post-construction, if the period between the design and post-construction stage reporting is greater than 12 months, then the AI must be recalculated using up-to-date public transport timetable information. As interim design stage.
3	A formal letter from the future building occupier confirming provision of and details for the dedicated bus services.	As interim design stage.

Additional information

Relevant definitions

Accessibility Index

A measure that provides an indicator of the accessibility and density of the public transport network at a point of interest (in the case of BREEAM, a building). The index is influenced by the proximity and diversity of the public transport network and the level or frequency of service at the accessible node. For example, a building that has a single public transport node 500m from its main building entrance with one service stopping every 15 minutes, i.e. four services per hour on average, will score an AI of approximately 1.90.

Alternatively, the same node with one service every 15 minutes, but 300m from the building entrance will achieve an AI of 2.26. The same node with two services stopping every 15 minutes will score an AI of 2.85. The greater the number of compliant nodes, services and their proximity to the building, the higher the AI.

Additional building type classifications

Higher education
Education that continues beyond the compulsory level, e.g. colleges and universities.

Higher education - Off campus
Higher education buildings located on a campus where less than 25% of students are resident on the campus or within 1km radius from the campus main entrance.

Higher education - On campus
Higher education buildings located on a campus where 25% or more of the students are resident on the campus or within 1km radius from the campus's main entrance.

Other building - Staffed
A building predominantly occupied by staff or employees with occasional business related visitors.

Other building - Visitors
A building occupied by a number of core staff or employees with a larger number of consistently frequent visitors or users (either resident or non-resident).

Other building - Rural
Building types specifically required to be located rurally as a result of their function, i.e. a building which would never be located within an urban area, e.g. a national park visitor centre (see definition of rural and rural location sensitive buildings location).

BREEAM Tra 01 Calculator tool
A spreadsheet-based calculator used to determine the Accessibility Index for the assessed building and the number of BREEAM credits achieved.

Compliant transport node
A compliant node includes any bus service with a stop within 650m and any railway station within 1000m of the assessed building's main entrance, measured via a safe pedestrian route (not 'as the crow flies'). The service stopping at each node must provide transport from, or onward travel to, either an urban centre, major transport node or a community focal point, e.g. doctor's surgery, library, school or village centre. Only local services should be assessed and any national public transport services should be excluded from the analysis, unless such a service can be said to provide a local commuter service.

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 and is available to the majority 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. building with a boundary on a public highway).

Operating hours
BREEAM seeks to define the building's accessibility to the public transport network for the period during which the majority of building users will travel to and from the building. In most cases the normal operating hours of the building can be used. Where shift patterns see the majority of building users (over 80%) arriving or leaving during a certain period, for example an office building where the majority of office workers arrive between 8.00-10.00, then that period can be used as an alternative to the operating hours of the building. This accounts for some building types that operate a 24-hour day and on a shift work basis. During what typically would be deemed unsociable hours, and therefore periods where there is little if any public transport operating, such periods are not required to be accounted for in the assessment of this issue. Where the assessed building operates on a 24-hour basis or the operating hours are unknown at the time of assessment, then refer to and use the table of default operating hours, which can be found in the additional information section of this issue.

Rural location (Urban location)

A rural location is defined in this context as a site clearly not within or on the boundary of a small, medium or large urban cover. An urban cover will have a population of 3000 people or more, located within a tract of continuously built-up urban land extending 20 hectares or more. Therefore, the definition of rural includes village locations, green field sites or small urban centres with a population of less 3000 people within a tract of land no greater than 20 hectares. Such locations will most likely be on a local bus route to larger urban areas or other local towns and may have local shops and other facilities.

Rural location sensitive buildings

This definition includes any of the building types (listed below) where there is a demonstrable social or economic need from a rural population for the service or demand, which the new building is intended to meet; and therefore locating the building at an alternative site which could have higher public transport accessibility levels, i.e. within an urbanised area, is unfeasible. The following building types are examples of those that may fall into this category.

1. Offices where providing services to the local community
2. Industrial where providing services to the local community
3. Retail where providing services to the local community
4. Preschool, primary and secondary school where providing services to the local community
5. Residential dwellings where providing accommodation to the local community.

Typical day

The typical day is that which represents the period when travel to and from the building by its users and visitors will be at its highest. For most buildings this should be taken as a midweek 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 (excluding Sundays).

Other information

Table 33: Default hours of operation by building type for a typical day

Building type	Default hours
Commercial	08:00 - 19:00
Preschool, school	07:30 -10:00,15:00 - 17:30
University, Higher education	08:00 - 19:00
Retail: Shopping centre	09:00 - 19:00
Retail: Supermarket	08:00 - 22:00
Retail: Service provider	08:00 - 18:00
Retail: Convenience store	07:00 - 22:00
Retail: DIY or retail park	08:00 - 20:00
Retail: shop	08:30 - 17:30
Residential dwellings and residential institutions	08:00 - 19:00
Hotel	08:00 - 19:00

Building type	Default hours
24-hour use building	07:00 - 20:00
Note: These hours are provided as a guideline: differing hours can be used, where justified by the assessor, as a result of regional or national culture, customs or routine.	

Tra 02 Proximity to amenities (all buildings)

Number of credits available	Minimum standards
Building type dependent	No

Aim

To encourage and reward a building location that facilitates easy access to local services and so reduces the environmental, social and economic impacts resulting from multiple or extended building user journeys, including transport-related emissions and traffic congestion.

Assessment criteria

The following is required to demonstrate compliance:

Up to two credits

1 All building types, except Type 6, must be located within the stated proximity of at least two accessible core amenities ('C' in Table 34 below).

2 The remaining number of amenities required, in Table 34 below, must be met using any other applicable amenities (including any remaining core amenities).

Checklists and tables

Table 34: Credits available for Tra 02 for different building types

Criteria	Building type					
	Type 1	Type 2	Type 3	Type 5 (Two credits available)		Type 6
No. of BREEAM credits	1	1	1	1	1	1
No. of amenities required	3	3	4	4	7	2
Proximity (metres)	500	500	500	500	1000	500
Appropriate food outlet	C	C	C	C	C	✔
Access to cash	C	C	C	C	C	✔

Criteria	Building type					
	Type 1	Type 2	Type 3	Type 5 (Two credits available)		Type 6
Access to a recreation or leisure facility for fitness or sports	C	C	C	✔	✔	✔
Access to an outdoor open space (public or private, suitably sized and accessible to building users)	✔	✔	✔	C	C	✔
Publicly available postal facility	✔	✔	✔	✔	✔	✔
Community facility	✔	✔	✔	✔	✔	✔
Over the counter services associated with a pharmacy	✔	✔	✔	✔	✔	✔
Public sector doctor's surgery or general medical centre	-	-	✔	✔	✔	✔
Child care facility or school	✔	-	✔	✔	✔	✔

Key:
C - Core amenity for building type
✔ - Amenity relevant to building type.

Building types:
Type 1: Offices, retail, industrial
Type 2: Preschool, schools
Type 3: Higher education and university
Type 4: Healthcare (requires a bespoke assessment)
Type 5: Residential dwellings and residential institutions - long term stay (two credits are available and each can be awarded independently of the other)
Type 6: Hotels, residential institutions - short term stay, and other non-standard buildings

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		

Ref	Terms	Description
CN1	Applicable assessment criteria	Both options: All criteria relevant to the building type and function apply. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - Partially fitted and fully fitted		
CN2	Applicable assessment criteria - Single and multiple dwellings	Both options: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN3	Collective amenities	One type of amenity may also exist within or as part of other types of amenities, e.g. a grocery store in a petrol station, cash point or pharmacy in a supermarket etc. It is not a requirement of this issue that each amenity is 'standalone'.
CN3.1	Amenities within the assessed building or on site	An amenity within the building or on the same site as the proposed development, e.g. where the assessed building is part of a campus, retail or business park or centre, complies with the assessment criteria.
CN3.2	Phased developments	The guidance provided in BREEAM issue Tra 01 Public transport accessibility on page 215 concerning phased developments also applies to this issue.

Methodology

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
All	Marked-up site plan or map highlighting: — Location of assessed building — Location and type of amenities — The route to the amenities — Plan or map scale.	Assessor's building or site inspection and photographic evidence confirming: — The existence of the local amenities — The route and distance to the amenities.

Criteria	Interim design stage	Final post-construction stage
All	Where the amenities do not currently exist, but are due to be developed, a letter from the client or developer confirming: — The location and type of amenities to be provided — The timescale for development of the amenities.	Evidence as outlined at the design stage of assessment OR As above where amenities developed, or under development at the time of post-construction review or assessment.

Additional information

Relevant definitions

Accessible amenities

Amenities (as listed) that are within the required proximity (distance in metres) of the building and accessible via safe pedestrian routes, e.g. pavements or paths and safe crossing points or, where provided, dedicated pedestrian crossing points. The distance should not be measured in a straight line.

Access to an outdoor open space (public or private, suitably sized and accessible to building users)

A space that enables building users to take an appropriate break from internal building activities, for example, an office building would benefit from a space to sit outside and have lunch. These spaces will need to be suitably sized to ensure that the space supports a reasonable number of building users associated with the project and should not form a part of the public highway.

Access to a recreation or leisure facility

A facility that will allow building users to exercise and maintain a healthy lifestyle. This could include a local leisure centre, tennis courts, an on site gym or, for a school, a local playground.

Appropriate food outlet

A means of accessing a food supply that is affordable to the majority of the building's users, as well as being appropriate for their day-to-day needs. For example, a small office building would benefit from having a small shop selling sandwiches or snacks, a residential dwelling and a residential institution would benefit from having a restaurant in the local area.

Child care or school

The intention of this amenity is to provide child support for potential building users; this could include a nursery, child minding facilities or a school local to the development. A school cannot be considered an amenity to a BREEAM assessment of the same school.

Community facility

An internal space that is inclusive to the majority of building users who will occupy the assessed building or development. The facility will serve to facilitate community activities for the assessed building and its users. For example, for a residential dwelling or a residential institution this could be a community hall or for an office building, a public house.

Other information

None.

Tra 03a Alternative modes of transport (non-residential, plus residential institutions)

For residential buildings, see Tra 03b Alternative modes of transport on page 235.

Number of credits available	Minimum standards
2	No

Aim

To provide facilities which encourage building users to travel using low carbon modes of transport and to minimise individual journeys.

Assessment criteria

The following is required to demonstrate compliance:

Up to two credits

One of the following options has been implemented:

Option	Criteria	Applicable building types	Credits
1	1 During the preparation of the brief the design team has consulted with the local authority on the state of the local cycling network and how the development could contribute to improving it. 2 One proposition has been chosen in agreement with the local authority and implemented. This proposition must be additional to what would have been done by the local authority without the support from the project and must have a significant impact on the local cycling network.	All	2
2	3 Negotiations with local bus companies have resulted in an increase of the local service provision in the development's local area. 4 This increase in public transport service has improved the existing AI by at least 1.00 (see Tra 01 Public transport accessibility on page 215).	All	2

Option	Criteria	Applicable building types	Credits
3	5 Electric recharging stations have been provided for at least 3% of the total car parking capacity for the building. 6 The design team can demonstrate electric vehicles using these charging points will have lower CO_2 emissions than their petrol or diesel counterparts.	All	2
4	7 A car sharing group or facility has been set up to facilitate and encourage building users to sign up to a car sharing scheme. 8 Marketing material has been developed to help raise awareness of the system and will be communicated to the tenants where applicable. 9 Priority spaces for car sharers are provided for at least 5% of the total car parking capacity for the building. 10 Priority spaces are located in the nearest available spaces in the nearest available parking area to the main building entrance on site.	All	2
5	11 Compliant cycle storage spaces that meet the minimum levels set out in Table 35 on the next page (see Checklists and tables on the next page) are installed.	All	1
	12 Criterion 11 above is achieved. 13 At least two of the following compliant facilities must be provided for the building users: 13.a Compliant showers 13.b Compliant changing facilities and lockers for clothes 13.c Compliant drying space for wet clothes.	Office, industrial, preschool, school, higher education, university, other building type 1 and 2, retail, hotel, other building type 3	1

Exemplary level criteria

The following outlines the exemplary level criteria to achieve an innovation credit for this BREEAM issue.

6. Two of the options above have been fully implemented.

Checklists and tables

Table 35: Cycle storage criteria for each building type

Building type	No. spaces per unit of measure	Unit of measure	Notes
Commercial			
Offices, Industrial	1	10 staff	
Retail			
Large retail	1	10 staff	The number of staff refers to the maximum number of employees working in the building at any time or shift. Both staff and customer cycle storage spaces must be provided in order to meet the criteria. Although they do not need to be separate, this is encouraged. A minimum of 10 customer cycle spaces is required. Where at least 50 customer cycle storage spaces are provided, this will comply with the criteria for the customer cycle spaces.
	1	20 public car parking spaces	
Small retail	10	Total	The spaces must be publicly accessible within the proximity of a main building entrance. Compliant cyclist facilities are intended for staff only, i.e. it is not a requirement of compliance to provide facilities for customers.
Education			
Preschool	1	10 staff	
Primary school	5	Per class in year group	For example: where a primary school has been designed to accommodate three classes per year, a total of 15 compliant cycle storage spaces are provided for the whole school. Where there are varying numbers of forms or classes per year, the calculation must be based on the year with the greatest number of classes or forms.
Secondary schools and higher education	1	10 staff and pupils or students total	Student numbers must account for both under- and post-graduates, as well as PhD students and post-doctorates.
Residential institutions			

Student residences	1	10 staff	The requirement is subject to a minimum of one compliant space being provided.
	1	2 residents	
Sheltered housing, care homes, supported living facility*	1	10 staff	* Or spaces specified in accordance with the number required as identified by the likely resident profile. Where the resident profile is not the elderly or physically disabled or impaired then, where appropriate, the requirement for wheelchair or electric buggy spaces should be changed to compliant cycle spaces.
	1 compliant wheelchair or electric buggy storage space	10 residents*	
Other buildings			
Other building - Staffed*	Use the criteria defined for office buildings.		
Other building - Visitors*	1	10 staff	
	1	10 visitors or beds	
Other buildings - Rural*	1	20 staff	A single credit can be awarded where spaces for staff only are provided as well as the appropriate compliant cyclist facilities. The compliance note allowing a reduction in the cyclist provision in rural locations has been accounted for in the unit of measure for this transport type. It should not therefore be applied again.
	1	20 building visitors or beds	

*See relevant definitions in the BREEAM issue Tra 01 Public transport accessibility on page 215 for classification of other buildings - Staffed, Visitors and Rural.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment options	Both options: All criteria relevant to the building type and function apply. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - Partially fitted and fully fitted		

Ref	Terms	Description
CN2	Applicable assessment criteria - Single and multiple dwellings	Both options: This issue is not applicable to residential dwellings. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN3	Number of building occupants unknown	If it is not possible to confirm the number of building occupants commuting to the development, possibly due to the speculative nature of the building, then the default occupancy rates given in the table in the Additional information section of BREEAM issue Tra 04 Maximum car parking capacity on page 240 can be used to help determine a default number of users. Alternatively, the number of building occupants in an existing development of similar type and size can be used (the assessor needs to justify or validate the number used in their certification report).
CN3.1	Building types	Please see BREEAM issue Tra 01 Public transport accessibility on page 215 to determine the building type. If assessing a bespoke building, please see the bespoke criteria appendix for confirmation.
CN3.2	More onerous requirements	Where local authorities require more onerous requirements than BREEAM (i.e. number of electric recharging stations or cycle spaces), these must be met in order to award the credits.
CN3.3	Existing compliant facilities and extensions to existing buildings	For assessments of new buildings on an existing site, where there are existing compliant facilities, such facilities can be assessed against the requirements of this issue. The number of existing compliant facilities must be large enough to cater for the building users of the assessed building, in addition to the users from any existing buildings.
CN3.4	Building locations with a high level of public transport accessibility	For sites where at least 50% of the available credits for BREEAM issue Tra 01 Public transport accessibility on page 215 have been awarded (rounded to the nearest whole credit), the number of compliant cycle spaces can be reduced by 50%. This reduction will also reduce the requirement for compliant shower or lockers by the same margin.

Ref	Terms	Description
CN3.5	Public bicycle sharing systems	Bicycle sharing systems are increasingly popular and diverse systems that have appeared over the past few years in major cities whereby a number of bicycles are made available for shared use among people who do not own a bicycle. The central concept of many of the systems is free or affordable access to bicycles for city transport in order to reduce the use of automobiles for short trips inside the city thereby diminishing traffic congestion, noise and air pollution. Up to 50% of the BREEAM cycle spaces requirement may be provided by a public bicycle sharing system where it complies with the following: 1. The programme is implemented by the municipality or through a public–private partnership 2. The system must be open to casual users who wish to use them for one-way rides to work, education or shopping centres 3. Bicycles are available at unattended urban locations; and they operate in a manner that could be seen as 'bicycle transit' 4. Service terminals must be available throughout the city 5. The average distance between service terminals is 500m maximum in inner city areas 6. A service terminal is available within 500m of the main building entrance 7. The bicycle terminals do not need to comply with the design requirements listed in the definition of Compliant cycle storage on page 234. The number of compliant facilities is calculated based on the total number of cycle spaces required. For retail projects, public bicycle spaces can also count towards the number of customer cycle spaces required.
CN3.6	Rural locations	For sites in rural locations, where the average building user commuting distances are likely to be greater than 16 km, the number of compliant cycle spaces can be reduced by 50%. This reduction will also reduce the requirement for compliant showers and lockers by the same margin. A 50% reduction in this context cannot be applied in addition to either the 50% reduction due to the building's Public Transport Accessibility level (as described in CN3.4 on the previous page). A rural location is defined in BREEAM issue Tra 01 Public transport accessibility on page 215
CN3.7	Minimum number of facilities	Where more than the minimum number of compliant cycle spaces is provided, it is not necessary to also provide more than the minimum number of showers or lockers or changing facilities.
Building type specific		
CN4	Hotel	Where the term 'building visitors' is used this does not include guests staying at the hotel. However, it would include visitors to the conference facilities or restaurant or gym, etc. who are not staying in the hotel (where present).

Methodology

Sliding scale of compliance

To recognise the increased confidence in availability that occurs where there is larger scale provision of facilities, it is acceptable to reduce the provision requirement for building users by increasing the standard unit of measure (defined in Table 35 on page 228

1. For buildings with more than 200 users but less than 300, the unit of measure can be increased by a ratio of 1.5.
2. For buildings with more than 300 users but less than 400, the unit of measure can be increased by a ratio of 2.
3. For buildings with more than 400 users, the unit of measure can be increased by a ratio of 2.5.

The calculation starts from the first 200 building users, with no ratio, and keeps going considering the ratio only for the remaining building users.

For example, an office building with 800 users would be required to provide the following number of cycle storage spaces:

— 1–200 users @ 1 space per 10 users = 20 spaces PLUS
— 201–300 users @ 1 space per 15 users (standard unit of measure x 1.5) = 7 spaces PLUS
— 301–400 users @ 1 space per 20 users (standard unit of measure x 2) = 5 spaces PLUS
— 401+ users @ 1 space per 25 users (standard unit of measure x 2.5) = 16 spaces
— Total compliant cycle storage spaces required = 48 spaces.

The sliding scale of compliance does not apply to the following building types: small and large retail, primary schools, and residential institutions.

Minimum cycle storage provision

Where the calculated number of required cycle storage spaces is less than four, total provision should be based on the lower of the following:

1. A minimum of four compliant storage spaces must be provided OR
2. One space per user (staff and where appropriate other user groups).

Provision of cycle storage and facilities on site with multiple buildings

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 with this issue may be assessed based on the standalone building or on a site-wide basis. How this is determined depends on the configuration of the proposed cycle storage, cycle facilities and the interpretation and justification of the assessor.

Standalone approach

Where cycle storage and associated facilities are being provided for the assessed building only, the following applies:

Cyclist storage:

— The number of cycle storage spaces is compliant based on the number of users in the assessed building.
— All storage spaces provided must be BREEAM compliant and these must be located within, or in close proximity to the assessed building. It is clear from access arrangements, demarcation and positioning that the cycle storage provided is clearly associated with the assessed building only.
— The sliding scale of compliance can be applied when determining the number of storage spaces required.

Cyclist facilities:

— All new and existing facilities may be included provided they are BREEAM compliant.
— Facilities should be located within the assessed building, or in an accessible adjacent building and for the sole use of the assessed building's users.

Site-wide approach

Where cycle storage and associated facilities are provided and these would be accessible to all users of the entire site, or where there is a distinct group of local buildings within a site that would share facilities, the following applies:

Cyclist storage:

- The number of cycle storage spaces is compliant based on the number of users on site or within a group of local buildings.
- All new storage spaces must be BREEAM compliant. Existing storage spaces may also be counted, provided they allow bikes to be easily stored and removed with the ability to be locked securely to a compliant cycle space (see point 2 of compliant cycle storage, in the Relevant definitions on the next page).
- The sliding scale of compliance can be applied when determining the number of storage spaces required.

Cyclist facilities:

- The number of cyclist facilities is compliant based on the number of users on site who would be able to use these facilities.
- Cyclist facilities may be located anywhere on site. However, the total route that cyclists must take to access the nearest cycle storage, cyclist facilities and building entrances must be no greater than 200m via a safe and convenient route, as measured from the first to the last point on the route. Where possible, different types of cyclist facilities should be grouped together in designated areas for ease of access and use.
- All new and existing facilities may be included provided they are BREEAM compliant and conform to the 200m requirement above.

Combination of the two approaches

A mixture of the two approaches can be applied where cycle storage is delivered as a site-wide approach and facilities are being met for the assessed building only. However, a mixed approach cannot be applied where facilities are delivered as a site-wide approach and storage spaces are being met for the assessed building only.

Evidence

Criteria	Interim design stage	Final post-construction stage
All	Design drawings or relevant sections or clauses of the building specification or contract. Plus the following where relevant to the options selected: — Assumptions and calculations used to determine the number of public users — Consultation documentation — Responses or actions to consultation feedback — Marketing material — Evidence or calculations supporting that CO_2 emissions from electric vehicles are lower than their petrol or diesel counterparts.	As design stage evidence. Assessor's building or site inspection and photographic evidence confirming the installation of the compliant facilities. Plus timetables where relevant to the options selected. Where changes have occurred since the design stage that could affect compliance, full details of the changes are required to demonstrate compliance.

Additional information

Relevant definitions

Additional building type classifications

See the BREEAM issue Tra 01 Public transport accessibility on page 215.

Compliant cycle storage

Compliant cycle storage facilities are those that meet the following:

1. Cycles can be secured within spaces, with fixings for one or more cycles. The fixings should allow both the wheel and frame to be locked securely. Spaces are covered overhead and the cycle spaces are set in or fixed to a permanent structure (building or hardstanding). Alternatively the cycle storage may be located in a locked structure fixed to, or part of, a permanent structure with appropriate surveillance
2. The distance between each cycle space, and cycle space and other obstructions, e.g. a wall, allows for appropriate access to the cycle storage space to enable bikes to be easily stored and accessed
3. The facilities are in a prominent site location that is viewable or overlooked from either an occupied building or a main access to a building. In the scenario where cycle storage spaces are within the building, prominent signage should be provided to advertise their location to building users and cyclists.
4. The cycle storage facility has adequate lighting; this could be demonstrated with the lighting criteria defined in BREEAM issue Hea 01 Visual comfort on page 83. The lighting must be controlled to avoid out-of-hours use and operation during daylight hours, where there is sufficient daylight in or around the facility.

Compliant showers

Compliant showers are defined as those that meet the following:

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

Compliant changing facilities

Compliant changing facilities are defined as those that meet the following:

1. Appropriately sized for the likely or required number of users. The assessor should use their judgment to determine whether the changing area is appropriately sized given the number of cycle storage spaces or showers provided
2. 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
3. Toilet or shower cubicles cannot be counted as changing facilities.

Compliant lockers

Compliant lockers are defined as those that meet the following:

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

Compliant drying spaces

A compliant drying space is defined as a space that is specifically designed and designated with adequate heating or ventilation for the drying of wet clothes. A plant room, for example, is not a compliant drying space.

Tra 03b Alternative modes of transport (residential only)

For non-residential buildings and residential institutions, see Tra 03a Alternative modes of transport on page 226.

Number of credits available	Minimum standards
2	No

Aim

To provide facilities which encourage building users to travel using low carbon modes of transport and to minimise individual journeys.

Assessment criteria

The following is required to demonstrate compliance:

Up to two credits

One of the following options has been implemented:

Option	Criteria	Credits
1	1 During the preparation of the brief, the design team has consulted with the local authority on the provision or condition of the local cycling network and how the development could contribute to improving it. 2 One proposition has been chosen in agreement with the local authority and implemented. This proposition must be additional to what would have been done by the local authority without the support from the project and must have a significant impact on the local cycling network.	2
2	3 Negotiations with any local bus, tram or train companies have resulted in an increase of the local service provision in the development's local area. 4 This improvement in public transport provision has increased the pre-development AI by at least 1.00 (see Tra 01 Public transport accessibility on page 215).	2
3	5 Electric recharging stations have been provided for the dwelling occupants. Table 37 on page 237 illustrates how credits are achieved. 6 The design team can demonstrate electric vehicles using these charging points will have lower CO_2 emissions than their petrol or diesel counterparts.	Up to 2 (see Table 37 on page 237)

Option	Criteria	Credits
4	7 A communal 'car club' is created where the members share the use of a locally based fleet of vehicles. 7.a The use of the vehicles should be charged on a 'pay-as-you-drive' basis. 7.b The club should be introduced to residents in sales literature and during sales or open days. 7.c Details of the scheme including costs and how to join should be provided to each dwelling.	2
5	8 Cycles are stored in a compliant individual or communal cycle storage space. This has to be safe, secure, convenient, weather-proof and with easy and direct access. 9 Table 36 below illustrates how credits are achieved.	Up to 2 (see Table 36 below
Note: When both option 3 and option 5 meet the requirement for one credit, two credits in total can be achieved under this assessment issue.		

Exemplary level criteria

The following outlines the exemplary level criteria to achieve an innovation credit for this BREEAM issue.

6. Two of the options above have been fully implemented.

Checklists and tables

Table 36: Number of cycle spaces per dwelling and number of credits available

Size of dwelling	1 cycle space for every 2 dwellings	1 cycle space per dwelling	2 cycle spaces per dwelling	4 cycle spaces per dwelling
	Credits available			
Studio or one bedroom	1	2	2	2
2–3 bedrooms	0	1	2	2
4 or more bedrooms	0	0	1	2

Table 37: Number of electric recharging stations per dwelling and number of credits available

Size of dwelling	**1 electric recharging station every 2 dwellings**	**1 electric recharging station per dwelling**	**2 electric recharging stations per dwelling**
	Credits available		
Studio or one bedroom	1	2	2
2 or more bedrooms	0	1	2

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	Both options: This issue is not applicable to non-residential and residential institutions. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - partially fitted and fully fitted		
CN2	Applicable assessment criteria - Single and multiple dwellings	Both options: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN2.1	Existing compliant facilities and extensions to existing buildings	Please refer to issue Tra 03a Alternative modes of transport on page 226.
CN2.2	Building types	Please refer to issue Tra 03a Alternative modes of transport on page 226.
CN2.3	Access to the cycle store	Access from the cycle store to the public right of way must not be through the residence, i.e. where cycles are stored in a shed in the back garden of a mid-terraced home and there is no back garden gate, this is non-compliant. In blocks of flats and multi-dwellings with communal areas, communal cycle stores have to be located within 100m from the front door or the main entrance. If for strategic reasons (outside the control of the developer) the store cannot be located within the required distance, exceptions to the rule may be allowed. Full details must be provided and BRE Global consulted prior to awarding credits.

Ref	Terms	Description
CN2.4	Storage space within the dwelling	Where cycles are to be stored inside the dwelling, the credit cannot be achieved (unless within a porch of adequate space as defined in minimum space requirements).
CN2.5	Folding cycles	The provision of space for folding cycles stored within the dwelling would not achieve the credit. Folding cycles would be a temporary provision whereas the provision of cycle storage is a permanent feature.

Methodology

Minimum cycle storage provision

Where the calculated number of required cycle storage spaces is less than four, total provision should be based on the lower of the following:

1. A minimum of four compliant storage spaces must be provided OR
2. One space per user.

Provision of cycle storage on site with multiple buildings

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 with this issue may be assessed based on the standalone building or on a site-wide basis. How this is determined depends on the configuration of the proposed cycle storage, cycle facilities and the interpretation and justification of the assessor.

Standalone approach

Where cycle storage is being provided for the assessed building only, the following applies:

Cyclist storage:

- The number of cycle storage spaces is compliant based on the number of users in the assessed building.
- All storage spaces provided must be BREEAM compliant and these must be located within, or in close proximity to, the assessed building. It is clear from access arrangements, demarcation and positioning that the cycle storage provided is clearly associated with the assessed building only.

Site-wide approach

Where cycle storage is provided and this would be accessible to all users of the entire site, or where there is a distinct group of local buildings within a site that would share facilities, the following applies:

Cyclist storage:

- The number of cycle storage spaces is compliant based on the number of users on site or within a group of local buildings.
- All new storage spaces must be BREEAM compliant. Existing storage spaces may also be counted, provided they allow bikes to be easily stored and removed with the ability to be locked securely to a compliant cycle space (see point 2 of compliant cycle storage, in the Relevant definition).

Combination of the two approaches

A mixture of the two approaches can be applied where cycle storage is delivered as a site-wide approach and facilities are being met for the assessed building only. However, a mixed approach cannot be applied where facilities are delivered as a site-wide approach and storage spaces are being met for the assessed building only.

Evidence

Criteria	Interim design stage	Final post-construction stage
All	Design drawings and relevant sections or clauses of the building specification or contract. Plus the following where relevant to the options selected: — Assumptions and calculations used to determine the number of public users — Consultation documentation — Responses and actions to consultation feedback — Marketing material — Evidence or calculations supporting that CO_2 emissions from electric vehicles are lower than their petrol or diesel counterparts.	As design stage evidence. Assessor's building and site inspection and photographic evidence confirming the installation of the compliant facilities. Plus timetables where relevant to the options selected. Where changes have occurred since the design stage that could affect compliance, full details of the changes are required to demonstrate compliance.

Additional information

Relevant definitions

Compliant cycle storage spaces

Compliant cycle storage facilities are those that meet the following:

1. Cycles can be secured within spaces, with fixings for one or more cycles. The fixings should allow both the wheel and frame to be locked securely. Spaces are covered overhead and the cycle spaces are set in or fixed to a permanent structure (building or hardstanding). Alternatively the cycle storage may be located in a locked structure fixed to, or part of, a permanent structure with appropriate surveillance
2. The distance between each cycle space, and cycle space and other obstructions, e.g. a wall, allows for appropriate access to the cycle storage space to enable bikes to be easily stored and accessed
3. The facilities are in a prominent site location that is viewable or overlooked from either an occupied building or a main access to a building. In the scenario where cycle storage spaces are within the building, prominent signage should be provided to advertise their location to building users and cyclists.
4. The cycle storage facility has adequate lighting; this could be demonstrated with the lighting criteria defined in BREEAM issue Hea 01 Visual comfort on page 83. The lighting must be controlled to avoid out-of-hours use and operation during daylight hours, where there is sufficient daylight in or around the facility.

Other information

None.

Tra 04 Maximum car parking capacity

(non-residential and residential institutions only)

Number of credits available	Minimum standards
2	No

Aim

To encourage the use of alternative means of transport other than the private car to and from the building, thereby helping to reduce transport-related emissions and traffic congestion associated with the building’s operation.

Assessment criteria

The following is required to demonstrate compliance:

Up to two credits - Car parking capacity

1. The building's car parking capacity is compared to the maximum car parking capacity benchmarks in Table 38 below and the relevant number of credits awarded.
   For most building types, except those where stated, the benchmarks vary according to the building's public transport Accessibility Index (AI; determined in accordance with BREEAM issue Tra 01 Public transport accessibility on page 215). Therefore, for these building types the AI must be determined prior to assessing this issue. This is required to ensure that the building’s car parking capacity is relative to the development's accessibility to the public transport network.

Checklists and tables

Table 38: Credits available in Tra 04 Maximum car parking capacity for different building types

	Criteria			Credits
Building's Accessibility Index	< 4	≥ 4 - < 8	≥ 8	
Building type	Max. parking capacity 1 space per x building users, where x is:			
Office, industrial, student residences	3	4	5	1
	4	5	6	2

Building's Accessibility Index	Criteria			Credits
	< 4	≥ 4 - < 8	≥ 8	
Sheltered accommodation, care homes and supported living facility	4	5	6	1
	5	6	7	2
University and higher education	15	20	25	1
	20	25	30	2
Other building – Staffed and Visitors	3	4	5	1
	4	5	6	2
Preschool, schools, retail, other building – Rural	Issue not assessed for these building types.			

Compliance notes

Ref	Terms	Description
Applicable assessment criteria		
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	Both options: All assessment criteria relevant to the building type and function apply. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - Partially fitted and fully fitted		
CN2	Applicable assessment criteria - Single and multiple dwellings	Both options: This issue is not applicable. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		

Ref	Terms	Description
CN3	Exclusions	Parking spaces set aside for the following building users can be excluded provided these spaces are dedicated for that use, i.e. sized accordingly with the appropriate signage or markings: 1. Disabled 2. Parent and baby 3. Motorbike 4. Car share. In the case of excluding car share spaces, the future building occupier will need to confirm they have an enforceable car share policy.
CN3.1	Parking shared with other buildings	Where the assessed building forms part of a wider site, e.g. campus, business park, hospital, and parking is not designated to individual buildings, then the assessor has two options: 1. Assess compliance on the basis of parking capacity for the whole development, accounting for all existing and new users and parking spaces 2. Assess compliance using a pro-rata of parking capacity to building users, e.g. if the assessed building is occupied by 20% of the development's total occupants, then attribute 20% of the total parking spaces to the assessed building for the purpose of the assessment.

Methodology

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
All	A site plan or copy of the specification. Relevant documentation or correspondence from the design team or client confirming the number of building users. Confirmation of the building’s AI (as per Tra 01 Public transport accessibility on page 215).	As design stage. Assessor’s building or site inspection and photographic evidence.

Additional information

Relevant definitions

Accessibility Index

Refer to Tra 01 Public transport accessibility – Accessibility Index on page 218.

Building users

Where the term building users is referenced in this BREEAM issue it refers to the following, where relevant to the building type:

1. Staff (who will work within the building)
2. Students (who will access the building for work or study during a typical academic term time or semester day)
3. Residents (who will reside permanently or for a short period of time in the building).

If known, or can be reasonably estimated, project specific occupancy figures should be used. If this is not possible, for example where the building is a speculative project, use the default occupancy rates given in Table 39 below to determine the number of users. Where the number of building users is variable, provision of parking spaces should be based on the maximum number of building users likely to be using the building at any time during a typical day.

Care homes

For the purpose of BREEAM, care homes are defined as buildings with residential accommodation and meals, and have residents that require a level of personal care such as eating, cleaning and a level of medical care.

Sheltered housing

Sheltered housing can be defined as self-contained accommodation, usually with an emergency alarm system, communal facilities and a resident warden.

Other building types

See the BREEAM issue Tra 01 Public transport accessibility on page 215 for a definition of Other building Staffed, Visitors and Rural.

Other information

Table 39: Default occupancy rates by building type

Building type and function area	Occupant density (person/m²)	Building type and function area	Occupant density (person/m²)
Business		**University and higher education**	
Office area (including reception areas)	0.111	Resident's bedroom	0.120
Food preparation area (staffed)	0.108	Classroom	0.203
Small workshop or category laboratory space	0.068	Food preparation area	0.096
Industrial		Hall, lecture theatre, assembly area	0.202
Food preparation area	0.213	Computer laboratory	0.231
Industrial process area	0.022	Laboratory	0.106
Laboratory	0.107	Laundry	0.105
Reception	0.110	Reception	0.112
Warehouse storage	0.009	Workshop (small-scale)	0.068
Generic office area	0.108	Office and consulting areas	0.098

Building type and function area	Occupant density (person/m²)	Building type and function area	Occupant density (person/m²)
Care homes		**Hotels and other short stay accommodation**	
Reception	0.152	Bedroom	0.094
Food preparation area	0.161	Food preparation area	0.108
Physiotherapy studio	0.200	Reception	0.105
Bedroom unit	0.105	Generic office area	0.106
Laundry	0.117	**Other spaces or buildings**	
Assembly areas and halls	1.000	Data centre or server room	0.096
Hydrotherapy pool hall	0.100		
Office and consulting areas	0.195		

Notes for Table 39 on the previous page of default occupancy rates:

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 uses 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 UK Simplified Building Energy Model (SBEM).

Tra 05 Travel plan

(non-residential, residential institutions, and multiple dwellings only)

Number of credits available	Minimum standards
1	No

Aim

To recognise the consideration given to accommodating a range of travel options for building users, thereby encouraging the reduction of reliance on forms of travel that have the highest environmental impact.

Assessment criteria

The following is required to demonstrate compliance:

One credit

1 A travel plan has been developed as part of the feasibility and design stages.

2 A site-specific travel assessment or statement has been undertaken to ensure the travel plan is structured to meet the needs of the particular site and covers the following (as a minimum):
   - 2.a Where relevant, existing travel patterns and opinions of existing building or site users towards cycling and walking so that constraints and opportunities can be identified
   - 2.b Travel patterns and transport impact of future building users
   - 2.c Current local environment for walkers and cyclists (accounting for visitors who may be accompanied by young children)
   - 2.d Disabled access (accounting for varying levels of disability and visual impairment)
   - 2.e Public transport links serving the site
   - 2.f Current facilities for cyclists.

3 The travel plan includes a package of measures to encourage the use of sustainable modes of transport and movement of people and goods during the building's operation and use.

4 If the occupier is known, they must be involved in the development of the travel plan and they must confirm that the travel plan will be implemented post-construction and be supported by the building's management in operation.

Checklists and tables

None.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	Both options: All assessment criteria relevant to the building type and function apply. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - Partially fitted and fully fitted		
CN2	Applicable assessment criteria - Single dwellings	Both options: This issue is not applicable. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
CN2.1	Applicable assessment criteria - Multiple dwellings	Both options: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN3	Existing travel plan. See criterion 3 on the previous page.	The credit can be awarded if the assessed building is part of a site that has an existing up-to-date organisational travel plan that is compliant with BREEAM, is applicable to all building users (in existing and assessed new buildings) and accounts for the additional travel resulting from users of the new building.
CN3.1	Travel assessment or statement. See criterion 2 on the previous page.	A travel assessment (also referred to as transport assessment) will be required where a proposed development is likely to have significant transport and related environmental impacts. The study area for a transport assessment related to a proposed development should be determined in discussions between the developer and appropriate authorities. A transport statement is required where the proposed development is not likely to have a significant transport impact. A transport statement is suitable to demonstrate compliance with BREEAM when the proposed development is expected to generate relatively low numbers of trips or traffic flows, with minor transport impacts. For further guidance refer to planning guidance.planning portal.gov.uk

Ref	Terms	Description
CN3.2	Travel plan measures. See criterion 3 on page 245	The following measures could be considered as part of the travel plan for development: — Providing parking priority spaces for car sharers — Providing dedicated and convenient cycle storage and changing facilities — Lighting, landscaping and shelter to make pedestrian and public transport waiting areas pleasant — Negotiating improved bus services, i.e. altering bus routes or offering discounts — Restricting or charging for car parking — Criteria for lobby areas where information about public transport or car sharing can be made available — Pedestrian and cycle friendly (for all types of user regardless of the level of mobility or visual impairment) by the provision of cycle lanes, safe crossing points, direct routes, appropriate tactile surfaces, well-lit and signposted to other amenities, public transport nodes and adjoining off-site pedestrian and cycle routes — Providing suitable taxi drop-off or waiting areas — Ensuring that rural buildings are located with appropriate transport access to ensure that they adequately serve the local community (where procured to do so, e.g. community centre).
CN3.3	Where the end user or occupier is not known	A travel plan is still required, even if the end user or occupier is not known, albeit that it may only be an interim travel plan or one that broadly addresses all the issues covered in the assessment criteria. The developer must confirm that they will hand over a copy of the travel plan to the building's future tenants or owner or occupiers, so that it may inform their own travel plan or strategy.

Methodology

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
1–4	A copy of the travel plan. A copy of the site-specific transport survey or assessment.	As design stage.

Criteria	Interim design stage	Final post-construction stage
3 on page 245	A marked-up copy of the site plan demonstrating examples of design measures, implemented in support of the travel plan's findings OR Where a detailed site plan is not available, a formal letter from the client confirming that measures will be implemented into the final design in support of the travel plan's findings.	Assessor's building or site inspection and photographic evidence confirming the installation of measures that support the travel plan.
4 on page 245	A letter of confirmation from either the building's occupier, or in the case of a speculative development, the developer.	As design stage.

Additional information

Relevant definitions

Building users

Where the term 'building users' is used, this refers to the following, as appropriate to building type:

1. Staff (commuter journeys and business travel)
2. Pupils and students
3. Visitors
4. Customers
5. Community users
6. People who make deliveries or collections to and from the development
7. Contractors and service providers, who regularly work at and access the building or development
8. Residents of residential dwellings and residential institutions.

Travel plan

A travel plan is a strategy for managing all travel and transport within an organisation, principally to increase choice and reduce reliance on the car by seeking to improve access to a site or development by sustainable modes of transport. A travel plan contains both physical and behavioural measures to increase travel choices and reduce reliance on single occupancy car travel.

Other information

Guidance on how to produce a travel plan can be found at the following locations:

1. The Essential Guide to Travel Planning
2. TfL Travel Planning Guidance

While these documents have been written for UK property development, the principles can be applied internationally.

Tra 06 Home office

(residential only)

Number of credits available	Minimum standards
1	No

Aim

To reduce the need to commute to work by providing residents with the necessary space and services to be able to work from home.

Assessment criteria

The following is required to demonstrate compliance:

One credit

1 A home office has been provided within each dwelling with adequate space and services, as follows:
- 1.a For dwellings with one or two bedrooms or studio homes, space is provided in the living room, one of the bedrooms or any other suitable area in the home such as a large hall or dining area
- 1.b For dwellings with three or more bedrooms, sufficient working space is provided within a room other than the kitchen, living room or master bedroom or bathroom
- 1.c In all cases, the room is large enough not to prevent the intended use of that room, i.e. a home office set up in the main bedroom does not compromise the ability for a double bed and other necessary furnishing to be contained within that room.

2 Sufficient services must include as a minimum:
- 2.a Two double power sockets
- 2.b Two telephone points (or double telephone point) or one telephone point where the dwelling is connected to a cable or broadband service available at the address
- 2.c Adequate daylight, the room chosen to be the nominated home office must have a compliant average daylight factor, see Hea 01 Visual comfort: Table 10 on page 84
- 2.d Adequate ventilation, either through an openable window or alternative ventilation such as passive stack, mechanical ventilation, etc.

Checklists and tables

None.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	Both options: This issue is not applicable to non-residential and residential institutions. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - Partially fitted and fully fitted		
CN2	Applicable assessment criteria - Single and multiple dwellings	Partially fitted: This issue is not applicable. Fully fitted: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN3	Sufficient space	This is defined as the minimum size (1.8m wall length) to: 1. Allow a desk, chair and filing cabinet or bookshelf to be installed 2. Allow space to move around the front and side of the desk 3. Use the chair appropriately and operate the filing cabinet safely. The 1.8m wall size requirement can, in some circumstances, be altered if drawings can prove that a desk can be fitted in any other type of arrangement, i.e. alcove or similar, fulfilling all the above criteria.
CN3.1	Adequate ventilation	Rooms intended to be used as a home office must meet the requirements in Hea 02 Indoor air quality: Criterion 6

Methodology

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
All	Scaled drawings or a copy of the specification.	As-built drawings or assessor’s site inspection report confirming the details required at the design stage.

Additional information

Relevant definitions

None.

Other information

None.

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.

Category summary table

Issue	Credits	Credit summary
Wat 01 Water consumption	5	— Reducing the demand for potable water through the provision of efficient sanitary fittings, rainwater collection and water recycling systems.
Wat 02 Water monitoring	1	— Specification of water meters on the mains water supply to encourage water consumption management and monitoring to reduce the impacts of inefficiencies and leakage.
Wat 03 Water leak detection and prevention	3	— Recognition of leak detection systems capable of detecting a major water leak on the mains water supply — Flow control devices that regulate the supply of water to each WC area or facility to reduce water wastage — Easily accessible leak isolation valves, to allow leaks to be stopped and then fixed quickly and with minimum water wastage.
Wat 04 Water efficient equipment	1	— Identify a building's water demand from uses other than domestic-scale drinking and sanitary components and mitigate or reduce their consumption.

Wat 01 Water consumption

(all buildings)

Number of credits available	Minimum standards
5	Yes

Aim

To reduce the consumption of potable water for sanitary use in new buildings from all sources through the use of water efficient components and water recycling systems.

Assessment criteria

The following is required to demonstrate compliance:

Up to five credits

1 An assessment of the efficiency of the building's domestic water-consuming components is undertaken using the BREEAM Wat 01 calculator.

2 The water consumption (L/person/day) for the assessed building is compared against a baseline performance and BREEAM credits awarded based upon Table 40 on the next page.

3 The efficiency of the following 'domestic-scale' water-consuming components must be included in the assessment (where specified):
3.a WCs
3.b Urinals
3.c Taps (wash hand basins and where specified kitchen taps and waste disposal unit)
3.d Showers
3.e Baths
3.f Dishwashers (domestic and commercial-sized)
3.g Washing machines (domestic and commercial or industrial sized).

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

4 Where a greywater or rainwater system is specified, its yield (L/person/day) is used to offset non-potable water demand from components that would otherwise be supplied using potable water.

5 Any greywater systems must be specified and installed in compliance with the national best practice standard.

Checklists and tables

Table 40: BREEAM credits available for percentage improvement over baseline building water consumption

No. of BREEAM credits	Percentage improvement		
	Precipitation zone 1	Precipitation zone 2	Precipitation zone 3
1	12.5%	12.5%	12.5%
2	25%	25%	25%
3	40%	35%	35%
4	50%	45%	40%
5	55%	55%	50%
Exemplary	65%	65%	60%

Please refer to compliance note CN3.1 and Figure 5 on page 263 for information on BREEAM precipitation zone classifications. Also, please note that for some building types an alternative approach to compliance must be used to award credits (for further information please refer to Methodology on page 256 and the BREEAM Wat 01 calculator).

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	**All criteria** Shell only: This issue is not applicable. Shell and core: This issue is applicable subject to CN1.1 below Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
CN1.1	Shell and core assessments	**Shell and core** Compliance for this issue must be assessed on the basis of all water-consuming components and greywater or rainwater systems specified and installed by the developer. Components or systems listed in the criteria and sited within tenant areas that are not being specified by the developer, but will be specified by the tenant do not need to be assessed for a shell and core project.
Residential - Partially fitted and fully fitted		

Ref	Terms	Description
CN2	Applicable assessment criteria - Single and multiple dwellings	Partially fitted: All criteria relevant to the building type and function apply subject to CN2.1 below. Fully fitted: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
CN2.1	Water efficiency and partially fitted dwellings	Compliance for this issue must be assessed on the basis of all water-consuming components and greywater or rainwater systems specified and installed by the developer. Components or systems listed in the criteria that are not being specified and installed by the developer, but will be specified by the new homeowner, do not need to be assessed. The minimum standard is still applicable. Where the homeowner will be responsible for installing all of their own water fittings and components, no credits can be awarded, and the minimum standard is not applicable.
General		
CN3	No fittings present	Where a project under assessment contains none of the specified components, the performance specification for components provided in facilities in an adjacent and accessible building must be used in the calculation, i.e. those facilities most likely to be used by the occupants and visitors of the assessed building. This rule also applies where a project under assessment consists solely of an extension to an existing building, i.e. where the extended building contains no new sanitary facilities because there are facilities present within the existing building.
CN3.1	Precipitation Zones (by Köppen)	Please refer to Figure 5 on page 263 for information on the BREEAM precipitation zone classification. 1. Precipitation zone 1: corresponds to Köppen's precipitation regions f (fully humid) and m (monsoonal). 2. Precipitation zone 2: corresponds to Köppen's precipitation regions s (summer dry) and w (winter dry). 3. Precipitation zone 3: corresponds to Köppen's precipitation regions S (steppe) and W (desert). For more information and guidance on the Köppen climate classification refer to Scope of BREEAM International New Construction on page 23.
Country specific		

Ref	Terms	Description
CN4	National best practice standard for specifying and installing greywater and rainwater systems	Please refer to the country reference sheet to locate the appropriate national best practice standards in the country of assessment. Alternatively, please demonstrate applicability as follows: — The minimum requirements as set out in the Approved standards and weightings list are covered by the proposed documents OR — Where appropriate standards do not exist for a country, the design team should demonstrate compliance with the UK or European standards as listed in each relevant country reference sheet.
Building specific		
CN5	Hotel type	Please use 'Other buildings type calculator' tab within the Wat 01 calculator tool. The alternative Wat 01 method (see Methodology below) should be used for the assessment of a hotel.

Methodology

A building's water efficient performance is determined using the BREEAM Wat 01 calculator in one of two ways, using either the standard approach (common building types) or alternative (other building type) approach. Each approach is summarised below.

Standard Wat 01 method

The standard BREEAM method determines water efficiency (measured in L/person/day and m^3/person/yr) for a building based on the building's actual component specification and default usage patterns for the building type and its activity areas. This modelled output is compared with the same output for a baseline component specification and the percentage improvement used to determine the number of BREEAM credits achieved.

The baseline component specification is equivalent to the water efficiency of industry standard components (see Table 41 on page 258), steered by the minimum levels required by the Water Supply (Water Fittings) Regulations. The BREEAM percentage improvement benchmarks have then been determined based on progressively more efficient standards for water-consuming components and, for the higher levels of performance, the specification of greywater and rainwater systems.

The standard approach is the default method for calculating water efficiency of a BREEAM-assessed building and is that used for most of the common building types, where usage data are available. For buildings types where usage data are not available, and therefore the standard approach for determining performance cannot be used, an alternative approach to compliance must be used (described below). Refer to the BREEAM Wat 01 calculator for the current list of building types which can be assessed using the standard approach.

Alternative Wat 01 method

Where it is not possible to use the standard approach to determine the building's water consumption total (L/person/day) the assessment can be completed on an elemental basis, as follows.

1. Using the list of applicable domestic-scale water-consuming components (see criterion 3 on page 253), determine those that are specified or present in the assessed building.
2. Compare the actual specification for each component type with the table of water efficient consumption levels by component type (Table 41 on page 258) to determine the level of performance for each type. Note that the volumes quoted are maximums for that level and the % WC or urinal flushing demand is a minimum for that level.

3. Define each component's level of performance in the 'Other building type calculator' worksheet of the BREEAM Wat 01 calculator.
    a. For the alternative approach, the calculator applies a building type specific weighting to each component level to reflect its 'in-use' consumption relative to the other components present. A component with high 'in-use' water consumption therefore has a larger weighting than one with lower 'in-use' consumption and contributes relatively more to the building's overall level of performance under this BREEAM issue.
    b. The weightings are derived from data on actual water consumption per day from non-domestic buildings, sourced from BNWAT22[60]. They can be found in the BREEAM Wat 01 calculator.
4. Based upon the performance categorisation of each component type and the component weighting, the calculator will determine an overall level of performance and award the relevant number of BREEAM credits as follows:

	Greywater or rainwater level achieved			
		Precipitation zones 1 and 2		Precipitation zone 3
Overall component level	_	4	5	5
Baseline	0 credits	1 credit	2 credits	1 credit
Level 1	1 credit	2 credits	3 credits	2 credits
Level 2	2 credits	3 credits	4 credits	3 credits
Level 3 or 4	3 credits	4 credits	5 credits	4 credits
Level 5	4 credits	5 credits	5 credits	5 credits

Note:

1. An innovation credit for exemplary level performance can be awarded where the component specification achieves level 5 and > 95% of WC or urinal flushing demand is met using recycled non-potable water.
2. Due to the use of the weightings, the overall component level achieved will not necessarily be a whole number, e.g. component level 4. Where this is the case the methodology will always round down to the nearest component level and therefore BREEAM credits level, e.g. if the component specification achieved is 3.6 credits, the actual number of credits awarded is 3 credits (the methodology will not round up to 4 credits because the performance specification for 4 credits has not been achieved).
3. Where the assessed building development has multiple specifications for the same water-consuming component type, the number of fittings and component level achieved for each specification can be entered in the 'Other building type calculator'. Using this information, the calculator will determine the building's aggregated performance level for that component type.

Please note: while attempts have been made to align the benchmarking of both methodologies described above, they determine performance in different ways. The number of BREEAM credits awarded by each method could therefore differ for the same water component specification. This could lead to variation in the credits achieved when applying BREEAM New Construction to a number of different building types that form a part of the same overall development.

Component type

Table 41 on the next page outlines the standards, by component type, used to define the performance levels set in BREEAM. These defined levels of efficiency have been steered by a range of published sources of information (see references[61]) and therefore reflect robust levels of typical, good, best and exemplary practice.

Table 41: Water efficient consumption levels by component type

Component		Performance levels (quoted numbers are minimum performance required to achieve the level)						
		Base	**1**	**2**	**3**	**4**	**5**	**Unit**
WC		6	5	4.5	4	3.75	3	Effective flush volume (litres)
Wash hand basin taps		12	9	7.50	4.50	3.75	3	litres/min
Showers		14	10	8	6	4	3.50	litres/min
Baths		200	180	160	140	120	100	litres
Urinal (2 or more urinals)		7.50	6	3	1.50	0.75	0	litres/bowl/hour
Urinal (1 urinal only)		10	8	4	2	1	0	litres/bowl/hour
Greywater or rainwater system	Precipitation zone 1	0%	0%	0%	25%	50%	75%	% of WC or urinal flushing demand met using recycled non-potable water
	Precipitation zone 2	0%	0%	0%	0%	25%	50%	
	Precipitation zone 3	0%	0%	0%	0%	0%	15%	
Kitchen tap: kitchenette		12	10	7.50	5	5	5	litres/min
Kitchen taps: restaurant (pre-rinse nozzles only)		10.30	9	8.30	7.30	6.30	6	litres/min
Domestic sized dishwashers		17	13	13	12	11	10	litres/cycle
Domestic sized washing machines		90	60	50	40	35	30	litres/use
Waste disposal unit		17	17	0	0	0	0	litres/min
Commercial-sized dishwashers		8	7	6	5	4	3	litres/rack
Commercial or industrial sized washing machines		14	12	10	7.50	5	4.50	litres/kg

Please note that specifying components for a building in accordance with the above levels will result, in most cases, in the corresponding number of BREEAM credits being achieved. However, please bear in mind that the component specifications above are akin to thresholds between each level. Therefore caution should be exercised when defining a component specification for a BREEAM-assessed building using exactly the same levels as the threshold levels. It is recommended that, where Wat 01 BREEAM credits are being targeted, the performance of a particular building's component specification is verified using the BREEAM Wat 01 calculator before committing to a particular specification and ordering or installing components. This will provide greater assurance that the component specification achieves the targeted number of BREEAM credits.

Water-consuming components - data requirements

Table 42: This table defines for each component type the appropriate data that will need to be collected from manufacturers' product information to complete the assessment

Domestic component	Data requirements
WCs	Actual maximum or, where dual flush, effective flush volume in litres/use.
Urinals	Flush volume in litres/use for single use flush urinals. For cistern fed systems, the flushing frequency/hour and cistern capacity in litres.
Taps	Flow rate of each tap, at full flow rate in litres per minute measured at a dynamic pressure: For high pressure (Type 1) taps: 3 - 0.2 bar (0.3 - 0.02 MPa) OR For low pressure (Type 2) taps: 0.1 - 0.02 bar (0.01 - 0.002 MPa). (EN 200:2008, Sanitary tapware, single taps and combination taps for supply systems of type 1 and 2. General technical specifications). This includes any reductions achieved with flow restrictions.
Showers	Flow rate of each shower at the outlet using cold water (T 30°C), in litres per minute measured at a dynamic pressure: For high pressure (Type 1) supply systems: 3 - 0.2 bar (0.3- 0.02 MPa) OR For low pressure (Type 2) supply systems: 0.1 - 0.05 bar (0.01 - 0.005 MPa) (EN 1112:2008, Sanitary tapware. Shower outlets for sanitary tapware for water supply systems type 1 and 2. General technical specifications).
Kitchen taps	Maximum flow rate litres/minute.
Baths	Capacity to overflow in litres. Taps on baths should not be included in the calculation, as the water consumption from bath taps is taken account of in the use factor for baths. The calculation of water consumption for baths will assume 40% of the capacity to the overflow. This is to reflect that: 1. Users tend not to fill the bath to overflow; and 2. The displacement effect the user has on the actual volume of water required for a bath.
Dishwasher	Litres/cycle for domestic applications or appliances or litres/rack for commercial applications or appliances.
Washing machine	Litres/use for domestic applications (for a typical wash cycle) or appliances, or litres/kg for commercial applications or appliances, e.g. in hotels.
Waste disposal unit	Flow rate in litres/minute.

Unspecified water-consuming components

As the methodology and BREEAM credits for water efficiency compare the building's modelled water consumption performance against the performance of a baseline specification for the same component types, where a component type is not specified it is not accounted for in the methodology, i.e. the component is excluded from both the proposed and baseline building. Therefore no benefit is gained in terms of BREEAM performance, by deciding not to specify a particular component. However, the methodology will reflect the reduction in overall water consumption (litres/person/day) for the building, as a result of not specifying a particular component.

Buildings with greywater and rainwater systems

The following information is required where a greywater or rainwater system is specified:

Rainwater:

1. Collection area (m^2).
2. Yield coefficient (a coefficient (%) to recognise that some rainwater is lost due to splashing, evaporation, leakage and overflow etc. This coefficient will vary depending on the surface from which the rainwater is collected).
3. Hydraulic filter efficiency (a coefficient (%) to recognise the efficiency of the hydraulic filter).
4. Rainfall (average mm/year).

OR

5. Daily rainfall collection (litres) calculated in accordance with credible and verifiable national or local data, e.g. a regional, national or international meteorological organisation, data source or equivalent.

Greywater:

1. Manufacturer or system designer details.
2. The percentage volume of waste water collected (and reused) from the following (where relevant); wash hand basins, showers, kitchen basins, dishwashers, baths, washing machines and sources of waste water from non-domestic components.

Where greywater or rainwater systems are specified, a minimum level of component efficiency must be achieved to award 4 or 5 BREEAM credits and the exemplary level credit. This is to avoid awarding a higher number of BREEAM credits where performance from less efficient fittings is offset by the specification of a greywater or rainwater collection system.

The intention behind this is to ensure demand reduction is prioritised before offsetting consumption. Where a greywater or rainwater system is specified or installed, the component specification must achieve a percentage reduction in water consumption (over the baseline specification) equivalent to that required for 2 credits, i.e. a 25% improvement. Where this level is achieved, all of the total water demand met by greywater or rainwater sources can contribute to the overall percentage improvement required to achieve BREEAM credits. If it is not achieved, the percentage of greywater or rainwater allowable will be equivalent to the percentage improvement in water consumption achieved for the component specification, i.e. percentage improvement on baseline performance.

For example, if a 20% improvement only is achieved, and therefore the building is not meeting the 25% requirement, only 20% of the water demand met via greywater or rainwater sources can be used to offset water consumption from the micro components. This minimum requirement does not apply where only 1, 2 or 3 credits are sought or where no greywater or rainwater system is specified, i.e. percentage improvement is based solely on the water efficiency of the micro-component specification.

BRE Global may allow some exemptions to this rule in instances where a particular fitting type requires a high flow rate due to specialised end user requirements, and its specification prevents compliance with 25% improvement.

Buildings with a mixture of different functional areas

For the majority of buildings using the standard Wat 01 method, the BREEAM Wat 01 calculator defines the building type and range of different water-consuming activity areas within that building; for example, a retail development with sales area and goods storage or an office that includes a canteen and gym. However, where carrying out a single assessment of a building or development which consists of a diverse mix of activity areas or building types, all of which can be assessed separately within the calculator, the following applies:

Determine the building's total water consumption performance by carrying out separate assessments for each relevant activity area or building type. On completion of each assessment, the assessor will need to determine the percentage improvement as follows:

$$\mathbf{I} = 100 \times \left[1 - \frac{(\mathbf{T_{1Act}} \times \mathbf{T_{1Occ}}) + ... + (\mathbf{T_{nAct}} \times \mathbf{T_{nOcc}})}{(\mathbf{T_{1Base}} \times \mathbf{T_{1Occ}}) + ... + (\mathbf{T_{nBase}} \times \mathbf{T_{nOcc}})}\right]$$

Where:

I = Overall improvement (%)$T_{n\ Act}$ = the modelled net water consumption (L/person/day) for each building type $T_{n\ Base}$ = the modelled baseline water consumption for the corresponding building type $T_{n\ Occ}$ = the total default occupancy rate for the corresponding building type.

Where greywater or rainwater systems are specified, the assessor should take care to avoid unintended double counting of the yield from such systems and using it to offset demand for each activity area or building type.

Fixed water use

The BREEAM water efficiency calculation includes an allowance for fixed water use. This includes water consumption for vessel filling (for building users' drinking water), cleaning in kitchens and food preparation in buildings with a catering facility. Fixed uses are included to provide greater accuracy in the reporting of the building's overall estimated water consumption. As these uses are fixed for both actual and baseline building models, their totals do not influence the achievement of BREEAM credits.

Other permissible component demand for non-potable water

The focus of this BREEAM issue is the performance of the building's permanent domestic-scale water-consuming components. Where a greywater or rainwater system is specified, the yield from the system should be prioritised for such uses, i.e. WC or urinal flushing. However, where the building demonstrates that it has other consistent (i.e. daily) and equivalent levels of non-potable water demand, and such demands are intrinsic to the building's operation, then it is permissible for the demand from these non-domestic uses to be counted, i.e. the demand for rainwater or greywater yield from such systems or components can be used as well as, or instead of, non-potable water demand from the building's WC or urinal components. Examples of consistent and intrinsic demands could include laundry use in hotels or residential institutions, or horticultural uses in garden centres, botanical gardens and golf courses. Demand for general landscaping and ornamental planting irrigation are not considered as equivalent or intrinsic by BREEAM.

Other permissible sources of non-potable water

The methodology allows for the collection and recycling of non-potable water from the relevant components listed in the criteria, i.e. taps, showers, baths and dishwashers or washing machines. In addition, where non-potable water is collected from a non-domestic component or source that is intrinsic to the building, then the amount collected can be accounted for in the methodology. This could include, for example, wastewater from active hygiene flushing, i.e. a regular hygiene flushing programme to minimise poor water quality in a potable cold or hot water system. In order for the method to account for this total, the design team will need to confirm to the assessor the yield from the component or system (in litres) and the frequency of that yield (in days), i.e. if once a week, the frequency would be seven days.

Evidence

Criteria	Interim design stage	Final post-construction stage
All	A completed copy of the BREEAM Wat 01 calculator. The relevant sections or clauses of the building specification or design drawings confirming technical details of: 1. Sanitary components 2. Rainwater and greywater collection system OR Where detailed documentary evidence is not available at this stage; A letter of instruction to a contractor or supplier or a formal letter from the developer giving a specific undertaking, providing sufficient information to allow the water calculations to be completed.	As design stage for post-construction information OR Written confirmation from the developer that the appliances or fittings have been installed as specified for the Design Stage OR An assessor site inspection report and photographic evidence confirming installation of components in accordance with a compliant specification.

Additional information

Relevant definitions

BREEAM Wat 01 calculator

The BREEAM Wat 01 calculator is a method for the assessment of water efficiency in most common types of new buildings. The calculator assesses the contribution that each internal domestic-scale water-consuming component (as listed in the criteria) has on whole building water consumption. The calculator and accompanying guidance on its application is available separately from this Scheme Document. Please note, the calculator is a compliance tool and not a design tool for water demand and drainage systems. The tool uses default usage and occupancy rates to provide a benchmark of the typical consumption given the specified fittings (in L/person/day and m^3/person/year) and their impact on the building's overall water efficiency. Due to the impacts and differences of actual user behaviour and occupancy rates, the results of the method will not reflect directly the actual water use during building operation. The results from the methodology should, therefore, not be used for the purpose of comparison with, or prediction of, actual water consumption from a non-domestic building.

Domestic-scale components

Domestic-scale components include water consumed (potable and non-potable) by internal building components including kitchen taps, wash hand basin taps, baths, showers and dishwashers, WCs, urinals, washing machines and waste disposal units.

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 x 1) + (4 litre x 3)}/4 = 4.5 litre effective flushing volume (for a 6/4 dual flush WC)
— Domestic: {(6 litre x 1) + (4 litre x 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.

Greywater recycling

The appropriate collection, treatment and storage of domestic wastewater (which is defined as that discharged from kitchens, 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.

Potable water

Drinking quality water that is taken from a connection to the main water supply to the building, which may be from the public water supply or from a private supply such as from groundwater via a borehole.

Non-potable water

Any water other than potable water, also referred to as unwholesome 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.

Other information

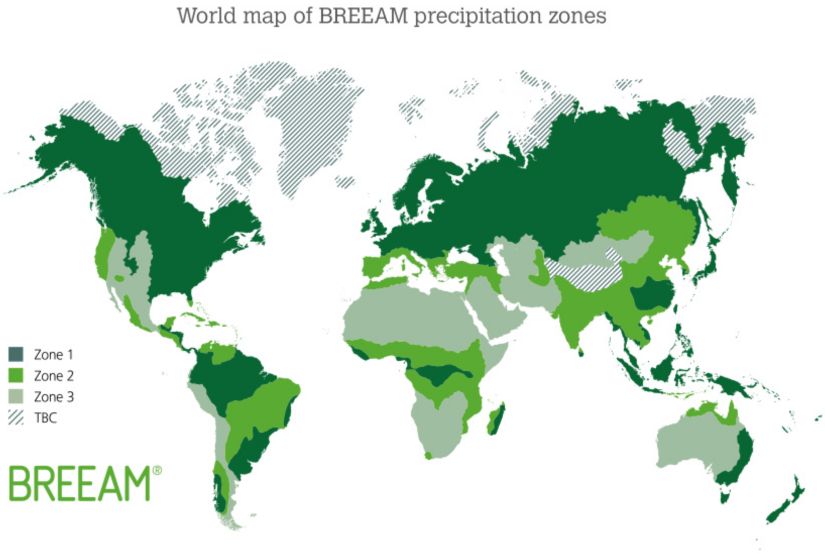

Figure 5: World map of BREEAM precipitation zones

Wat 02 Water monitoring

(all buildings)

Number of credits available	Minimum standards
1	Yes (criterion 1 below only)

Aim

To ensure water consumption can be monitored and managed, and therefore encourage reductions in consumption.

Assessment criteria

The following is required to demonstrate compliance:

One credit

1. The specification of a water meter on the mains water supply to each building; this includes instances where water is supplied via a borehole or other private source.
2. Water-consuming plant or building areas, consuming 10% or more of the building's total water demand, are either fitted with easily accessible sub-meters or have water monitoring equipment integral to the plant or area (see Compliance notes).
3. Each meter (main and sub) has a pulsed or other open protocol communication output to enable connection to an appropriate utility monitoring and management system, e.g. a building management system (BMS), for the monitoring of water consumption (see Relevant definitions on page 267).
4. If the site on which the building is located has an existing BMS, managed by the same occupier or owner (as the new building), the pulsed or digital water meters for the new building must be connected to the existing BMS (see Relevant definitions on page 267).

Checklists and tables

None.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	**Criteria 1 on the previous page, 3 and 4 on the previous page** Both options: All criteria relevant to the building type and function apply. **Criterion 2 on the previous page** Shell only: This criterion is not applicable Shell and core: This criterion is applicable. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
CN1.1	Shell and core assessments	Shell and core Compliance with criterion 2 on the previous page must be demonstrated for water-consuming plant or building areas identifiable by the developer (see Relevant definitions on page 267). Water-consuming plant or building areas to be added or installed by the tenant do not need to be assessed for this issue.
Residential - Partially fitted and fully fitted		
CN2	Applicable assessment criteria - Single dwellings	Both options: Criterion 1 on the previous page is applicable only Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
CN2.1	Applicable assessment criteria - Multiple dwellings	Both options: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
CN2.2	Utility company water monitoring equipment	Water meters installed by a water utility company that provide the future homeowner or tenant with accurate and regular water usage information per dwelling will comply with this issue.
General		

Ref	Terms	Description
CN3	Water-consuming plant or building area. See criterion 2 on page 264.	As a minimum, this includes the following (where present): 1. Buildings with a swimming pool and its associated changing facilities (toilets, showers etc.) 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): — Each individual unit supplied with water (for residential institutions with self-contained dwellings, each dwelling) — Common areas (covering the supply to toilet blocks) — Service areas (covering the supply to outlets within storage, delivery, waste disposal areas etc.) — 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.
CN3.1	10% of water demand. See criterion 2 on page 264.	The sub-meter requirement does not necessarily apply in the following cases, where the assessor confirms there will be no additional monitoring benefit resulting from their installation: 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.
CN3.2	Extensions to existing buildings. See criterion 4 on page 264.	If no new water supply is being installed because the occupants of the extended building will use the facilities in, and therefore water supply to the existing building, then the following must be provided in the existing building: 1. A water meter for the mains water supply 2. Sub-meters for large water-consuming plant or facilities, e.g. evaporative cooling, swimming pool etc. (where present). The meters provided must have a pulsed output or connection to the existing BMS in accordance with the assessment criteria.
CN3.3	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, then in such instances the guidance given in the above compliance note for extensions to existing buildings applies.

Methodology

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
All	The relevant sections or clauses of the building specification or contract. Design drawings.	BREEAM Assessor's site inspection report and photographic evidence OR As-built drawings.

Additional information

Relevant definitions

Staff areas

Refer to BREEAM issue Hea 01 Visual comfort – Relevant definitions on page 95.

Meter outputs

Examples include pulsed outputs and other open protocol communication outputs, such as Modbus.

Utility monitoring and management system

Examples include automatic meter reading systems (AMR) and building energy management systems (BEMs). Automatic monitoring and targeting (AM&T) is an example of a management tool that includes automatic meter reading and data management.

Other information

None.

Wat 03 Water leak detection and prevention (all buildings)

Number of credits available	Minimum standards
Building type dependent	No

Aim

To reduce the impact of water leaks that may otherwise go undetected.

Assessment criteria

The following is required to demonstrate compliance:

One credit - Leak detection system

1 A leak detection system which is capable of detecting a major water leak on the mains water supply within the building and between the building and the utilities' water meter is installed. The leak detection system must be:
- 1.a A permanent automated water leak detection system that alerts the building occupants to the leak OR an inbuilt automated diagnostic procedure for detecting leaks
- 1.b Activated when the flow of water passing through the water meter or data logger is at a flow rate above a preset maximum for a preset period of time
- 1.c Able to identify different flow and therefore leakage rates, e.g. continuous, high or low level, over set time periods
- 1.d Programmable to suit the owner's or occupiers' water consumption criteria
- 1.e Where applicable, designed to avoid false alarms caused by normal operation of large water-consuming plant such as chillers.

One credit - Flow control devices (all buildings except residential))

2 Flow control devices that regulate the supply of water to each WC area or facility according to demand are installed (and therefore minimise water leaks and wastage from sanitary fittings).

One credit - Leak isolation (residential only)

3 Isolation valves are located in an accessible place that allows hot and cold water to be isolated by hand separately (switched on or off) for the following supplies:
- 3.a Incoming supply to the dwelling
- 3.b Taps
- 3.c Showers
- 3.d Heating or hot water systems
- 3.e Appliances (e.g. dishwasher, washing machine etc.).

Checklists and tables

None.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	**Leak detection system, criterion 1 on the previous page** Both options: All criteria relevant to the building type and function apply. **Flow control devices, criterion 2 on the previous page** Shell only: This criterion is not applicable. Shell and core: All criteria relevant to the building type and function apply. **Leak isolation, criterion 3 on the previous page** Both options: This criterion is not applicable. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
CN1.1	WC Areas or facilities	Shell and core: The water supplies to WC areas or facilities must be assessed as per criterion 2 on the previous page regardless of whether or not the WC areas or facilities are fitted out.
Residential - Partially fitted and fully fitted		
CN2	Applicable assessment criteria - Single dwellings	Both options: Criterion 3 on the previous page only applies. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
CN2.1	Applicable assessment criteria - Multiple dwellings	Partially fitted: Criterion 3 on the previous page only applies. Fully fitted: Criteria 1 and 3 on the previous page apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN3	Leakage rates. See criterion 1 on the previous page.	This issue does not specify what the high and low level leakage rates should be; however, the leak detection equipment installed must have the flexibility to distinguish between different flow rates to enable it to be programmed to suit the building type and owner's or occupiers' usage patterns.
CN3.1	System criteria. See criterion 1 on the previous page.	It is anticipated that the leak detection credit will usually be achieved by installing a system which detects higher than normal flow rates at meters or sub-meters. It does not necessarily require a system that directly detects water leakage along part or the whole length of the water supply system.

Ref	Terms	Description
CN3.2	Water utilities' meters. See criterion 1 on page 268.	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.
CN3.3	Flow control devices. See criterion 2 on page 268.	The following could be considered as types of flow control devices: — 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 preset volume is reached — A presence detector and controller, i.e. an automatic device detecting occupancy or movement in an area to switch water on and turn it off when the presence is removed — A central control unit, i.e. a dedicated computer-based control unit for an overall managed water control system, utilising some or all of the types of control elements listed above.
CN3.4	Flow control systems	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. The criteria are set to encourage the isolation of the water supply to each WC block when it is not being used.
CN3.5	Accessible location. See criterion 3 on page 268.	Isolation valves must be located in an accessible location. This could be within a cupboard or access hatch, where the valve can be accessed without undue hazard or difficulty. The valve should be in close proximity to the appliance or fitting and clearly labelled. Examples of non-accessible locations are behind kitchen units or under floor boards.
CN3.6	Single WCs. See criterion 2 on page 268.	The flow control criteria for this issue 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).
CN3.7	No water supply to the building or unit. See criteria 1 and 2 on page 268.	These credits are still assessed where there are no installed fittings and therefore no water supply to the building. In these instances the facilities likely to be used by the future occupants of the assessed building must meet the criteria, e.g. those facilities within the nearest accessible building.
CN3.8	Extensions to existing buildings. See criteria 1 and 2 on page 268.	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.
Building type specific		

Ref	Terms	Description
CN4	Residential institutions and guest accommodation: Flow control specification. See criterion 2 on page 268.	The credit for the specification of flow control devices in WC areas or facilities does not apply to ensuite facilities in residential areas, e.g. 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. The credit and criteria are however applicable to buildings which have guest bedrooms with ensuite facilities, e.g. hotel rooms, and communal WC areas or facilities, e.g. communal WC facilities in hotels or hostels and care homes.

Methodology

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
All	The relevant sections or clauses of the building specification or contract. Design drawings. Manufacturer's product details.	BREEAM Assessor’s site inspection report and photographic evidence. Manufacturer's product details.

Additional information

Relevant definitions

Isolation valve

An isolation valve is a valve in a plumbing system that stops the flow of water to a given location for maintenance purposes. This enables the flow of water to a terminal fitting, appliance or whole system (e.g. a tap, washing machine, heating system or whole home) to be isolated, thus allowing maintenance or replacement of components or systems.

Other information

None.

Wat 04 Water efficient equipment

(all buildings)

Number of credits available	Minimum standards
1	No

Aim

To reduce water consumption by encouraging specification of water efficient equipment.

Assessment criteria

The following is required to demonstrate compliance:

One credit

1 The design team has identified all water demands from uses other than domestic-scale drinking and sanitary use components, e.g. swimming pools, vehicle wash and irrigation equipment (see Relevant definitions on page 274).

2 Systems or processes have been identified to reduce the water demand, and demonstrate, through either good practice design or specification, a meaningful reduction in the total water demand of the building.

Checklists and tables

None.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	Both options: All criteria relevant to the building type and function apply. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - Partially fitted and fully fitted		

Ref	Terms	Description
CN2	Applicable assessment criteria - Single and multiple dwellings	Both options: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN3	No water demand from uses other than domestic-scale drinking and sanitary use components	Where there is no water demand from uses other than domestic-scale drinking and sanitary use components in the building this issue is not applicable and does not require assessment.
CN3.1	Reducing water consumption. See criterion 2 on the previous page	BREEAM does not prescriptively define all potential means or solutions for reducing water consumption. The design team needs to demonstrate to the assessor that they have identified key areas of water consumption in the building and that a reduction in water consumption has been achieved using existing 'tried and tested' solutions or new innovative solutions relevant to the building and its functional requirements. The following are some examples of solutions deemed to satisfy compliance for a number of different building types or functions (where the water demand for that function is one of the significant contributors in the building). 1. Drip-fed subsurface irrigation incorporating soil moisture sensors. The irrigation control should be zoned to permit variable irrigation to different planting assemblages. 2. 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. 3. External landscaping and planting that relies solely on precipitation, during all seasons of the year. 4. All planting specified is restricted to contextually appropriate species that thrive without irrigation and will continue to do so in those conditions likely as a result of climate change, i.e. typically warmer and drier conditions.
CN3.2	Microbial contamination	Where vehicle wash systems are specified, the design team are to clarify that the installed systems are designed to minimise any legionella risk (refer to BREEAM issue Hea 09 Water quality on page 144).
Building specific		
CN4	Single dwellings - Rainwater harvesting	In single dwellings with a garden, the provision of a water butt is sufficient to demonstrate compliance with the criteria. No requirements are set on the type of water butt or storage capacity required. The assessor should be satisfied that, within reason, the installation is adequate for the size of development and climatic conditions of the region.

Methodology

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
All	Documentation detailing all water demands from uses other than domestic-scale drinking and sanitary use components. The relevant sections or clauses of the building specification or contract OR Design drawings (where necessary). Manufacturer's product details.	BREEAM Assessor's site inspection report and photographic evidence. Manufacturer's product details.

Additional information

Relevant definitions

Water demand

For the purposes of this BREEAM issue, water demand includes, but is not limited to; swimming pools, recreational hot tubs and hydrotherapy pools, equipment used for irrigation, and vehicle wash equipment. Water demand from domestic-scale sanitary fittings is not assessed in this issue, but is assessed under issue Wat 01 Water consumption on page 253.

Vehicle wash

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.

Other information

None.

Materials

Summary

This category encourages steps taken to reduce the impact of construction materials through design, construction, maintenance and repair. Issues in this section focus on the procurement of materials that are sourced in a responsible way and have a low embodied impact over their life including extraction, processing and manufacture, and recycling.

Category summary table

Issue	Credits	Credit summary
Mat 01 Life cycle impacts	Up to 6 credits	— Reductions in the building's environmental life cycle impacts through assessment of the main building elements.
Mat 02 Hard landscaping and boundary protection	N/A	
Mat 03 Responsible sourcing of construction products	4	— Materials sourced in accordance with a sustainable procurement plan. — Key building materials are responsibly sourced to reduce environmental and socio-economic impacts.
Mat 04 Insulation	N/A	
Mat 05 Designing for durability and resilience	1	— The building incorporates measures to reduce impacts associated with damage and wear and tear. — Relevant building elements incorporate appropriate design and specification measures to limit material degradation due to environmental factors.
Mat 06 Material efficiency	1	— Opportunities and measures have been identified and taken to optimise the use of materials.

Mat 01 Life cycle impacts

(all buildings)

Number of credits available	Minimum standards
Building type dependent	No

Aim

To recognise and encourage the use of robust and appropriate life cycle assessment tools and consequently the specification of construction materials with a low environmental impact (including embodied carbon) over the full life cycle of the building.

Assessment criteria

The following is required to demonstrate compliance:

One to five credits

1 The project uses a life cycle assessment (LCA) tool to measure the life cycle environmental impact of the building elements.

2 The LCA includes at least the mandatory building elements indicated in the 'Materials assessment scope' section of the BREEAM International Mat 01 calculator (where present in the building).

3 The mandatory requirements identified in the 'Materials assessment tool, method and data' section of the BREEAM International Mat 01 calculator on page 279 have been met.

4 A member of the project team completes the BREEAM International Mat 01 calculator on page 279 and determines a score based on the robustness of the LCA tool used and the scope of the assessment in terms of the elements considered. Credits are awarded as follows:

Table 43: Percentage of BREEAM Mat 01 calculator points achieved and credits awarded

Percentage of BREEAM Mat 01 calculator points achieved (%)	Credits	
	Industrial	All other buildings
25.0	1	1
62.5	1	2
75.0	1	3
80.0	2	4
82.5	2	5
85.0	2 + Exemplary	5 + Exemplary

One credit - Environmental product declarations (EPD)

5 Where a range of at least five products specified at Design Stage (DS) and installed by Post-Construction Stage (PCS) are covered by verified EPD (see CN3.2 on the next page).

Exemplary level criteria

6 The requirements for exemplary level criteria outlined in Table 43 on the previous page within the assessment criteria above have been achieved.

7 Where a range of at least 10 products specified at DS and installed by Post-Construction Stage (PCS) are covered by verified manufacturer specific EPD (see CN3.2 on the next page).

Checklists and tables

None.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	Both options: All criteria relevant to the building type and function apply. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - Partially fitted and fully fitted		
CN2	Applicable assessment criteria - Single and multiple dwellings	Both options: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN3	Element not specified (applicable elements)	In some buildings, not all elements listed within the BREEAM International Mat 01 calculator on page 279 will be present or specified, e.g. upper floors in single storey buildings. In these instances the calculator will re-evaluate the standard and exemplary level benchmarks according to the applicable elements.

Ref	Terms	Description
CN3.1	LCA tool approvals	Where a project team is considering using a LCA tool which has not been previously evaluated by BRE Global (BREG), the assessor should contact BREG providing all information required for the evaluation of the tool. The evaluation process of LCA tools often requires the involvement and issue of evidence by the tool producer or developer. The evaluation process can take up to four weeks; therefore assessors are advised to contact BREG as soon as possible to initiate the process. The fee sheet available on BREEAM Projects provides details of fees for LCA tool evaluations. All tools (and versions of tools) used must: 1. Meet the mandatory requirements outlined in the BREEAM International Mat 01 calculator on the facing page 2. Have the score generated by the BREEAM International Mat 01 calculator on the facing page and evaluated by BRE Global. The BREEAM International Mat 01 calculator on the facing page provides a list of previously submitted tools (by version) and their associated evaluation score.
CN3.2	Environmental Product Declarations (EPD) Classifications	Each EPD shall be classified according to Mat 03 Responsible sourcing of construction products: Table 46 on page 291 . For each EPD, select the classification that is the closest match. Only two EPDs per classification group may be counted. This is to encourage a range of EPDs from different construction product sectors. Where a product is comprised of more than one material, the assessor should decide which material category classification should be used at their own discretion. EPD certificates must be valid (unexpired) at the point of specification. The EPD must be compliant with ISO 14025, ISO 21930 or EN 15804.

Evidence

Criteria	Interim design stage	Final post-construction stage
1–4	Specification confirming: 1. The name and version of the LCA tool used 2. A copy of the LCA tool output or information from the tool provider to demonstrate answers given in the BREEAM International Mat 01 calculator. A copy of the output from the BREEAM International Mat 01 calculator. See also Other information on the facing page section for detailed requirements.	As design stage but with as-built data.
5 on the previous page	A schedule of specified products in the building with accepted EPDs, and their product categories. Copies of the EPD certificates.	As design stage but with as-built data.

Additional information

Relevant definitions

BREEAM International Mat 01 calculator

A spreadsheet-based calculator required to determine whether a project has used an appropriate LCA tool, and to calculate the number of credits achieved for this BREEAM issue, based on the scope and rigour of life cycle assessment and elements considered within the LCA.

Environmental Product Declaration

An EPD is an independently verified environmental label (i.e. ISO Type III label) according to the requirements of ISO 14025.
For construction products, the EPD must be produced to either EN 15804[62],ISO14025[63] or ISO 21930[64].

Integrated Material Profile and Costing Tool (IMPACT)

Integrated Material Profile And Costing Tool. For more information about IMPACT visit: www.IMPACTwba.com

Calculation procedures

This issue is concerned with the use of LCA on the project, and robustness of the method or tools used. At present, we do not seek to benchmark performance. This is likely to be included as LCA matures and BRE Global have collated enough building performance data to establish robust benchmarks.

The Mat 01 Calculator scores points based on the rigour of the life cycle assessment in terms of:

1. The quality of the assessment tool or method and data
2. The scope (of building elements) included in the assessment.

Other information

Evidence requirements

Note: Aside from the likely benefit to the environment from teams using LCA tools, the objective for BREEAM is to gather LCA performance data in order to create benchmarks and inform future updates of the scheme. The evidence requirements below are generic, but BRE Global understand that some tools are not able to fulfil all of the criteria. Where this is the case, the tool operator should submit results as close as possible to that required for the tool.

IMPACT compliant tools

A copy of the full IMPACT project or building file submitted by the assessor to BRE Global must be transmitted in the following format:

1. For 3D CAD or building information model (BIM) based IMPACT compliant tools: In Industry Foundation Classes (IFC) or the IMPACT Compliant tool's native format.
2. For spreadsheet-based IMPACT compliant tools: IFC, MS Excel or comma-separated variables (CSV) file format.
3. Building element categorisation to be according to New Rules of Measurement (NRM) Royal Institution of Chartered surveyors (RICS).
4. A table in MS Excel or CSV file format listing each building element with, for each one, the information listed under 2 b, c and d (from the 'other tools' section), along with the NRM classification.

Other tools

An electronic data table or tables of results (suitably cross referenced) generated by the tool, submitted by the assessor to BRE Global must fulfil the following criteria:

1. Submit a total building environmental impact result for year 0 (installation only) and year 60 study periods, as follows:
   a. To include individual results for all environmental issues or indicators that the tool or data permits, showing issue or indicators names and units used. Where issues or indicators according to BS EN 15978:2011 are available, these should be used
   b. Include individual results for each life stage or module, e.g. stages A, B and C (see BS EN 15978:2011). Where the tool further permits, or where complete measurement of the aforementioned stages is not possible, more detail should be provided. For example, BS EN 15978:2011 modules should be used
   c. The reporting format should be to BS EN 15978:2011 (or equivalent).
2. Results for each element as follows, to enable project team members and assessors without an IMPACT Compliant tool to check the accuracy of the model:
   a. Element impact per issue (as above), with units
   b. Element kg kg CO_2-eq per life stage or module (as above)
   c. Element quantity, with units
   d. Element description
   e. For each material in the element:
      i. Installed quantities, with units
      ii. Site wastage quantities, with units
      iii. Replace, repair, refurbish quantities, with units
      iv. Reuse, recycling or disposal (landfill, incineration) quantities, with units.
3. Transmitted in IFC, MS Excel or CSV file format.

Data permissions

Submission of information to BRE Global for the purpose of assessing this issue will be deemed to grant permission for the BRE Group of companies to use the information to:

1. Fulfil BREEAM quality assurance requirements
2. Conduct further research (using anonymised data), including for the establishment of robust building level life cycle performance benchmarks in BREEAM and BRE associated tools and methodologies.

Mat 02 Hard landscaping and boundary protection

Not assessed as a standalone issue within BREEAM International New Construction, but incorporated within Mat 01 Life cycle impacts on page 276.

Mat 03 Responsible sourcing of construction products

(all buildings)

Number of credits available	Minimum standards
4	Yes (criterion 1 below only)

Aim

To recognise and encourage the specification and procurement of responsibly sourced construction products.

Assessment criteria

The following is required to demonstrate compliance:

Prerequisite

1 All timber and timber-based products used on the project are Legally harvested and traded timber on page 293.

Note: For other construction products there are no prerequisite requirements at this stage.

One credit - Sustainable procurement plan

2 By the end of concept design stage, the client or developer has a documented policy and procedure that sets out procurement requirements for all suppliers and trades to adhere to relating to the responsible sourcing of construction products (see CN3 on the facing page).

3 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.

4 The documented policy and procedure must encourage the specification of products with responsible sourcing certification over similar products without certification.

Up to three credits - Responsible sourcing of construction products

5 The available responsible sourcing credits (refer to Table 44 below) can be awarded where the applicable construction products (refer to Table 45 on page 286) are responsibly sourced in accordance with the BREEAM methodology, as defined in the Methodology on page 285 section.

Table 44: The number of BREEAM credits achieved is determined as follows

Responsible sourcing credits	% of available Responsible sourcing points achieved
3	≥ 36
2	≥ 20
1	≥ 10

Exemplary level criteria

The following outlines the exemplary level criteria to achieve one innovation credit for this BREEAM issue:

6 Where at least 52% of the available responsible sourcing points are achieved.

Checklists and tables

None.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	Both options: All criteria relevant to the building type and function apply. Refer to Appendix D – Shell and core project assessments on page 409 of this Scheme Document for further description of the above options.
Residential - Partially fitted and fully fitted		
CN2	Applicable assessment criteria - Single and multiple dwellings	Both options: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN3	Documented product procurement policy. See criterion 2 on the previous page.	This may be prepared and adopted at an organisational level or be site or project specific. It is recommended (but not a requirement) that the documented policy follows the principles of BS 8900-1:2013[65] Managing sustainable development of organisations - Guide or BS 8903:2010[66] Principles and framework for procuring sustainably – Guide. This policy may form a part of a broader Sustainable Procurement Plan or be in the form of a standalone document.
CN3.1	BREEAM recognised responsible sourcing certification schemes (RSCS) and their point scores. See criterion 5 on the previous page.	Guidance Note 18 available in the responsible sourcing section of the BREEAM website , provides a table of RSCSs recognised under BREEAM, their scope and associated point scores. This table is reviewed on a regular basis and BREEAM Assessors must ensure they use the current table.

<table>
<tr><th>Ref</th><th>Terms</th><th>Description</th></tr>
<tr><td>CN3.2</td><td>Checking responsible sourcing claims. See criterion 5 on page 282.</td><td>Confirmation of manufacturers' and suppliers' claims should be sought from the relevant responsible sourcing scheme provider. Many of the organisations who administer responsible sourcing certification schemes will, via their website, list companies and products that have been certified against their standards, including the scope of any such certification. Some schemes, including BES 6001 via www.greenbooklive.com, will provide downloadable copies of the relevant certificate, which can in turn be used as evidence of compliance for this BREEAM issue.</td></tr>
<tr><td>CN3.3</td><td>Route 1
Cut-off
See step 1 in Methodology on the facing page.</td><td>Any construction product in the following location or use categories (see Table 45 on page 286) which clearly accounts for less than the following volumes can be excluded from the assessment. 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 this threshold. Also, see CN3.5 below.
— 'Internal partition and internal walls (including finishes)': Less than 0.33 m^3 per 1000m^2 of gross internal floor area (GIFA).
— 'Ceiling (including ceiling finishes)': Less than 0.33 m^3 per 1000m^2 of GIFA.
— All other location or use categories: Less than 1m^3 per 1000 m^2 of GIFA.</td></tr>
<tr><td>CN3.4</td><td>Broken chain</td><td>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 BREEAM International Mat 03 tool where the downstream risk to responsible sourcing is considered to be low. Specifically, it is acceptable for the following types of organisations in the supply chain (that are downstream of the organisation with certification) not to have their own responsible sourcing certification:
1. Organisations that only handle or transport,
OR
2. Organisations that only fabricate, assemble or install and are using a recognised quality management system to ensure the mixing and substitution of the certified upstream source with uncertified sources has not occurred
AND
Are operating in a jurisdiction that can demonstrate relatively robust and well enforced environmental, social and economic controls. For example:
— States which are members of the EU
— States that have declared adherence to the OECD Guidelines for Multinational Enterprises.</td></tr>
<tr><td>CN3.5</td><td>Quantities precision</td><td>The degree of tolerance accepted for estimating quantities is ± 20% of the final installed quantity.
It is not necessary for the assessor to submit calculations in order to justify estimates. In particular, the cut-off estimation for many construction products (that are clearly below the cut-off) may be done without the need for any calculations at all.</td></tr>
</table>

Ref	Terms	Description
CN3.6	Insulation	Insulation must be assessed (where relevant) as part of the Location or Use categories listed in the Table 45 on the next page below.

Methodology

To determine the number of credits achieved for criterion 5 on page 282, either route 1, 2 or 3 must be followed (see the Additional information on page 292 section for information on different routes). The following steps outline the process to be followed to determine the number of credits achieved for responsible sourcing.

For examples and a further explanation of this method, along with a simplified methodology for building services construction products, see Guidance Note 24.

Step 1: Collating information and entering it in the BREEAM International Mat 03 tool

For all routes, the BREEAM International Mat 03 tool is used according to the following steps.

1. For each construction product in the building that is in the scope (see Table 46 on page 291 under 'Scope of assessment' section below):

Note: For **Route 1**, only steps 1.1,1.3,1.5,1.6,1.7 and 1.9 must be followed. Step 1.4 is optional for routes 1 and 2.

Step 1.1: Estimate if the quantity of the product is above the cut-off volume (see CN3.3 on the previous page). If it is, enter the construction product in the tool and assign it a ' Location and use' category, then proceed to the next step. If the quantity meets the cut-off then the product can be excluded.

Step 1.2 **(Route 2 only)**: Estimate the quantity (mass or volume) of the product (see CN3.5 on the previous page).

Step 1.3: Obtain the BREEAM recognised responsible sourcing certifications scheme (RSCS) certification or environmental management system (EMS) certification, if any (see CN3.2 on the previous page). Compare the certification with Guidance Note 18 and obtain the RSCS point score. Where the construction product has no certification, is non-compliant with broken chain requirements (see CN3.4 on the previous page) or the certification type is not listed in Guidance Note 18, the score is zero. Where the construction product is a reused product, obtain the score from Guidance Note 18 for these products.

Step 1.4 **(Optional, if not being followed go to step 1.5)**: Where a constituent construction product has a better certification score (see CN3.2 on the previous page) than the overall construction product and it complies with the broken chain requirements (see CN3.4 on the previous page), the following steps should be followed:

Step 1.4.1: Identify the materials categories that make up an estimated ≥ 80% of the constituent construction product's volume.

Step 1.4.2: Include each identified materials category in the tool (by creating new rows in the tool).

Step 1.4.3: If ≥ 5% of the volume is unaccounted for in step 1.4.1, include the 'Other' material category.

Step 1.4.4 **(Route 2 only)**: For each material following route 2 and identified in step 1.4.1, enter the building-wide quantity into the tool. This may be based on a percentage of the overall construction product's quantity estimated in step 1.1.

Step 1.4.5: For each material category (including 'Other'), enter the constituent's certification score identified in step 1.4 into the tool.

Step 1.5: Identify the materials categories that make up an estimated ≥ 80% of the product's volume (excluding quantities entered for step 1.4.1 , if applicable).

Step 1.6: Include each identified materials category in the tool (by duplicating the entry made in step 1.1).

Step 1.7: If ≥ 5% of the volume is unaccounted for in step 1.5 (and step 1.4, where applicable), include the 'Other' material category.

Step 1.8 **(Route 2 only)**: For each material category following route 2 and identified in step 1.5, enter the building-wide quantity into the tool. This may be based on a percentage of the overall construction product's quantity estimated in step1.1.

Step 1.9: For each material category (including 'Other'), enter the overall construction product's certification score (from step 1.3) into the tool.

Step 2: BREEAM International Scoring and reporting tool

Step 2.1: Enter the credit result produced by the BREEAM International Mat 03 tool into the BREEAM International scoring and reporting tool.

Scope of assessment

Table 45 below (based on the New Rules of Measurement (NRM) classification system) indicates the building elements that must be included in the scope of the assessment. Including these elements (and only these) is necessary to ensure an appropriate level of comparability. 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 International Mat 03 tool. For each building element the respective location or use category for use in the BREEAM International Mat 03 tool is provided in the table.

Table 45: Scope of assessment, common building element designation, and location and use categories

RICS NRM elements and BREEAM equivalents			
Level 1 element: 1–Substructure **Level 2 element: 1–Substructure**			
Level 3 sub-element		**BREEAM 'Location/use' category**	**Include**
1	Standard foundations	7. Structure , primary and secondary	Y
2	Specialist foundations systems	7. Structure , primary and secondary	Y
3	Lowest floor construction	7. Structure , primary and secondary	Y
4	Basement excavation	N/A	Y
5	Basement retaining walls	7. Structure , primary and secondary	Y
Level 1 element: 2–Superstructure **Level 2 element: 1–Frame**			
Level 3 sub-element		**BREEAM 'Location/use' category**	**Include**
1	Steel frames	7. Structure, primary and secondary	Y
2	Space decks	7. Structure, primary and secondary	Y
3	Concrete casings to steel frames	7. Structure, primary and secondary	Y

RICS NRM elements and BREEAM equivalents			
4	Concrete frames	7. Structure, primary and secondary	Y
5	Timber frames	7. Structure, primary and secondary	Y
6	Other frame systems	7. Structure, primary and secondary	Y
Level 1 element: 2–Superstructure **Level 2 element: 2–Upper Floors**			
Level 3 sub-element		**BREEAM 'Location/use' category**	**Include**
1	Floors	3. Floor (including floor finishes)	Y
2	Balconies	3. Floor (including floor finishes)	Y
3	Drainage to balconies	11. Other	Y
Level 1 element: 2–Superstructure **Level 2 element: 3–Roof**			
Level 3 sub-element		**BREEAM 'Location/use' category**	**Include**
1	Roof structure	6. Roof (including roof finishes)	Y
2	Roof coverings	6. Roof (including roof finishes)	Y
3	Specialist roof systems	6. Roof (including roof finishes)	Y
4	Roof drainage	6. Roof (including roof finishes)	Y
5	Roof lights, skylights and openings	2. Door and window	Y
6	Roof features	6. Roof (including roof finishes)	Y
Level 1 element: 2–Superstructure **Level 2 element: 4–Stairs and ramps**			
Level 3 sub-element		**BREEAM 'Location/use' category**	**Include**
1	Stairs and ramps structures	7. Structure, primary and secondary	Y
2	Stair and ramp finishes	3. Floor (including floor finishes)	Y
3	Stair and ramp balustrades and handrails	11. Other	Y
4	Ladders, chutes and slides	11. Other	Y

RICS NRM elements and BREEAM equivalents			
Level 1 element: 2–Superstructure **Level 2 element: 5–External walls**			
Level 3 sub-element		**BREEAM 'Location/use' category**	**Include**
1	External enclosing walls above ground floor level	8. External wall	Y
2	External enclosing wall below ground floor level	7. Structure, primary and secondary	Y
3	Solar and Rain screening	8. External wall	Y
4	External soffits	8. External wall	Y
5	Subsidiary walls, balustrades, handrail and proprietary balconies	11. Other	Y
6	Façade access and cleaning systems	11. Other	Y
Level 1 element: 2–Superstructure **Level 2 element: 6–Windows and external doors**			
Level 3 sub-element		**BREEAM 'Location/use' category**	**Include**
1	External windows	2. Door and window	Y
2	External doors	2. Door and window	Y
Level 1 element: 2–Superstructure **Level 2 element: 7–Internal walls and partitions**			
Level 3 sub-element		**BREEAM 'Location/use' category**	**Include**
1	Walls and partitions	5. Internal partition and internal walls (including finishes)	Y
2	Balustrades and handrails	11. Other	Y
3	Moveable room dividers	5. Internal partition and internal walls (including finishes)	Y
4	Cubicles	5. Internal partition and internal walls (including finishes)	Y

RICS NRM elements and BREEAM equivalents			
Level 1 element: 2–Superstructure **Level 2 element: 8–Internal doors**			
Level 3 sub-element		**BREEAM 'Location/use' category**	**Include**
1	Internal doors	2. Door and window	Y
Level 1 element: 3–Internal Finishes **Level 2 element: 1–Wall finishes**			
Level 3 sub-element		**BREEAM 'Location/use' category**	**Include**
1	Finishes to walls	5. Internal partition and internal walls (including finishes)	Y
Level 1 element: 3–Internal Finishes **Level 2 element: 3–Ceiling finishes**			
Level 3 sub-element		**BREEAM 'Location/use' category**	**Include**
1	Finishes to ceilings	1. Ceiling (including ceiling finishes)	Y
2	False ceilings	1. Ceiling (including ceiling finishes)	Y
3	Demountable suspended ceilings	1. Ceiling (including ceiling finishes)	Y
Level 1 element: 4–Fittings, Furnishings and Equipment **Level 2 element: 1–Fitting, furnishings and equipment**			
Level 3 sub-element		**BREEAM 'Location/use' category**	**Include**
2	Kitchen fittings and equipment (ONLY)	11. Other	Y
Level 1 element: 5–Services **Level 2 element: (ALL)**			
Level 3 sub-element		**BREEAM 'Location/use' category**	**Include**
	(ALL)	9. Building services	Y
Level 1 element: 8–External Works **Level 2 element: 2–Roads, paths and pavings**			
Level 3 sub-element		**BREEAM 'Location/use' category**	**Include**
1	(ALL)	10. Hard landscaping	Y

RICS NRM elements and BREEAM equivalents			
Level 1 element: 8–External Works **Level 2 element: 2–Roads, paths and pavings**			
Level 3 sub-element		**BREEAM 'Location/use' category**	**Include**
1	(ALL)	10. Hard landscaping	Y
Level 1 element: 8–External Works **Level 2 element: 3–Soft landscaping, planting and irrigation systems**			
Level 3 sub-element		**BREEAM 'Location/use' category**	**Include**
		N/A	N
Level 1 element: 8–External Works **Level 2 element: 4–Fencing, railings and walls**			
Level 3 sub-element		**BREEAM 'Location/use' category**	**Include**
1	(ALL)	10. Hard landscaping	Y
Level 1 element: 8–External Works **Level 2 element: 5–External fixtures**			
Level 3 sub-element		**BREEAM 'Location/use' category**	**Include**
			N
Level 1 element: 8–External Works **Level 2 element: 6–External drainage**			
Level 3 sub-element		**BREEAM 'Location/use' category**	**Include**
	(ALL)	9. Building services	Y
Level 1 element: 8–External Works **Level 2 element: 7–External services**			
Level 3 sub-element		**BREEAM 'Location/use' category**	**Include**
	(ALL)	9. Building services	Y

The material categories, for use in the BREEAM International Mat 03 tool, must be in accordance with Table 46 on the facing page. For each construction product, identify the closest matching category.

Table 46: Material categories

Material categories
1. Timber or timber-based products 2. Concrete or cementitious 3. Metal 4. Stone or aggregate 5. Clay-based 6. Gypsum 7. Glass 8. Plastic, polymer, resin, paint, chemicals and bituminous 9. Animal fibre, skin, cellulose fibre 10. Other.

Evidence

Criteria	Interim design stage	Final post-construction stage
1 on page 282	Written confirmation from the principal contractor or client that all timber and timber based products will be sourced in compliance with the definition of Legally harvested and Legally traded timber or has certification that fulfils these requirements (e.g. FSC, PEFC) OR A specification or letter of intent from the design team confirming that all timber and timber based products will be procured in accordance with the BREEAM requirements.	Documentary evidence confirming all timber used in the building is legally harvested and trader timber.
2 on page 282–4 on page 282	A copy of the documented sustainable procurement plan. Evidence that the plan is disseminated, or a written commitment to do so. Evidence that the plan is included in the construction contract, or a written commitment to do so. Evidence that there is a policy to encourage the specification of products with responsible sourcing certification.	Evidence that the plan was disseminated. Evidence that the plan was included in the construction contract.

Criteria	Interim design stage	Final post-construction stage
5 on page 282	A copy of the completed BREEAM International Mat 03 tool. A copy of all responsible sourcing and EMS certificates OR A letter of intent from the design team or other detailed documentary evidence confirming that the products shall be sourced from suppliers capable of providing the required certification. For affected certified construction products, evidence on how the broken chain requirements are met.	Written confirmation that the documentary evidence provided at the design stage was followed during construction. Where different from the design stage, provide updated documentary evidence that was followed during construction. Where certified materials were used, copies of certificates AND Corresponding invoices and delivery receipts. For post-construction stage assessment only, provide a copy of the BREEAM Mat 03 calculator and detailed documentary evidence (as listed for the design stage) AND corresponding invoices and delivery receipts.

Additional information

Relevant definitions

BREEAM International Mat 03 calculator

A calculator tool used by the BREEAM Assessor to determine the number of BREEAM credits achieved for BREEAM issue Mat 03.

BREEAM recognised responsible sourcing certification schemes (RSCSs)

These are third party schemes evaluated by BRE Global for recognition under BREEAM. Refer to Guidance Note 18 available in the Responsible sourcing section of the BREEAM website for information on the evaluation criteria and the process for the evaluation and acceptance of schemes, including application and appeals.

Convention on International Trade in Endangered Species (CITES)

The Convention on International Trade in Endangered Species of wild fauna and flora (CITES) works by subjecting international trade in specimens of selected species to certain controls. All import, export, re-export and introduction from the sea of species covered by the Convention has to be authorised through a licensing system. Each Party to the Convention must designate one or more Management Authorities in charge of administering that licensing system and one or more scientific authorities to advise them on the effects of trade on the status of the species. The species covered by CITES are listed in three appendices, according to the degree of protection they need.

1. Appendix I includes species threatened with extinction. Trade in specimens of these species is permitted only in exceptional circumstances.
2. Appendix II includes species not necessarily threatened with extinction, but in which trade must be controlled in order to avoid utilisation incompatible with their survival.
3. Appendix III contains species that are protected in at least one country, which has asked other CITES Parties for assistance in controlling the trade.

Appendices I and II of the CITES list illustrate species of timber that are protected outright. Appendix III of the CITES list illustrates species that are protected in at least one country. If a timber species used in the project is on Appendix III it can be included as part of the assessment as long as the timber is not obtained from the country or countries seeking to protect this species.

Legally harvested and traded timber

Legally harvested timber and wood-derived products are those that originate from a forest where the following criteria are met:

1. The forest owner or manager holds legal use rights to the forest
2. There is compliance by both the forest management organisation and any contractors with local and national legal criteria including those relevant to:
   a. Forest management
   b. Environment
   c. Labour and welfare
   d. Health and safety
   e. Other parties' tenure and use rights
   f. All relevant royalties and taxes are paid.
3. There is full compliance with the criteria of CITES.

Legally traded means timber or products derived from Legally harvested timber were:

1. Exported in compliance with exporting country laws governing the export of timber and timber products, including payment of any export taxes, duties or levies
2. Imported in compliance with importing country laws governing the import of timber and timber products, including payment of any import taxes, duties or levies
3. Traded in compliance with legislation related to the convention on international trade in endangered species (CITES), where applicable.

New Rules of Measurement

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/.

Responsible sourcing

The management and implementation of sustainable development principles in the provision, procurement and traceability of construction materials and components. In BREEAM, this is demonstrated through auditable third party certification schemes. Refer to Guidance Note 18 available in the Responsible sourcing section of the BREEAM website for an up-to-date table of RSCSs recognised by BRE Global for the purposes of a BREEAM assessment.

Responsible sourcing certification scheme point scores

A graded scale to reflect the rigour of the certification scheme used to demonstrate responsible sourcing, forming the basis for awarding credits in the BREEAM issue Mat 03. Refer to Guidance Note 18 available in the Responsible sourcing section of the BREEAM website for an up-to-date table of RSCSs recognised by BRE Global for the purposes of a BREEAM assessment.

Route 1

Route 1 does not require the quantities of each construction product to be entered into the BREEAM International Mat 03 tool. This reduces the time taken to calculate the score achieved per construction product but, because the varying quantities of each construction product in the building cannot be taken into account when the credit is calculated, the lowest 'location or use' category score per materials category is used for the overall materials category score.

Route 2

Route 2 provides a more accurate measurement of the risks in the building design associated with construction products by taking account of the quantity of each construction product with a location and use category. It requires quantities to be entered into BREEAM International Mat 03 tool rather than using the lowest 'location or use' category score per material category. The improvement in rigour justifies route 2 having the potential to produce better scores than route 1.

Route 3

Route 3 is a mixture of route 1 and route 2. 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 materials category.

Other information

None.

Mat 04 Insulation

Not assessed as a standalone issue within BREEAM International New Construction Version 6, but incorporated within Mat 01 Life cycle impacts on page 276 and Mat 03 Responsible sourcing of construction products on page 282.

Mat 05 Designing for durability and resilience (all buildings)

Number of credits available	Minimum standards
1	No

Aim

To recognise and encourage adequate protection of exposed elements of the building and landscape, therefore minimising the frequency of replacement and maximising materials optimisation.

Assessment criteria

The following is required to demonstrate compliance:

One credit

Protecting vulnerable parts of the building from damage

1 The building incorporates suitable durability and protection measures, or designed features or solutions to prevent damage to vulnerable parts of the internal and external building and landscaping elements. This must include, but is not necessarily limited to:
   - 1.a Protection from the effects of high pedestrian traffic in main entrances, public areas and thoroughfares (corridors, lifts, stairs, doors etc.)
   - 1.b Protection against any internal vehicular or trolley movement within 1m of the internal building fabric in storage, delivery, corridor and kitchen areas
   - 1.c Protection against, or prevention from, any potential vehicular collision where vehicular parking and manoeuvring occurs within 1m of the building façade for all car parking areas and within 2m for all delivery areas.

Protecting exposed parts of the building from material degradation

2 The relevant parts of the building incorporate appropriate design and specification measures to limit material degradation due to environmental factors (see Methodology on page 298 for the process to assess this criterion).

See Table 47 on the next page for a list of applicable elements, environmental factors and material degradation effects to consider.

Checklists and tables

Table 47: Applicable building elements, environmental factors and material degradation effects to consider

Applicable building elements, environmental factors and material degradation effects
Applicable building elements
1. Foundation, substructure, lowest floor, retaining walls 2. External walls 3. Roof or balconies 4. Glazing: windows, skylight 5. External doors 6. Railings or balusters (where exposed to external environment) 7. Cladding (where exposed to external environment) 8. Staircases or ramps (where exposed to external environment) 9. Hard landscaping.
Environmental factors
1. Environmental agents, including: a. Solar radiation b. Temperature variation c. Water or moisture d. Wind e. Precipitation, e.g. rain and snow f. Extreme weather conditions: high wind speeds, flooding, driving rain, snow 2. Biological agents, including: a. Vegetation b. Pests, insects 3. Pollutants, including: a. Air contaminants b. Ground contaminants.
Material degradation effects (includes, but not necessarily limited to the following)
1. Corrosion 2. Dimensional change, e.g. swelling or shrinkage 3. Fading or discolouration 4. Rotting 5. Leaching 6. Blistering 7. Melting 8. Salt crystallisation 9. Abrasion.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	**Protecting vulnerable parts of the building from damage - criterion 1 on page 295** Where the identified vulnerable parts of the building form part of the shell and core developer's remit: Both options: All assessment criteria relevant to the building type and function apply and must be accounted for in the assessment of this issue. Where the identified vulnerable parts of the building do not form a part of the shell and core developer's remit, e.g. they are in lettable areas and compliance is subject to the tenant's or future occupier's fit-out specification: Both options: These areas can be excluded from assessment. **Protecting exposed parts of the building from material degradation - criterion 2 on page 295** Both options: All criteria relevant to the building type and function apply. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - Partially fitted and fully fitted		
CN2	Applicable assessment criteria - Single dwellings	**Protecting vulnerable parts of the building from damage - criterion 1 on page 295** Both options: Criteria 1.a on page 295 and 1.b on page 295 are not applicable. **Protecting exposed parts of the building from material degradation - criterion 2 on page 295** Both options: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
CN2.1	Applicable assessment criteria - Multiple dwellings	**Protecting vulnerable parts of the building from damage - criterion 1 on page 295** Both options: All criteria relevant to the building type and function apply. **Protecting exposed parts of the building from material degradation - criterion 2 on page 295** Both options: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		

Ref	Terms	Description
CN3	Suitable durability measures. See criterion 1 on page 295.	Suitable durability and protection measures to vulnerable parts of the building can include: 1. Bollards or barriers, or raised kerbs to delivery and vehicle drop-off areas 2. Robust external wall construction, up to 2m high 3. Protection rails to walls of corridors 4. Kick plates or impact protection (from trolleys etc.) on doors 5. Hard-wearing and easily washable floor finishes in heavily used circulation areas (i.e. main entrance, corridors, public areas etc.) 6. Designing out the risk without the need for additional materials specification to protect vulnerable areas.
CN3.1	Vehicle impact protection. See criterion 1.c on page 295.	Any vehicle impact protection measures specified must be positioned at an adequate distance from the building to protect the fabric from impact from any vehicle with a measurable overhang of the body from the wheel track, in particular for any goods delivery areas. In vehicle movement areas only: where the external robust wall construction is specified to comply with the credit, additional protection must be provided to ensure against potential damage to the robust façade from vehicle movement, i.e. specifying bollards or protection rails.
CN3.2	Preventing excessive material use	The specification or design measures chosen should reflect the need to balance the additional specification of materials with the need to protect building elements to minimise their replacement, insuring against excessive material use and promoting materials optimisation. See Mat 06 Material efficiency on page 300.
CN3.3	Public or common areas	Consideration should be given to materials specification in public or common areas (especially public waiting areas and toilet areas) to provide protection against potential malicious or physical abuse, as far as possible.

Methodology

Protecting exposed parts of the building from material degradation

The following outlines the process to assess criterion 2 on page 295 for newly specified materials and construction elements:

1. Identify from the list of 'applicable building elements' under Table 47 on page 296 the elements that are appropriate to the building being assessed.
2. Establish from the 'environmental factors' list those factors that are likely to cause material degradation effects in the identified applicable building elements.
3. Confirm the design and specification measures in place to limit these degradation effects.
4. The assessor should use their professional judgment in determining whether the design team have adequately demonstrated that they have designed and specified materials or measures which will be effective in preventing unnecessary deterioration, so reducing frequent replacements, repairs and maintenance through the life cycle of the building.
5. At the post-construction stage, where the design and specification measures installed differ from those proposed at the design stage, the assessor must ensure that these measures still meet the aims of the criterion as detailed in point 4.

Evidence

Criteria	Interim design stage	Final post-construction stage
1 on page 295	Design drawings illustrating vulnerable areas or parts of the building. Design drawings or specification confirming the durability of the measures specified.	Assessor’s building or site inspection, or photographic evidence confirming compliance.
2 on page 295	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 details confirming the material degradation effect militated by the specified product.	As interim design stage and based on as-built drawings.

Additional information

Relevant definitions

Materials efficiency

Refer to BREEAM issue Mat 06 Material efficiency on page 300

Other information

None.

Mat 06 Material efficiency

(all buildings)

Number of credits available	Minimum standards
1	No

Aim

To recognise and encourage measures to optimise material efficiency in order to minimise the environmental impact of material use and waste without compromising on structural stability, durability or service life of the building.

Assessment criteria

The following is required to demonstrate compliance:

One credit

1 Opportunities have been identified, and appropriate measures investigated and implemented, to optimise the more efficient use of materials in building design, procurement, construction, maintenance and end of life.

2 The above is carried out by the design or construction team in consultation with the relevant parties (see CN3 on the facing page) at each of the following project work stages:
- 2.a Preparation and Brief
- 2.b Concept Design
- 2.c Developed Design
- 2.d Technical Design
- 2.e Construction.

Checklists and tables

None.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	Both options: All criteria relevant to the building type and function apply. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.

Ref	Terms	Description
Residential - Partially fitted and fully fitted		
CN2	Applicable assessment criteria - Single and multiple dwellings	Both options: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN3	Relevant parties	All parties (as relevant to the project stage) involved in the design, specification or construction of the building should be consulted. This includes, but is not limited to, the following: 1. Client or developer 2. Cost consultant 3. Architect 4. Structural or civil engineers 5. Building services engineers - mechanical, electrical 6. Principal contractor 7. Demolition or strip-out contractor 8. Environmental consultant 9. Project management consultant 10. Materials or component manufacturers or suppliers.
CN3.1	Evidence requirements	The evidence required to demonstrate compliance will vary according to the work stage; examples of how material efficiency could be considered have been provided in Table 48 on the next page. To demonstrate compliance, as a minimum BREEAM Assessors must ensure that the measures and outputs under the 'evidence' column have been met.

Methodology

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
All	See compliance note CN3.1 above, one or more appropriate evidence types can be used to demonstrate compliance with the criteria requirements.	

Additional information

Relevant definitions

Material efficiency

The process of undertaking a building project to enable the most efficient use of materials over the life cycle of the building and its components. This includes using fewer materials, reusing existing demolition 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 or construction that result in lower materials usage and lower wastage levels including off-site manufacture and use of pre-assembled service pods.

Other information

Table 48: The following table is based on the principles set out in parts 1 and 2 of the BS 8895 series of standards, and provides some examples of how material efficiency can be considered at each work stage. As a minimum, the measures listed under the 'evidence' column have been met to show compliance with the issue.

Work Stage	Objective	Participants	Action	Evidence
Preparation and Brief	To set requirements that will inform decisions throughout the design and construction.	Client or client's agent with input from the design team.	Assess the site, the likely project scale, and the client's functional and aesthetic requirements to set material efficiency objectives for the project.	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	Develop strategies to implement or action the materials efficiency requirements set under the Preparation and Brief stage.	Design team.	Hold workshops with the project team to identify design opportunities to reduce or optimise materials use through design, specification, construction techniques etc.	— 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 predicted reductions in material quantities.

Work Stage	Objective	Participants	Action	Evidence
Developed Design and Technical Design	Developed design proposals based on learning from the concept design.	Design team	— 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.	— Report on deviations from previous stages. — Documentation demonstrating the incorporation of the outcomes from the concept stage, for example: design drawings or specifications demonstrating materials efficiency measures undertaken.
Construction	Implement material efficiency measures in construction.	Principal contractor.	— Implement material efficiency measures and strategies identified in previous stages in building construction and identify deviations. — Identify further efficiencies as appropriate for this stage.	— 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.

Optimising material use

Optimising material use is one the key resource efficiency goals for any sustainability strategy. This involves various components to ensure efficient use of materials, waste prevention and reduction, minimal damage to the environment and depletion of natural resources. This new BREEAM issue aims to encourage and support efforts to reduce the amount of materials used in building design without compromising on the structural stability and other performance factors. BRE intends to further develop the assessment criteria for this issue in future updates of BREEAM, and as such BRE would welcome any feedback on the application of this assessment issue to assist with the evolution of the criteria and inclusion of additional guidance on compliance in future BREEAM versions.

Tools to guide material efficiency strategies

The following provide frameworks for the consideration and review of resource efficiency in design and construction.

BS 8895 Designing for material efficiency in building projects

This standard 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 is comprised of the following four parts:

- Part 1: Code of practice for Strategic Definition and Preparation and Brief[67] (published)
- Part 2: Code of practice for concept and developed design[68] (published)
- Part 3: Code of practice for technical design (planned for development)
- Part 4: Code of practice for operation, refurbishment (planned for development).

WRAP

Designing out Waste: A design team guide for Buildings[69] This document outlines five principles of designing out waste and can be applied during design development, and serve as prompts for investigating opportunities for material efficiency in design.

Waste

Summary

This category encourages the sustainable management (and reuse where feasible) of construction and operational waste and waste through future maintenance and repairs associated with the building structure. By encouraging good design and construction practices, issues in this section aim to reduce the waste arising from the construction and operation of the building, encouraging its diversion from landfill. 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.

Category summary table

Issue	Credits	Credit summary
Wst 01 Construction waste management	3	— Development of a construction resource management plan. — Reducing construction waste related to on site construction and off-site manufacture or fabrication. — Diverting non-hazardous construction (on site and dedicated off-site manufacture or fabrication), demolition and excavation waste (where applicable) generated by the project from landfill.
Wst 02 Recycled aggregates	1	— Percentage levels of recycled or secondary aggregate specified against set targets.
Wst 03a Operational waste	1	— Provision of suitable space and facilities to allow for segregation and storage of operational recyclable waste volumes generated by the assessed building or unit, its occupants and activities.
Wst 03b Operational waste	2	— Provision of suitable space and facilities to allow for segregation and storage of operational recyclable waste volumes generated by the assessed building or unit, its occupants and activities.
Wst 04 Speculative finishes	1	— Specification of floor and ceiling finishes only where agreed with the occupant or for tenanted areas where the future occupant is not known, carpets, other floor finishes and ceiling finishes are installed in a show area only to reduce wastage.
Wst 05 Adaptation to climate change	1	— Encourage consideration and implementation of measures to mitigate the impact of more extreme weather conditions arising from climate change over the lifespan of the building.
Wst 06 Functional adaptability	1	— Encourage consideration and implementation of measures to accommodate future changes to the use of the building and its systems over its lifespan.

Wst 01 Construction waste management (all buildings)

Number of credits available	Minimum standards
3	Yes

Aim

To promote resource efficiency via the effective and appropriate management of construction waste.

Assessment criteria

This issue is split into two parts:

- Construction waste reduction (2 credits)
- Diversion of resources from landfill (1 credit)

The following is required to demonstrate compliance:

Construction waste reduction

One credit

1 Where appropriate targets for the amount of non-hazardous and hazardous waste produced on site are set in m^3 of waste per $100m^2$ or tonnes of waste per $100m^2$.

2 Procedures are in place to minimise non-hazardous and hazardous waste in line with the targets.

3 The amount of site construction waste created is being monitored and targets regularly reviewed.

4 The design or site management team has nominated an individual responsible for implementing the above.

5 A pre-demolition audit of any existing buildings, structures or hard surfaces is completed to determine if refurbishment or reuse is feasible and, if not, to maximise the recovery of material from demolition for subsequent use, prioritising high grade or value applications. The audit must cover:
5.a Identification of the key refurbishment and demolition materials
5.b Potential applications and any related issues for the reuse and recycling of the key refurbishment and demolition materials.

6 Using the collated data, report the amount of waste generated per $100m^2$ (gross internal floor area) in m^3 (where volume is actual volume of waste, not bulk volume) or tonnes from the construction process via the BREEAM scoring and reporting tool.

One credit

7 Criteria 1 to 6 above (where applicable) are achieved.

8 Procedures are in place for sorting, reusing and recycling construction waste into at least five defined waste groups (see Table 50 on page 308) either on site or off-site through a licensed external contractor.

Diversion of resources from landfill

One credit

9 A significant quantity of non-hazardous construction and demolition waste (where applicable) generated by the project has been diverted from landfill according to the figures within Table 49 below below:

Table 49: BREEAM targets for diversion from landfill according to National construction and demolition (C&D) waste recovery rate

National recovery rates*	Type of waste	One credit	Exemplary level
		BREEAM target rates for diversion from landfill	
< 50% (by weight)*	Construction	≥ 60% (by weight) or ≥ 50% (by volume)	≥ 75% (by weight) or ≥ 65% (by volume)
≥ 50% (by weight)*	Construction	≥ 10% improvement over national rate (up to where 95% of total waste created is diverted to landfill)	≥ 35% improvement over national rate (up to where 95% of total waste created is diverted to landfill)
< 60% (by weight)*	Demolition	≥ 70% (by weight) or ≥ 60% (by volume)	≥ 75% (by weight) or ≥ 65% (by volume)
≥ 60% (by weight)*	Demolition	≥ 10% improvement over national rate (up to where 95% of total waste created is diverted from landfill)	≥95% of total waste created is diverted from landfill
*Where the national waste recovery rate is reported for both construction and demolition waste together, the same target should be used for both types of waste. For the project to achieve the credit, both construction and demolition waste (reported separately) must meet the target.			

10 Waste materials will be sorted into separate key waste groups (according to the waste streams generated by the scope of the works) either on site or off-site through a licensed contractor for recovery (see Table 50 on the next page for information on waste groups).

11 Using the collated data, report the following via the BREEAM scoring and reporting tool (this applies to construction and demolition waste, where applicable):
  11.a Destination of the non-hazardous waste leaving the site (i.e. address and facility); and
  11.b Level of waste diverted from landfill as a percentage of overall arising OR m^3 of waste per 100m² OR tonnes of waste per 100m² (see Compliance notes on page 309).

Exemplary level criteria

The following outlines the exemplary level criteria to achieve an innovation credit for this BREEAM issue:

12 Criteria 1 to 11 above, where applicable, are achieved.

13 The percentage of non-hazardous construction and demolition waste (if relevant) diverted from landfill meets or exceeds the exemplary level percentage benchmark (outlined in Table 49 above).

Checklists and tables

Even though some locations may have limited infrastructure, it should be possible to reuse and recycle the five basic materials (ceramics, excavated material, plasterboard, concrete and timber) locally, so the second credit will be awarded only if C&D waste is sorted into at least five waste groups (see : Key waste group examples below) or the minimum required by local regulations, whichever is the most onerous. Where there is a significant amount of metals to be reused or recycled this can replace the smallest of the five categories listed above.

Table 50: Key waste group examples

Key group	Examples
Bricks	Bricks
Concrete	Pipes, kerb stones, paving slabs, concrete rubble, precast and in situ
Insulation	Glass fibre, mineral wool, foamed plastic
Packaging	Paint pots, pallets, cardboard, cable drums, wrapping bands, polythene sheets
Timber	Softwood, hardwood, board products such as plywood, chipboard, medium density fibreboard (MDF)
Electrical and electronic equipment	Electrical and electronic TVs, fridges, air-conditioning units, lamps equipment
Canteen or office	Office waste, canteen waste, organic waste, e.g. food waste
Oils	Hydraulic oil, engine oil, lubricating oil
Asphalt and tar	Bitumen, coal tars, asphalt
Ceramics	Tiles, bricks, ceramic sanitary ware, etc.
Excavated material (all inert)	Mixed rubble (mixture of concrete, ceramics and inert soils, clays, rocks, etc.)
Topsoil	Topsoil
Glass	Glass
Metals	Radiators, cables, wires, bars, sheet
Gypsum	Plasterboard, render, plaster, cement, fibre cement sheets, mortar

Key group	Examples
Plastics	Pipes, cladding, frames, non-packaging sheet
Furniture	Tables, chairs, desks, sofas
Soils	Soils, clays, sand, gravel, natural stone
Liquids	Non-hazardous paints, thinners, timber treatments
Hazardous	As defined in national legislation or as defined in the Hazardous Waste List (HWL) of the European Waste Catalogue (EWC). Compliance is required with the more onerous of the two.
Floor coverings (soft)	Carpets, vinyl flooring
Architectural features	Roof tiles, reclaimed bricks, fireplaces
Mixed or other	Efforts should be made to categorise waste into the above categories wherever possible

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	Both options: All criteria relevant to the building type and function apply. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - Partially fitted and fully fitted		
CN2	Applicable assessment criteria - Single and multiple dwellings	Both options: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN3	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.

Ref	Terms	Description
CN3.1	Diversion from landfill	Diversion from landfill includes: 1. Reusing the material on site (in situ or for new applications) 2. Reusing the material on other sites 3. Salvaging or reclaiming the material for reuse 4. Returning material to the supplier via a 'take-back' scheme 5. Recovery of the material from the site by an approved waste management contractor and subsequently being recycled or sent for energy recovery.
CN3.2	Use of BRE Smartwaste	Criteria 1– 4 on page 306 are achieved where the client or contractor confirms that BRE's SMARTWaste system is to be used for planning and monitoring.
CN3.3	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.
CN3.4	National construction and demolition waste recovery rate	Where the national construction and demolition recovery rates are known submit these as part of the ASWL process. . Where the national construction and demolition recovery rates are unknown the design team should assume that they are 50% for both construction and demolition. Achieving a 10% improvement will therefore require the design team or the contractor to divert 60% by weight of their non-hazardous construction waste from landfill.
CN3.5	Waste from temporary support structures	Some projects require temporary works that fall outside the scope of normal construction methods or practices, for example, projects that require bespoke temporary steelwork supports for façade retention. If it can be demonstrated that the components and materials used will be either reused or, if this is not possible, recycled after use then these may be excluded from the construction waste reduction and diversion from landfill assessments of this issue. However, the strategy for ensuring resource efficient design of the temporary works and an explanation of the reuse or recycling of the materials concerned must be reported in the site waste management plan, including a full justification for exemption, and provided to BRE Global. This justification will be reviewed by BRE Global on a case-by-case basis and must be approved prior to these credits being awarded.

Methodology

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
All	A copy of the specification or contract or other formal document confirming waste procedures, including recycling and targets OR a letter from the client or their representative. Where relevant, a copy of the pre-demolition audit.	A copy of the waste procedures, including recycling and targets. Monitoring records or report. Where relevant, a copy of the pre-demolition audit.

Additional information

Relevant definitions

Appropriate targets

These can be set according to best practice (where available) and will depend on the type of waste and the opportunities for reuse on site. Targets could also be set to improve on data from similar past projects or which are working towards a company target. The design team should justify why the targets are deemed appropriate. A target is NOT deemed to be an 'appropriate target' within this issue solely because it is achievable. Note: Targets and measurements should exclude demolition and excavation waste as this varies from project to project (and is addressed in the 'diversion from landfill' credit). Further information can be found on the SMARTWaste Plan website on how to set appropriate targets.

Inert waste

Waste is considered inert if:

1. It does not undergo any significant physical, chemical or biological transformations;
2. It does not dissolve, burn or otherwise physically or chemically react, biodegrade or adversely affect other matter with which it comes into contact in a way likely to give rise to environmental pollution or harm to human health; and
3. Its total leachability and pollutant content and the ecotoxicity of its leachate are insignificant and, in particular, do not endanger the quality of any surface water or groundwater (taken from the European Community (EC) Directive 1999/31/EC on the landfill of waste).

Pre-demolition audits

These provide detailed information on materials that can be reclaimed and recycled, so reducing the cost and environmental impact of waste disposal, bringing savings from reusing existing materials and earnings from selling those that are not needed. They:

1. Identify volumes of wastes so that your company can plan 'reuse, recycling and recovery' activities prior to work starting.
2. Are tailor-made for each demolition project including:
   a. Identifying markets for recycled or recovered material
   b. Identifying reclamation and reuse potential both on site and off-site
   c. Local and national material valuation
   d. Segregation recommendations
   e. Environmental quantification.
3. Increase material and labour efficiency, reduce waste and maximise profit.

Other information

Site waste management plan

The implementation of a site waste management plan (SWMP) can help manage the site construction waste produced. The aim of a SWMP is 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 and off the site. A SWMP consists of a combination of commitments to:

1. Design out waste
2. Reduce waste generated on site
3. Develop and implement procedures to sort and reuse or recycle construction waste on and off-site (as applicable).

Data obtained from measuring and monitoring site construction waste can then be used to check performance against targets and benchmarks, analyse the effectiveness of any solutions implemented and strive for continual improvement.

SMARTWaste

SMARTWaste is an online environmental reporting tool for the construction industry. It enables organisations to efficiently capture, monitor and report on:

- Waste (including site waste management plans and pre-demolition audits)
- Energy (including conversion to carbon dioxide emissions)
- Water
- Responsible sourced materials (including timber)
- Transport
- Considerate Contractors Scheme.

Used to meet the criteria of this issue and as a source of evidence for demonstrating compliance, SMARTWaste helps organisations to reduce their environmental impacts, making substantial time and cost savings.

More information about SMARTWaste can be found at: www.smartwaste.co.uk.

Wst 02 Recycled aggregates

(all buildings)

Number of credits available	Minimum standards
1	No

Aim

To recognise and encourage the use of recycled and secondary aggregates, thereby reducing the demand for virgin material and optimising material efficiency in construction.

Assessment criteria

The following is required to demonstrate compliance:

One credit - Recycled aggregates

1 At least 25% of the high grade aggregate uses (within the development) are provided by secondary or recycled aggregate. This percentage can be measured using either weight or volume.

2 The recycled or secondary aggregates are EITHER
  2.a Construction, demolition and excavation waste obtained on site or off-site OR
  2.b Secondary aggregates (see Relevant definitions on page 315)

Exemplary level criteria

The following outlines the exemplary level criteria to achieve an innovation credit for this BREEAM issue.

3 Where the total amount of recycled or secondary aggregate specified is greater than 50% (by weight or volume) of the total high grade aggregate specified for the project.

4 The contributing recycled or secondary aggregate must not be transported more than 30km by road transport.

Checklists and tables

None.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	Both options: All criteria relevant to the building type and function apply. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - Partially fitted and fully fitted		
CN2	Applicable assessment criteria - Single and multiple dwellings	Both options: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN3	Recycled aggregates in concrete	Where national building regulations limit the use of recycled aggregates in concrete (typically applicable to bound aggregate uses as listed), the onus for achieving this credit is on the unbound uses (please note that the total aggregate figure must still include the bound uses).
CN3.1	National restrictions on the use of recycled aggregates	In countries where the use of recycled aggregates is restricted, this credit cannot be achieved by default. In countries where there is a maximum permitted regulatory level of less than 50% recycled aggregate, the exemplary credit can be achieved where the percentage of recycled aggregates used is greater than or equal to 35%. Where there is no maximum regulatory level, the 50% requirement must be achieved in order to award this credit.
CN3.2	National best practice guidance on defining granular fill and capping as a high grade use	The ASWL will confirm any approved national standards regarding the use of high grade materials. Where none have been approved, Checklist A6 should be used to confirm compliance. This should then be submitted to BRE for approval and the ASWL will be updated.
CN3.3	Off-site recycled aggregates	Where off-site recycled aggregates from construction, demolition and excavation waste are used, they should be produced according to the relevant standards for aggregates.
CN3.4	Aggregates in off-site manufactured applications	Where high grade aggregate uses have been incorporated into applications manufactured off-site, the aggregate present in these applications should be included in the assessment of this issue.

Ref	Terms	Description
CN3.5	Air-cooled blast furnace slag as a secondary aggregate	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 aggregates standards that apply to the end use application (e.g. bitumen bound, unbound etc.).

Methodology

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
All	Relevant section and clauses of the building specification or contract. Project team calculations. Documentation confirming the source of recycled or secondary aggregates and that the required amount can be provided. Appropriate documentation for the Approved standards and weightings list, e.g. specification, standards etc.	Calculations detailing the weights (or volumes) and types of aggregate provided for each application. Delivery notes (or confirmation from the supplier) of the types and quantities of aggregates provided on site. Confirmation that the materials meet the appropriate standard as defined in the Approved standards and weightings list.

Additional information

Relevant definitions

High Grade aggregate uses

High Grade aggregate uses are considered to be:

Bound

1. Structural frame
2. Floor slabs including ground floor slabs
3. Bitumen or hydraulically bound base, binder, and surface courses for paved areas and roads.

Unbound

1. Asphalt-based or similar road surfaces
2. Granular fill and capping
3. Pipe bedding
4. Sub bases and building foundations
5. Gravel landscaping.

Low grade aggregate uses

Crushed masonry used as fill material for general landscaping is not considered to be high grade. This practice is now common place on construction sites due to increased landfill costs.

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.

Secondary aggregates

1. China clay waste
2. Slate overburden
3. Pulverised Fuel Ash (PFA)
4. Ground Granulated Blast Furnace Slag (GGBFS)
5. Air-cooled blast furnace slag
6. Steel slag
7. Furnace Bottom Ash (FBA)
8. Incinerator bottom ash
9. Foundry sands
10. Recycled glass
11. Recycled plastic
12. Spent oil shale
13. Colliery spoil
14. Municipal solid waste treatment residues.

Other information

None.

Wst 03a Operational waste

(non-residential, plus residential institutions)

For residential buildings, see Wst 03b Operational waste on page 322.

Number of credits available	Minimum standards
1	Yes

Aim

To recognise and encourage the provision of dedicated storage facilities for a building's operational-related recyclable waste streams, so that this waste is diverted from landfill or incineration.

Assessment criteria

The following is required to demonstrate compliance:

One credit - Operational waste

1 Dedicated space is provided for the segregation and storage of operational recyclable waste volumes generated by the assessed building or unit, its occupants and activities. This space must be:
- 1.a Clearly labelled, 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 Where the consistent generation in volume of the appropriate operational waste streams is likely to exist, e.g. large amounts of packaging or compostable waste generated by the building's use and operation, the following facilities are provided:
- 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 resulting from the building's daily operation and use; OR adequate space for storing segregated food waste and compostable organic material prior to collection and delivery to an alternative composting facility
- 2.c Where organic waste is to be stored or composted on site, a tap is provided adjacent to or within the facility for cleaning and hygiene purposes.

Additionally for Residential institutions with self-contained dwellings only

3 Each dwelling has a provision of three internal storage containers, as follows:
- 3.a A minimum total capacity of 30 litres
- 3.b No individual container smaller than 7 litres
- 3.c All containers in a dedicated non-obstructive position
- 3.d The storage containers for recycling are provided in addition to non-recyclable waste storage.

4 Home composting facilities and a home composting information leaflet is provided within the kitchen area for each self-contained dwellings.

Additionally for Residential institutions with individual bedrooms and communal facilities only

5 The above storage requirements (criterion 3 on the previous page) for self-contained dwellings or bedsits are met for every six bedrooms.

6 The recyclable storage is located in a dedicated non-obstructive position in either:
   6.a Communal kitchens OR
   6.b Where there are no communal kitchens present, in a communal space such as communal lounges or utility areas.

7 Home composting facilities and a home composting information leaflet is provided within the kitchen area or communal space for each individual bedrooms and communal facilities self, bedsit or communal kitchen.

Checklists and tables

None.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	**Operational waste, criteria 1 and 2 on the previous page** Both options: All criteria relevant to the building type and function apply. **Additional criteria for residential institutions, criteria 3 to 7 above** Both options: These criteria are not applicable. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
CN1.1	End-occupier not known. See criterion 2 on the previous page	If the end-occupier is not known, but the functions or areas of the assessed building suggest that large amounts of packaging or compostable waste is likely to be generated during the building's operation, e.g. it is a retail or industrial project or contains a large catering facility, then an appropriately sized space and services or infrastructure to accommodate the relevant facilities must be provided. The facilities themselves do not necessarily need to be provided or installed to demonstrate compliance.
Residential - Partially fitted and fully fitted		
CN2	Applicable assessment criteria - Single and multiple dwellings	Both options: This issue is not applicable. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		

Ref	Terms	Description
CN3	Determining if the dedicated space complies. See criteria 1 and 2 on page 317.	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: 1. At least $2m^2$ per $1000m^2$ of net floor area for buildings < $5000m^2$ 2. A minimum of $10m^2$ for buildings ≥ $5000m^2$ 3. An additional $2m^2$ per $1000m^2$ of net floor area where catering is provided (with an additional minimum of $10m^2$ for buildings ≥ $5000m^2$). The net floor area should be rounded up to the nearest $1000m^2$.
CN3.1	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.
CN3.2	Multiple building assessments and buildings that form part of a wider estate. See criterion 1.c on page 317.	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.
CN3.3	Limited space or vehicle access for a compactor or baler. See criterion 2 on page 317.	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.
CN3.4	Internal storage areas	Where the facilities are situated internally, vehicular gate heights and widths and manoeuvring and loading space must be sized to ensure ease of access for vehicles collecting recyclable materials.
CN3.5	General waste	The area for storage of recyclable materials must be provided in addition to areas and facilities provided for dealing with general waste and other waste management facilities, e.g. compactors, balers and composters.
CN3.6	Small industrial units. See criterion 1 on page 317.	For an industrial building or development or site consisting of a number of smaller units, each ≤ $200m^2$ floor area, shared facilities that meet the above criteria for the building or site as a whole are sufficient to achieve this credit.
CN3.7	Shopping centres and retail parks. See criterion 1 on page 317.	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.

Ref	Terms	Description
CN3.8	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.
Building specific		
CN4	Home composting information leaflet (multi-residential buildings). See criteria 3, 5, 6 and 7 on page 318.	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.); and — 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 uthority is sufficient to meet the information leaflet criteria.
CN4.1	Residential institutions: supported living facility	Where it is not possible to locate the recycling bins within a communal area, which is 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.

Methodology

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
All	Design drawings or relevant section or clauses of the building specification confirming provision and scope of dedicated facilities (on site and off-site). Project team meeting minutes or a letter confirming likely building waste streams and indicative volumes.	As design stage. BREEAM Assessor's site inspection report and photographic evidence confirming compliant installation.

Additional information

Relevant definitions

Accessible space

Accessible space is typically within 20m 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 20m of a building entrance. In such circumstances, judgment on whether the space is 'accessible' to the building occupants and vehicle collection must be made.

Automated waste collection system

Some companies now offer a fully automated underground system for the collection, sort and transport of waste. It allows for waste separation at the source, for different types of waste and from multiple locations, with enhanced hygienic, occupational health and safety standards. It also reduces the use of waste transport by lorries, reducing nuisance and CO_2 emissions, from fossil fuel consumption.

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.

Other information

Recyclable storage

The following footprint dimensions 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 x 2.4m
2. Skip: the footprint of an 8 and 12 cubic yard skip measures 3.4m x 1.8m; therefore allow a minimum of 2.0m width and 4.0m length or 8m² area for the storage and access of such containers
3. Wheeled bins: 360 litre = 0.86m x 0.62/660L= 1.2m x 0.7m/1100L = 1.28m x 0.98m
4. Roll-on/roll-off containers: allow a minimum of 6.1m x 2.4m
5. Vehicle access: the following are dimensions for lorry types that are typically used to collect waste. Therefore gate heights and widths should not be smaller than these measurements:
   a. Dustcart: medium capacity; length = 7.4m, height = 4m, width 3.1m
   b. Skip lorry: length = 7m, height = 3.35m, width 3.1m.

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.

Recycling bins

Individual recycling bins located at convenient locations throughout the building are necessary to maximise recycling rates.

Wst 03b Operational waste

(residential only)

For non-residential buildings and residential institutions, see Wst 03a Operational waste on page 317.

Number of credits available	Minimum standards
2	Yes

Aim

To recognise and encourage the provision of dedicated storage facilities for operational-related household waste streams and so help to avoid waste being sent to landfill or incineration.

Assessment criteria

The following is required to demonstrate compliance:

One credit - Recycling

1 An adequate external space has been allocated to the storage of both recyclable and non-recyclable or non-compostable household waste (see Compliance notes on the facing page). The space must be:
- 1.a At least the minimum recommended by the appropriate local authority OR
- 1.b Where there are no recommendations from the local authority, 100L of volume for a single bedroom dwelling and a further 70L for each additional bedroom
- 1.c Located on level hardstanding surface
- 1.d Accessible to the occupants of the house or block of flats.

2 Adequate internal space (including bins) has been allocated to the storage of recyclable household waste as follows:
- 2.a Where there is a recyclable waste collection scheme in the area that can be used by the residents EITHER of the following have been provided for the storage of recyclable household waste:
  - 2.a.i A minimum of three individual internal bins each no smaller than 7L OR
  - 2.a.ii A single bin of minimum capacity 35L (only allowable where the local collection collects a number of different waste groups within a single container)
- 2.b Where no recyclable waste collection scheme is in place at least five bins (each not smaller than 15L) have been provided for the storage of recyclable household waste
- 2.c The internal recycling bins should be located in a dedicated non-obstructive position. Free-standing recycling bins placed directly on the floor or in a cupboard do not comply. The bins could be in the kitchen (close to the non-recyclable waste bin) or located adjacent to the kitchen (i.e. within 10m), e.g. in a utility room or connected garage.

One credit - Composting

3 Provision of adequate external facilities for the storage or composting of household compostable waste. The facilities must be:
- 3.a Located in a dedicated position and accessible to the dwelling occupants
- 3.b Accompanied by an information leaflet, delivered to each dwelling or communal kitchen. The leaflet must provide information on:
  - 3.b.i How composting works and why it is important

- 3.b.ii The materials that can be composted (e.g. raw vegetable peelings and fruit, shredded paper, teabags, etc.)
- 3.b.iii Details of the operation and management plan for any communal composting scheme
- 3.b.iv Where adequate external composting facilities are provided, troubleshooting information, e.g. what to do if the compost gets too dry or too wet.

4 Adequate internal container space (large enough to hold at least a 7L container), for storing segregated compostable organic material (i.e. food waste), is provided in each dwelling kitchen or each communal kitchen. This can be one of the three internal storage bins mentioned in criterion 2.a on the previous page.

5 Where adequate external facilities have not been provided with a composting container, compliance can be demonstrated where one of the following is applicable to all dwellings under assessment:
- 5.a An accessible local communal or community composting service, run by either a local authority or a private organisation
- 5.b A management plan, which is in place to ensure food or green waste is appropriately removed and delivered to an alternative composting facility
- 5.c A local authority or private organisation green or kitchen waste collection system.

6 For communal facilities at least one water outlet is provided for cleaning in and around the facility.

Checklists and tables

None.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	Both options: This issue is not applicable. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - Partially fitted and fully fitted		
CN2	Applicable assessment criteria - Single and multiple dwellings	Partially fitted: Criteria1 on the previous page and 3 on the previous page are applicable only. Fully Fitted: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN3	Extensions to existing buildings	Where there are external 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 waste from the new and existing buildings.
CN3.1	Community based adequate external space	In countries where the outdoor space supplied for storing non-recyclable and recyclable waste is provided by the local authority for small communities of dwellings this can still be used to demonstrate compliance.

Ref	Terms	Description
CN3.2	Accessible - reasonable distance to the facilities	Easy to access and within a reasonable distance to facilities. The distance will depend on the collection scheme prevalent in the country or locality and should permit easy transfer of recycled waste streams to the facility. As a baseline this should normally be taken as the recommended distance set out by local authority requirements or 50m from an external entrance for houses and blocks of flats where no other requirements are in place.
CN3.3	Areas not yet covered by a collection scheme	For the purposes of criterion 2 on page 322, the development can be considered as having a recycling scheme in place where a local authority or operator provides a local recycling scheme and confirms in a written statement that the recycling scheme will be provided to the development within one year of the completion date of the dwelling (or first phase of development for larger scale projects).
CN3.4	Recyclable household waste	For the purpose of this issue, the space needs to be compatible with the range of recyclable collections provided by the local authority; the following materials will therefore typically be considered: 1. Paper 2. Cardboard 3. Plastics 4. Glass 5. Metals (tins and cans) 6. Textiles (clothes and shoes) 7. Vegetable oils (from kitchen) 8. Batteries.
CN3.5	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.
CN3.6	Adequate external composting facilities	These must consist of an external storage bin for compostable waste or a composting container. The composting container must be specifically designed for composting and sited according to the manufacturer's instructions. Such containers should not be sited in close proximity of windows, doors, or ventilation intakes for habitable areas within the dwelling or surrounding dwellings. No requirements are set on the type of container or storage capacity required as this will be determined by the end user and predicted volumes of organic compostable waste. The assessor should be satisfied that, within reason, the installation is adequate for the size of the development, bearing in mind the likely quantity of organic waste that will be produced by the development.

Ref	Terms	Description
CN3.7	Community composting schemes	Existing and proposed community schemes are acceptable under this issue as long as they comply with all the specifications in the technical guide. The community scheme composting facility should be easily accessed from all dwellings served by the scheme, i.e. the householder would normally deliver the waste by foot. It is acceptable for the bin to be beside other recycling bins in a communal collection site as long as it is clearly identifiable as being connected to a licensed community scheme. The distance between the site entrance and the communal or community containers must not usually exceed 50m (if national regulations are in place and are more stringent, compliance with these is required).
CN3.8	Local authority green or kitchen waste collection schemes	A kitchen waste collection scheme run by the local authority is an acceptable alternative to communal or community composting facilities.

Evidence

Criteria	Interim design stage	Final post-construction stage
All	Drawings or a copy of the specification. Calculations to justify the size of the space allocated for external waste storage. Letters or a contract from the local authority or a private organisation where appropriate. Evidence for the existence of a community based adequate external space, set up and managed by the local authority, where applicable.	As design stage. As-built drawings or specifications (where applicable) OR written confirmation that the development has been constructed in accordance with the design stage drawings and specifications.

Additional information

Relevant definitions

Automated waste collection system

Some companies now offer a fully automated underground system, for the collection, sort and transport of waste. It allows for waste separation at the source, for different types of waste and from multiple locations, with enhanced hygienic, occupational health and safety standards. It also reduces the use of waste transport by lorries, reducing nuisance and CO_2 emissions, from fossil fuel consumption.

Composting

Composting is a natural process which converts organic waste into an earth-like mass by means of bacteria and micro-organisms. The composting process is also supported by larvae, wood lice, beetles, worms and other such creatures.

Communal or community composting

Communal or community composting is where a group of people share a composting system. The raw materials are provided by all who take part in the scheme, and the compost is then used in the community, either by individuals in their own gardens, or for use on larger projects within the local environment. The distance between the site entrance and the communal or community containers must not usually exceed 50m (or national regulations if these are more onerous).

The composting scheme must be compliant with all applicable legislation in the country of assessment.

Dedicated non-obstructive position

Ideally this would be in 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.

Local authority collection scheme

In these schemes the local authority is responsible for regular collection of household waste from the dwelling or its locality. This includes the collection of residual waste (waste not intended for recycling or composting) and recyclable household waste.

Private recycling scheme operator

A private recycling scheme operator can be appointed to collect recyclable materials where a local authority collection scheme is not in operation or where a landlord or occupier elects to go private, e.g. in some apartments.

Other information

None.

Wst 04 Speculative finishes

(offices and multiple dwellings only)

Number of credits available	Minimum standards
1	No

Aim

To encourage the specification and fitting of finishes selected by the building occupant and therefore avoid unnecessary waste of materials.

Assessment criteria

The following is required to demonstrate compliance:

One credit - Speculative finishes

1 For tenanted office areas (where the future occupant is not known), prior to full fit-out works, carpets, other floor finishes and ceiling finishes have been installed in a show area only.

2 In an office building developed for a specific occupant, that occupant has selected (or agreed to) the specified floor and ceiling finishes.

3 For multiple dwellings (where the future occupant is not known), floor, kitchen and bathroom finishes have been installed in a show area only.

4 In a residential building, future occupants have selected (or agreed to) at least three of the specified floor, kitchen and bathroom finishes (see Relevant definitions on page 329).

Checklists and tables

None.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	Both options - This issue is not applicable. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - Partially fitted and fully fitted		
CN2	Applicable assessment criteria - Single dwellings	Both options: This issue is not applicable. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
CN2.1	Applicable assessment criteria - Multiple dwellings	Both options: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
CN2.2	Occupant not involved	For dwellings where the occupant has no involvement with choosing the finishes, this credit cannot be awarded.
General		
CN3	General	None.

Methodology

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
All	Design drawings or relevant section or clauses of the building specification or contract or a letter from the client, project team or building user where the future occupant is known.	As design stage or the BREEAM Assessor's site inspection report and photographic evidence.

Additional information

Relevant definitions

Residential kitchen and bathroom finishes

1. Kitchen units (cabinets and counter tops):
2. Kitchen appliances
3. Kitchen wall finishes
4. Bathroom suites (bath, shower, basin, WC)
5. Bathroom wall finishes.

Show area

- Office buildings: either a floor plate or an individual office. However, to award this credit it must be less than 25% of the net lettable floor area.
- Residential buildings: a show home or apartment.

Other information

None.

Wst 05 Adaptation to climate change (all buildings)

Number of credits available	Minimum standards
1	No

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.

Assessment criteria

A number of BREEAM issues within the new construction scheme contain assessment criteria which aim to support mitigation of the impacts of extreme weather events arising from climate change. The main credit in this issue focuses on structural and fabric resilience not covered in other issues. An exemplary credit is awarded where a holistic approach to adaptation to climate change has been covered, demonstrated by achieving credits in other issues.

The following is required to demonstrate compliance:

One credit - Adaptation to climate change – structural and fabric resilience

1 Conduct a climate change adaptation strategy appraisal for structural and fabric resilience by the end of Concept Design (or equivalent), in accordance with the following approach:
  - 1.a Carry out a systematic (structural and fabric resilience specific) risk assessment to identify and evaluate the impact on the building over its projected life cycle from expected extreme weather conditions arising from climate change and, where feasible, mitigate against these impacts. The assessment should cover the following stages (see Methodology):
    - 1.a.i Hazard identification
    - 1.a.ii Hazard assessment
    - 1.a.iii Risk estimation
    - 1.a.iv Risk evaluation
    - 1.a.v Risk management
    - 1.a.vi Exemplary credit – Responding to adaptation to climate change.

Exemplary credit - Responding to adaptation to climate change

A holistic approach to the design and construction of the current building's life cycle, to mitigate against the impacts of climate change, is represented by the achievement of these criteria.

The following outlines the exemplary level criteria to achieve an innovation credit for this BREEAM issue:

2 Achievement of criterion 1 above, the structural and fabric resilience criterion in this issue, and the following criteria points or credits:

Hea 04 Thermal comfort

(Link to Wst 05 issue: to prevent increasing the risks of overheating)

— Hea 04 Thermal comfort: Criterion 6 has been achieved.

Hea 07 Hazards

(Link to Wst 05 issue: to reduce the risk of natural hazards which may be more severe due to climate change)

— The Hea 07 credit has been achieved.

Ene 01 Reduction of energy use and carbon emissions

(Link to Wst 05 issue: to maximise energy efficiency contributing to low carbon emissions resulting from increasing energy demands)

— At least eight credits in this issue have been achieved.

Ene 04 Low carbon design

(Link to Wst 05 issue: to maximise opportunities to avoid unnecessary carbon emissions)

— The passive design analysis credit in this issue has been achieved.

Wat 01 Water consumption

(Link to Wst 05: to minimise water demands in periods of drought)

— A minimum of three credits in this issue have been achieved.

Mat 05 Designing for durability and resilience

(Link to Wst 05 issue: to avoid increased risks of deterioration and higher maintenance demands)

— Criterion 2 relating to material degradation in this issue has been achieved.

Pol 03 Surface water run-off

(Link to Wst 05: to minimise the risks of increased flood risk and surface water run-off affecting the site or others)

— Flood risk — a minimum of one credit has been achieved.
— Surface water run-of f— two credits have been achieved.

Checklists and tables

None.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	**Adaptation to climate change – structural and fabric resilience** Both options: Criterion 1 on page 330is applicable. **Exemplary level criteria** Shell only: Criterion 2 on page 330is not applicable. Shell and core: Criterion 2 on page 330is applicable. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - Partially fitted and fully fitted		
CN2	Applicable assessment criteria - Single and multiple dwellings	Both options: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN3	Relevant bodies, see Hazard identification below.	This includes, but is not limited to the following: — Local authorities — Statutory bodies — Technical bodies.

Methodology

Hazard identification

1. Review the evidence and information from relevant bodies to identify and understand the expected impacts of increased extreme weather events from climate change on the building.
2. Identify likely hazards (see Relevant definitions on the facing page).

Hazard assessment

1. Determine the scale of the hazards identified.

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.

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 in health and safety, life cycle assessment and financial terms.

Risk management

1. Identify risk reduction measures.
2. Mitigate the hazards as far as is practically feasible.
3. Adapt the design or specification to incorporate the measures identified by the risk assessment in the final design.

Evidence

Criteria	Interim design stage	Final post-construction stage
All	A copy of the systematic risk assessment and any mitigation measures put in place.	As at design stage. BREEAM Assessor's site inspection report and photographic evidence.

Additional information

Relevant definitions

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

The ability of a building or structural system or material to withstand an accidental or exceptional loading or other incident without experiencing an undue degree of damage or decrease in performance, such that progressive collapse, loss of performance or a disproportionate degree of damage occurs.

Structural and fabric resilience

BREEAM defines this as 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 include:

1. Solar radiation
2. Temperature variation
3. Water or moisture
4. Wind
5. Precipitation, e.g. rain and snow
6. Extreme weather conditions: high wind speeds, flooding, driving rain, snow, rainwater ponding
7. Subsidence or ground movement.

Systematic risk assessment

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

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

Other information

This new BREEAM issue aims to encourage and support efforts to mitigate the future impacts of climate change on the building by considering a number of relevant factors during the design stages. BRE have avoided being overly prescriptive with the assessment criteria in order to allow a degree of flexibility in its application and demonstrating compliance, recognising that this is a complex environmental and design issue where solutions and approaches are largely influenced by site location and building specific factors. This places a greater emphasis on the BREEAM Assessor to use their judgment in determining whether the project team and the building design has met the aim and intent of the credit and its criteria, using appropriate project information to back their judgment. BRE will endorse the BREEAM Assessor's judgment through the quality assurance audit where a reasonable justification to award the credit on the basis of project team actions and proposed design solutions is evident. BRE would welcome any feedback on the application of this assessment issue to assist with the evolution of the criteria and inclusion of additional guidance on compliance in future BREEAM versions.

There are a number of UK reports and publications which also provide useful climate change adaptation principles for international projects including:

1. The National Adaptation Programme[70] report has been drawn up by the government, industry and other non-governmental 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.
2. The book "Design for climate change"[71] 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.
3. The BRE report[72], Potential implications of climate change in the built environment, discusses climate change adaptation strategies, including some for structural resilience.

Wst 06 Functional adaptability

(non-residential only)

Number of credits available	Minimum standards
1	No

Aim

To recognise and encourage measures taken to accommodate future changes of use of the building over its lifespan.

Assessment criteria

The following is required to demonstrate compliance:

One credit - Functional adaptability

1 A building-specific functional adaptation strategy study has been undertaken by the client and design team by completion of the concept design which includes recommendations for measures to be incorporated to facilitate future adaptation.

2 Functional adaptation measures (see examples in Table 51 on page 337) have been implemented in the design by completion of the technical design in accordance with the functional adaptation strategy recommendations, where practical and cost effective. Omissions have been justified in writing to the assessor.

Checklists and tables

None.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	Both options: All criteria relevant to the building type and function apply. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential -Partially fitted and fully fitted		

Ref	Terms	Description
CN2	Applicable assessment criteria - Single and multiple dwellings	Both options: This issue is not applicable. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN3	Functional adaptation strategy study	The functional adaptation strategy study should consider: 1. The potential for major refurbishment, including replacing the façade 2. Design aspects that facilitate the replacement of all major plant within the life of the building, e.g. panels in floors or walls that can be removed without affecting the structure, providing lifting beams and hoists 3. The degree of adaptability of the internal environment to accommodate changes in working practices 4. The degree of adaptability of the internal physical space and external shell to accommodate change in-use 5. The extent of accessibility to local services, such as local power, data infrastructure etc. For additional guidance, see Table 51 on the facing page
CN3.1	Functional adaptation implementation	The implementation will be specific to the building and scope of the project, but information should be made available to the assessor covering: 1. The feasibility for multiple or alternative building uses and area functions, for example, related to the structural design of the building 2. Options for multiple building uses and area functions based on design details, e.g. modularity 3. Routes and methods for major plant replacement, e.g. networks and connections have flexibility and capacity for expansion 4. Accessibility for local plant and service distribution routes, e.g. detailed information on building conduits and connections infrastructure 5. The potential for the building to be extended either horizontally, vertically or both.

Methodology

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
All	Functional adaptation strategy and implementation plan report.	As per interim design stage.

Additional information

Relevant definitions

Building functional adaptation

Work to an existing building that responds to a required change of use or requirements and goes beyond maintenance and repairs. These changes solve functional problems and could provide significant improvements. The functional adaptation works could include alterations, conversions or extensions.

Functional adaptability

The ability of a building to be adapted for a change in operational requirements within the same building type, or for use as a different building type.

Other information

Table 51 below provides examples of functional design measures that may be adopted for each assessment part when considering accessibility, spatial adaptability and expandability.

Table 51: Design measures allowing future adaptation

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

Land use and ecology

Summary

This category encourages sustainable land use, habitat protection and creation, and improvement of long term biodiversity for the building's site and surrounding land. Issues in this section relate to the reuse of brownfield sites or those of low ecological value, mitigation and enhancement of ecology and long term biodiversity management.

Category summary table

Issue	Credits	Credit summary
LE 01 Site selection	3	— To encourage the use of previously occupied or contaminated land and avoid land which has not been previously disturbed.
LE 02 Ecological value of site and protection of ecological features	2	— To encourage development on land that already has limited value to wildlife and to protect existing ecological features from substantial damage during site preparation and completion of construction works.
LE 03 Minimising impact on existing site ecology	N/A	
LE 04 Enhancing site ecology	3	— To encourage actions taken to enhance the ecological value of the site as a result of development.
LE 05 Long term impact on biodiversity	2	— To minimise the long term impact of the development on the site and the surrounding area's biodiversity.

LE 01 Site selection

(all buildings)

Number of credits available	Minimum standards
3	No

Aim

To encourage the use of previously occupied or contaminated land and avoid land which has not been previously disturbed.

Assessment criteria

This issue is split into two parts:

- Previously occupied land (2 credits)
- Contaminated land (1 credit)

The following is required to demonstrate compliance:

Up to two credits - Previously occupied land

1 A percentage of the proposed development's footprint is on an area of land which has previously been occupied by industrial, commercial or domestic buildings or fixed surface infrastructure.

Table 52: Percentage of proposed development's footprint on previously developed land

Percentage of the proposed development's footprint on previously developed land	Credits
75%	1
95%	2

One credit - Contaminated land

2 The site is deemed to be significantly contaminated, i.e. could not be developed or built to the proposed end use without remediation. This can either be confirmed by a contaminated-land professional or identified using Checklist A7 on page 442.

3 The more onerous of these criteria have been adopted:
   3.a Nationally recognised guidance for site investigation, risk assessment and appraisal of contaminated land as set out in the regulations or a nationally recognised code of practice OR
   3.b A robust site investigation, risk assessment and appraisal have been undertaken, in accordance with the requirements of Checklist A7 on page 442 (as a minimum).

4 The client or principal contractor confirms that remediation of the site will be carried out in accordance with the recommended remediation strategy and its implementation plan (defined in Checklist A7 on page 442) as set out by the contaminated-land professional and any relevant national or other legislation.

Checklists and tables

None.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	Both options: All criteria relevant to the building type and function apply. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - Partially fitted and fully fitted		
CN2	Applicable assessment criteria - Single and multiple dwellings	Both options: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN3	Temporary works. See criterion 1 on the previous page	Undeveloped areas of the site to be used for temporary works (e.g. temporary offices or parking, material or machinery storage) must be considered as development on undeveloped land and therefore included in the calculations unless they have been defined as 'land of low ecological value' in accordance with BREEAM issue LE 02 Ecological value of site and protection of ecological features on page 344.
CN3.1	Infill development. See criterion 1 on the previous page	New buildings developed within the boundary of existing sites do not automatically comply with the reuse of land criteria. The land on which at least 75% or 95% of the new building will be sited must meet the definition of previously developed.
CN3.2	Prior decontamination. See criteria 2 and 3 on the previous page	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.
CN3.3	Large sites split into smaller plots. See criteria 2 and 3 on the previous page	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.

Ref	Terms	Description
CN3.4	Health and safety related decontamination. See criteria 2 and 3 on page 339	Contaminated land that has been decontaminated solely for health and safety reasons (rather than for the specific purpose of redevelopment) does not comply.
CN3.5	Asbestos. See criteria 2 and 3 on page 339	Where the only remediation required is the removal of asbestos within an existing building fabric, the site cannot be classified as contaminated land. However, where asbestos is found to be present in the ground this will be classed as contamination for the purposes of assessing this issue.
CN3.6	Checklist A7 on page 442	Checklist A7 on page 442 indicates the likelihood of significant contamination problems on a site for the purposes of a BREEAM assessment. It also sets out the scope of any preliminary investigation, site investigation and remedial strategy. It does not seek to evaluate types, levels or risks of contamination present on the site.
Building specific		
CN4	Education (schools only). Playing fields. See criterion 1 on page 339	Development of a playing field within the construction zone can be counted as development on previously occupied land only if an equivalent area of playing field is reinstated within one year of the completed construction works; and where such reinstatement will not encroach on land of high ecological value as defined in BREEAM issue LE 02 Ecological value of site and protection of ecological features on page 344

Methodology

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
1	Design drawings (including existing site plan), report or site photographs.	BREEAM Assessor's site inspection report and photographic evidence or as-built drawings. Where alteration has occurred, the percentage must be recalculated using as-built plans.

Criteria	Interim design stage	Final post-construction stage
2–4	A completed copy of the relevant sections of Checklist A7 on page 442. Existing site plans showing contaminated areas to be remediated in relation to any proposed development. A copy of the contaminated-land professional's report. A letter from the principal contractor or remediation contractor confirming: 1. The remediation strategy for the site 2. 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.	As design stage with information for the as-built situation.

Additional information

Relevant definitions

Construction zone

For the purpose of this BREEAM issue the construction zone is defined as any land on the site which is being developed (and therefore disturbed) for buildings, hardstanding, soft landscape, site access plus a 3m wide zone measured outward from the boundary. It also includes any areas used for temporary site storage and buildings. If it is not known exactly where buildings, hardstanding, site access and temporary storage will be located it must be assumed that the construction zone is the entire site.

Contaminated land or site

Land that could not be legally or safely developed or built on to the proposed end use without the remediation of contamination. Contamination is defined as any substance or agent in, or on the ground within the construction zone, 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.

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.

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[73] definition of previously developed land). 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).

Proposed development

Any development (building, hard landscaping, car park and access roads) that falls within the boundary of the assessed site.

Remediation

Activity undertaken to prevent, minimise, remedy or mitigate the risk caused by contaminated land to human health or the environment.

Other information

None.

LE 02 Ecological value of site and protection of ecological features (all buildings)

Number of credits available	Minimum standards
2	No

Aim

To encourage development on land that already has limited value to wildlife and to protect existing ecological features from substantial damage during site preparation and completion of construction works.

Assessment criteria

This issue is split into two parts:

- Ecological value of site (1 credit)
- Protection of ecological features (1 credit)

The following is required to demonstrate compliance:

One credit - Ecological value of site

1 Land within the assessment zone is defined as 'land of low ecological value' using either:

  1.a The BREEAM checklist (Table 53 on the facing page) for defining land of low ecological value (see Checklists and tables on the facing page)

  OR

  1.b A suitably qualified ecologist (SQE) who has identified the land as being of 'low ecological value' within an ecological assessment report, based on a site survey. See the BREEAM definition of a Suitably qualified ecologist (SQE) on page 349.

One credit - Protection of ecological features

2 All existing features of ecological value (see Relevant definitions on page 349) within the assessment zone and site boundary area are adequately protected from damage during clearance, site preparation and construction activities (see CN3 on page 347).

3 In all cases, the principal contractor is required to construct ecological protection recommended by the SQE, prior to any preliminary site construction or preparation works (e.g. clearing of the site or erection of temporary site facilities).

Checklists and tables

BREEAM checklist for defining land of low ecological value

If the answer to all questions in the checklist is 'no', the land can be defined as having a low ecological value and the credit awarded. Should any of the questions be answered 'yes', the credit can only be awarded on confirmation from a SQE that the site is of low ecological value.

The checklist should be completed by either the BREEAM Assessor, using appropriate evidence submitted by the design team or completed by the design team and submitted to the assessor along with appropriate supporting evidence. The answers to the checklist must be based on an evaluation of the site prior to any site clearance or construction activities (refer to Compliance notes on the next page for further details).

Table 53: BREEAM checklist for defining land of low ecological value

ID	Question	Yes	No
Q1	Have any of the following local organisations identified possible ecological value on the site, all relevant bodies must be contacted before responding to the question? 1. The appropriate statutory body 2. Nature or conservation groups.	❑	❑
Q2	Is the development within 2km of a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long term conservation of nature with associated ecosystem services (e.g. Ramsar site)? The following sources of information are not exhaustive but can be used to check local land use 1. http://www.protectedplanet.net/ 2. Appropriate statutory body websites 3. Maps that show specific sites and provide information on local policies relating to that site.	❑	❑
Q3	Is the development within 500m of a designated area? The following sources of information are not exhaustive but can be used to check local land use: 1. http://www.protectedplanet.net 2. Appropriate statutory body websites 3. Maps that show specific sites and provide information on local policies relating to that site.	❑	❑

ID	Question	Yes	No
Q4	Are any of the following habitats present on, or within 100m of the construction zone? The following list is not exhaustive, but provides guidance on the type of habitat BREEAM defines as having ecological value: 1. Woodland (e.g. high forest, coppice, scrub)* 2. Water courses (e.g. rivers, streams or canals)** 3. Wetlands (e.g. swamps, marshes, wet grasslands, peatlands, oases, estuaries, deltas, tidal flats, near-shore marine areas, mangroves, coral reefs, and human-made sites such as fish ponds, rice paddies, reservoirs, and salt pans) 4. Grassland (e.g. steppe, prairie, pampas, meadow, veld, campos, savannah, heathland, bogs, etc.) 5. Dwarf shrub habitat (e.g. heathland, moorland, maquis) 6. Arid, semi-arid desert*** 7. Any other habitats considered to have ecological value.	❑	❑
Q5	Are any of the following features present within or on the boundary of the construction zone? 1. Mature or semi-mature trees 2. Mature hedgerow or mature planting marking a boundary (field hedgerows over 1m tall and 0.5m wide)**** 3. Existing buildings (occupied or derelict) that may provide shelter for wildlife.	❑	❑
Notes: * Woodland is defined as 'having over 25% canopy cover of trees and shrubs, over a metre high'. ** Broad habitats of rivers and streams are defined as running watercourses ranging from small headwater streams to large rivers. This broad habitat, along with wetlands, includes the open water itself and the vegetation along the water's edge. *** UNEP confirms deserts are unique, highly-adapted natural ecosystems, both providing life-supporting services on the planet and supporting human populations in much the same ways as in other ecosystems **** A hedge is defined as 'a line of woody vegetation that has been subject to management so that trees no longer take their natural shape.'			

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	Both options: All criteria relevant to the building type and function apply. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - Partially fitted and fully fitted		
CN2	Applicable assessment criteria - Single and multiple dwellings	Both options: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.

Ref	Terms	Description
General		
CN3	Protecting features of ecological value	Where the following features of ecological value exist on site and are being retained they should be protected as detailed below: — Trees of over 100mm trunk diameter, stands of trees, and trees of significant ecological value, are protected by barriers. Barriers must prohibit construction works in the area between itself and the tree trunk. The minimum distance between the tree trunk and barriers must be either the distance of branch spread or half tree height, whichever is the greater. Trees are protected from direct impact and from severance or asphyxiation of the roots. — Coastal developments, watercourses, wetland areas, areas of freshwater and known groundwater wells should be protected by cut-off ditches and site drainage to prevent run-off to minimise risk of pollution, silting or erosion. — Fenced exclusion zones should be maintained around all mangrove stands (landward side) that are being retained to minimise the risk of workforce machinery damage of these sensitive habitats. Activity on the seaward side of mangroves should be avoided where possible and closely monitored and controlled. Confirmation is required that mangrove stands would not be exposed to prolonged drought or waterlogging from changes in water levels as a result of construction activities. — Other ecological features and natural areas requiring protection must either have barriers erected and be protected, or, when remote from site works or storage areas, be protected with a prohibition of construction activity in the vicinity.
CN3.1	No features of ecological value. See criterion 2 on page 344	Where there are no features of ecological value, the credit for the protection of ecological features can only be awarded if the assessment zone is defined as 'land of low ecological value'.
CN3.2	Use of a SQE See criterion 1 on page 344	Where a SQE is employed and has, using their professional judgment, defined the site as land of low ecological value, this assessment or judgment overrides any assessment determined using the BREEAM checklist for defining land of low ecological value. The SQE must base their findings on data collected from a site visit conducted at appropriate times of the year, when different plant and animal species are evident. The content of the ecology report is to be representative of the existing site's ecology prior to the commencement of initial site preparation works (i.e. before construction). Where the ecologist has not visited the site at the appropriate times the credit cannot be awarded (except in the circumstances indicated below in CN3.4 on the next page.
CN3.3	Features of little or no ecological value. See criterion 2 on page 344	If a SQE has confirmed that a feature present on the site has little or no ecological value (see Relevant definitions on page 349), or where a tree is deemed to create a significant danger to the public or occupants by a statutory body or qualified arboriculturalist, then that feature may be exempt from the 'protection of ecological features' requirement of this issue.

Ref	Terms	Description
CN3.4	Prior removal of features of ecological value	If features of ecological value have been removed as part of the site clearance activities then the development cannot achieve the credits, even if they are to be replaced as part of a new soft landscape strategy.
CN4	Site clearance prior to purchase of the site. See criterion 1 on page 344	For sites cleared prior to purchase of the site and less than five years before assessment, a SQE should estimate the site's ecological value immediately prior to clearance using available desktop information (including aerial photography) and the landscape type or area surrounding the site. Where it is not possible for the ecologists to determine that the site was of low ecological value prior to the site clearance then the credits must be withheld, i.e. where there is no evidence and therefore justification for awarding the credits. For sites cleared more than five years ago, the ecological value of the site is to be based on the current situation on the basis that within five years, ecological features would have started to re-establish themselves and therefore act as an indicator of the site's ecological value.
CN4.1	Verification of a report written by an ecologist not meeting the BREEAM SQE criteria. See criterion 1.b on page 344.	Where a SQE is verifying an ecology report produced by another ecologist who does not meet the SQE criteria, they must, as a minimum, review the report and confirm in writing that they have found it to: 1. Represent sound industry practice 2. Report and recommend correctly, truthfully and objectively 3. Be appropriate given the local site conditions and scope of works proposed 4. Avoid invalid, biased and exaggerated statements. Additionally, written confirmation from the third party verifier that they comply with the definition of a SQE is required.

Methodology

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
All	A completed copy of Table 53 on page 345 signed and dated by the client or a design team member AND EITHER Plans, site photographs and specifications confirming presence, or otherwise, of ecological features and the protection measures specified OR Ecologist's report highlighting information required in accordance with Guidance Note 13 – Relating ecologist's report to BREEAM.	As design stage BREEAM Assessor's site inspection report and photographic evidence OR Ecologist's report confirming: 1. The boundary of the site and the construction zone has not been altered 2. Where applicable, all existing ecological features still remain.

Additional information

Relevant definitions

Appropriate statutory body

This refers to the statutory or legal organisation, or entity, whose duty it is to carry out the planning approval function for the development area.

Assessment zone

For the purpose of this BREEAM issue the assessment zone is defined as any land on the site which is being developed (and therefore disturbed) for buildings, hardstanding, soft landscaping, site access, plus a 3m wide zone measured outward from the boundary around these areas irrespective of site boundary. It also includes any areas used for temporary site storage and buildings. If it is not known exactly where buildings, hardstanding, site access and temporary storage will be located it must be assumed that the construction zone is the entire site.

Ecology related subject

Depending on the ecological content (minimum 60%), the following degrees might be considered relevant: Ecology, Biological Sciences, Zoology, Botany, Countryside Management, Environmental Sciences, Marine and Freshwater Management, Earth Sciences, Agriculture, Forestry, Geography, Landscape Management.

Features of ecological value

Features requiring protection during site clearance and construction to maintain their presence and ecological value, which include as a minimum:

1. Trees determined to be of value using one of the following measures
   a. More than 10 years old (or where age is unknown where the trunk diameter is over 100mm)
   b. Tree of significant ecological value as defined in BS 5837: 2012 by the SQE or qualified arboriculturalist
2. Hedges and natural areas requiring protection
3. Watercourses and wetland areas
4. Nesting or roosting opportunities for birds or bats within the building.

Note: Where a tree is deemed to create a significant danger to the public or occupants by a statutory body or qualified arboriculturalist, then that feature may be exempt from the 'protection of ecological features' requirement of this issue.

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 in ecology or a related subject comprising a significant ecology component.
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. The relevant experience must relate to the country that the assessment is being carried out in.

Other information

Very often there is the potential for a site to increase its biodiversity value through appropriate design and management, regardless of whether enhancing biodiversity is required to gain planning consent. This BREEAM assessment issue provides the opportunity to reward those projects that contribute to protecting and enhancing biodiversity, improve living environments and meet environmental objectives.

The SQE's recommendations may have an impact on specifications worked up by other design team members, such as landscape architects or drainage engineers. BREEAM recommends that collaborative input between the ecologist and relevant professionals is sought from the concept stage of the development to highlight opportunities and constraints and allow effective integration of these aspects into the ecologist's recommendations.

The World Database on Protected Areas (WDPA) contains information from various organisations such as national governments, non-governmental organisations, academic institutions, international biodiversity convention secretariats, etc. The data and maps can be used for environmental impact analysis and private sector decision-making when areas of ecological value could be impacted.

Relating ecology reports to BREEAM

Guidance on relating ecology reports to BREEAM is available in Guidance Note 13 on the BREEAM website.

LE 03 Minimising impact on existing site ecology

This issue is not applicable to BREEAM International New Construction Version 6.

LE 04 Enhancing site ecology

(all buildings)

Number of credits available	Minimum standards
3	No

Aim

To encourage actions taken to enhance the ecological value of the site as a result of development.

Assessment criteria

This issue is split into two parts:

- Ecologist's report and recommendations (1 credit)
- Increase in ecological value (2 credits)

The following is required to demonstrate compliance:

One credit - Ecologist's report and recommendations

1 A SQE has been appointed by the client or their project representative no later than the conclusion of the design brief, i.e. the ecologist is appointed at the beginning of Concept Design stage.

2 The SQE has provided an ecology report with appropriate ecological recommendations (see Relevant definitions on page 354) for the enhancement of the site's ecology at Concept Design stage. The report is based on a site visit or survey by the SQE (see also CN2.1 on the facing page).

3 At least 50% of the recommendations within the ecology report for enhancement of site ecology have been, or will be, implemented in the final design and build.

Up to two credits - Increase in ecological value

4 Criteria 1 above and 2 above are achieved.

5 A percentage of the recommendations within the ecology report for enhancement of site ecology have been, or will be, implemented in the final design and build.

Table 54: Percentage of recommendations within ecology report implemented

Percentage of ecology report recommendations implemented	Credits
75%	1
95%	2

Checklists and tables

None.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	Both options: All criteria relevant to the building type and function apply. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - Partially fitted and fully fitted		
CN1.1	Applicable assessment criteria - Single and multiple dwellings	Both options: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN2	Early stage involvement from the SQE. See criterion 1.	The role of the SQE during the Preparation and Brief stage will be to advise on early stage site layout and development density decisions so that opportunities to enhance site ecology are maximised. SQE involvement at the Concept Design stage will be necessary to provide more detailed ecological recommendations (see Relevant definitions on the next page) based on the outline design.
CN2.1	Timing of ecologist's survey and report. See criterion 2.	The SQE must carry out site surveys of existing site ecology, on which their report is based (or to provide verification where the report is prepared by others) at the Concept Design stage in order to facilitate and maximise potential ecological enhancement.
CN2.2	Guidance for ecologists and assessors	Guidance on relating ecology reports to BREEAM is available in Guidance Note 13 on the BREEAM website.
CN2.3	Infill construction on existing sites with limited space for ecological enhancements or overriding security requirements. See criterion 1.	Where it is not possible to implement ecological enhancements within the construction zone due to overriding security issues, or where space for ecological enhancements within the zone is severely limited, ecological enhancements made to other areas of the site can be taken into account and used to determine the number of BREEAM credits achieved. These enhancements must be made within the boundary of the wider existing development and be planned and commissioned on a similar timescale to the assessed development. Examples of instances where this Compliance note may apply include new 'infill' building developments within existing college and higher education campuses, retail or business parks.

Methodology

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
All	The SQE's report highlighting information required in Guidance Note 13 or a copy of Guidance Note 13 completed by the ecologist. Design drawings including proposed and existing (pre-development) site plan or survey. Written confirmation from the client or design team confirming how the ecologist's recommendations will be implemented.	As design stage requirements. BREEAM Assessor's site inspection report and photographic evidence confirming planting in accordance with design stage plan. Relevant section or clauses of the building specification or contract or a letter from the client or principal contractor confirming the planting will be completed within 18 months from completion of the development*. * This is for large mixed-use or multi-building developments, where the whole site has not been completed and ecological enhancements have not yet been added, or where features are being added at a later date in an appropriate planting season.

Additional information

Relevant definitions

Ecological recommendations

Ecological recommendations are defined as measures adopted to enhance the ecology of the site. These are measures that the ecologist reasonably expects can be implemented, considering their feasibility taking into account building or site constraints. Measures may include but are not limited to:

1. The planting of locally appropriate native species or non-native species with a known attraction or benefit to local wildlife
2. The adoption of horticultural good practice (e.g. no, or low, use of residual pesticides)
3. The installation of bird, bat or insect boxes at appropriate locations on the site
4. Development of a full biodiversity management plan including avoiding clearance or works at key times of the year (e.g. breeding seasons)
5. The proper integration, design and maintenance of sustainable drainage systems (SuDS) (such as rain gardens), green roofs, green walls, community orchards, community allotments etc.

Other information

None.

LE 05 Long term impact on biodiversity

(all buildings)

Number of credits available	Minimum standards
2	No

Aim

To minimise the long term impact of the development on the site and the surrounding area's biodiversity.

Assessment criteria

The following is required to demonstrate compliance:

Up to two credits

1 Where a SQE is appointed prior to commencement of activities on site and they confirm that all relevant EU, local and national regulations or legislation requirements relating to the protection and enhancement of ecology have been complied with during the design and construction process.

2 Where a landscape and habitat management plan, appropriate to the site (including impacts of the building both during construction and in operation), is produced covering at least the first five years after project completion. This is to be handed over to the building owner or occupants and includes:
- 2.a Management of any protected features on site
- 2.b Management of any new, existing or enhanced habitats
- 2.c A reference to any current or future legislation requirements (local, national or regional) that apply to the site regarding the protection of species and habitats (and where applicable refer to biodiversity action strategies or action plans)
- 2.d Confirmation from the SQE that all relevant aspects of ecology are included within the plan.

3 Where additional measures to improve the assessed site's long term biodiversity are adopted, according to Table 55 on the next page.

Where criteria 1 above to 3 above are met credits can be awarded as follows:

No. of credits	No. of additional measures
1	2
2	4

Where the SQE confirms that some of the additional measures listed in Table 55 on the next page are not applicable to the assessed development, the credits can be awarded as follows:

	Applicable additional measures				
	All	**4**	**3**	**2**	**1**
Credits	**Number of additional measures to assess**				
1	2	2	2	N/A	N/A
2	4	4	3	2	1

Checklists and tables

Table 55: Additional measures for the improvement of long term biodiversity

Ref	Additional measure for the improvement of long term biodiversity
1	The principal contractor nominates a biodiversity champion with the authority to influence site activities and ensure that detrimental impacts on site biodiversity are minimised in line with the recommendations of a SQE.
2	The principal contractor trains the site workforce on how to protect site ecology during the project. Specific training must be carried out for the entire site workforce to ensure they are aware of how to avoid damaging site ecology during operations on site. Training should be based on the findings and recommendations for protection of ecological features highlighted within a report prepared by a SQE.
3	The principal contractor records actions taken to protect biodiversity and monitor their effectiveness throughout key stages of the construction process. The requirement commits the principal contractor to make such records available where publicly requested.
4	Where a new ecologically valuable habitat appropriate to the local area is created. This includes a habitat that supports nationally, regionally or locally important biodiversity, or which is nationally, regionally or locally important itself. Local biodiversity expertise should be sought before the end of the Concept Design stage to help identify species of local biodiversity importance on site and ensure that the proposals support local priorities.
5	Where flora and fauna habitats exist on site, the contractor programmes site works to minimise disturbance to wildlife. For example, site preparation, ground works, and soft landscape works have been, or will be, scheduled at an appropriate time of year to minimise disturbance to wildlife. Timing of works may have a significant impact on, for example, breeding birds, flowering plants, seed germination, amphibians etc. Actions such as phased clearance of vegetation may help to mitigate ecological impacts. This additional requirement will be achieved where a clear plan has been produced detailing how activities will be timed to avoid any impact on site biodiversity in line with the recommendations of a SQE.

Ref	Additional measure for the improvement of long term biodiversity
6	**Education buildings (preschools, schools and colleges only)** A partnership has been set up by the design team with a local group that has wildlife expertise and the group has: 1. Provided advice early in the design process regarding protecting and providing habitats for species of local importance on the site 2. Provided advice to ensure the design is in keeping with the local environment. In particular this should draw on their local knowledge of any features or species of ecological interest on or near the site 3. Provided, or will continue to provide, ongoing support and advice to the educational establishment to help them manage, maintain and develop the outdoor space in the longer term.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	Both options: All criteria relevant to the building type and function apply. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - Partially fitted and fully fitted		
CN2	Applicable assessment criteria - Single and multiple dwellings	Both options: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN3	Where additional measures are not applicable. See criterion 3 on page 355.	In all cases it is necessary to employ a SQE to achieve credits for this BREEAM issue. As a minimum the SQE must provide the following in writing: 1. Confirmation that criteria 1 and 2 on page 355 have been achieved 2. Clarification of how many of the additional measures for criterion 3 on page 355 are applicable and have been achieved 3. Guidance on how to achieve additional measure 4 (where possible). Where the SQE confirms that none of the additional measures are applicable (due to the nature of the site and its surroundings) full credits can be awarded for demonstrating compliance with criteria 1 and 2 on page 355.
Building specific		

Ref	Terms	Description
CN4	Education (preschool and school buildings only). Additional measure 6: Ongoing support and advice	This could take the form of meetings several times a year with a staff or pupils or students working party to help them plan conservation and ecological enhancement work, or activities relating to the ecology in or near the school or college grounds.

Methodology

None.

Evidence

Criteria	Interim design stage	Final post-construction stage
1–3	Ecologist's report highlighting information required in Guidance Note 13 or a copy of Guidance Note 13 completed by the ecologist AND EITHER A copy of the site's landscape and habitat management plan OR The relevant section or clauses of the building specification or contract confirming its development and scope OR A letter from the client confirming a commitment to produce the management plan and its scope.	A letter from the SQE confirming that all relevant legislation relating to protection and enhancement of ecology has been complied with. A copy of the site's landscape and habitat management plan.
Additional measures		
1	The relevant section or clauses of the building specification or contract or an appointment letter from the contractor.	Assessor inspection of, or a copy of the relevant sections of the site log book confirming the details of any action or events taken by the biodiversity champion. If no actions were required or taken, this should be confirmed in the log book.
2	Training schedule or letter of confirmation from the principal contractor committing to provide relevant training OR A copy of the specification clause requiring the training of the site's workforce by the principal contractor.	A record of training undertaken including the necessary details.

Criteria	Interim design stage	Final post-construction stage
3	A letter from the principal contractor confirming monitoring and reporting criteria for the development OR A copy of the specification clause requiring the principal contractor to undertake monitoring and reporting.	BREEAM Assessor's (or SQE's) site inspection report and photographic evidence confirming the existence of the proposed habitat.
4	A copy of the proposed site plan highlighting the new ecologically valuable habitat and the SQE's report or letter confirming that the habitat supports the relevant biodiversity action plans.	BREEAM Assessor's (or SQE's) site inspection report and photographic evidence confirming the existence of the proposed habitat.
5	The SQE's report or letter confirming actions required with respect to programming site works to minimise disturbance. The principal contractor's programme of works OR The relevant section or clauses of the building specification or contract confirming that the programme of site works will minimise disturbance to wildlife in accordance with the SQE's recommendations.	A letter from the SQE, or a copy of their report confirming site works were executed in a manner that minimised disturbance to wildlife in accordance with their recommendations.
6	Documentary evidence from the design team or wildlife group confirming: 1. Scope of the partnership 2. Details and remit of the wildlife group 3. A description of the process for ongoing support that the group commit to give to the partnership 4. Details of the meetings and actions to date.	Documentary evidence from the design team or wildlife group detailing, as a minimum, meetings, actions, advice given, framework for future support including a timetable for meetings and events.

Additional information

Relevant definitions

Biodiversity

Biodiversity is defined as the variety of life on earth. It includes all species, animal, plants, fungi, algae, bacteria and the habitats that they depend upon.

Biodiversity action plan

A plan which sets specific, measurable, achievable, realistic and time bound conservation targets for species and habitats.

Biodiversity champion

An individual formally tasked by the principal contractor with the responsibility for monitoring and influencing site activities and minimising detrimental impacts on biodiversity. The individual must have sufficient authority and knowledge of ecology and construction, and also spend sufficient time on site in order to carry out the role. The biodiversity champion need not be an ecologist or ecological expert. This may be the same person as the sustainability champion in Man 03 Responsible construction practices on page 56.

Local group with wildlife expertise

A local group with wildlife expertise could be the local Wildlife Trust or an alternative group that has been involved in local wildlife conservation or enhancement projects.

Suitably Qualified Ecologist (SQE)

Refer to LE 02 Ecological value of site and protection of ecological features on page 344

Other information

Guidance on relating ecology reports to BREEAM is provided in Guidance Note 13 available on the BREEAM website.

The following are examples of what to include in long term management plans for habitats, species and biodiversity features:

1. Description and evaluation of features to be managed
2. Ecological trends and constraints on site that could influence management
3. Aims and objectives of management
4. Appropriate management options for achieving aims and objectives
5. Prescriptions for management actions
6. Preparation of a work schedule (including an annual work plan capable of being rolled forward over a five year period)
7. Body or organisation personnel responsible for implementation of the plan
8. Monitoring and remedial measures
9. Funding resources and mechanisms to ensure sustainable long term delivery of the proposed management.

The level of detail required for any given site should be that which is necessary to ensure the effective management of the biodiversity features present.

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.

Category summary table

Issue	Credits	Credit summary
Pol 01 Impact of refrigerants	4	— Avoidance or reduction of the impact of refrigerants through specification and leak prevention or detection.
Pol 02 NOx emissions	2	— Reduction in emissions of NO_x arising from the building's space and water heating systems.
Pol 03 Surface water run-off	5	— Development of sites with a low probability of flooding where the design minimises the impact of flooding through careful master-planning. — Surface water run-off is managed to be no worse than the pre-development scenario. — Watercourse pollution prevention systems are in place.
Pol 04 Reduction of night time light pollution	1	— External light pollution is eliminated through effective design or the removal of the need for unnecessary external lighting.
Pol 05 Reduction of noise pollution	1	— Measures to reduce the likelihood of disturbance arising as a result of noise from fixed installations on the development.

Pol 01 Impact of refrigerants

(all buildings)

Number of credits available	Minimum standards
4	No

Aim

To reduce the level of greenhouse gas emissions arising from the leakage of refrigerants used to heat or cool the building.

Assessment criteria

This issue is split into two parts:

- Buildings that use no refrigerants (including connection to systems off site) (all available credits)
  OR
- For buildings that use refrigerants:
  - Prerequisite
  - Ozone depletion potential (1 credit)
  - Impact of refrigerant (1 to 2 credits)
  - Leak detection (1 credit)

The following is required to demonstrate compliance:

All available credits - No refrigerant use

1 Where the building does not require the use of refrigerants within its installed plant or systems, or any off-site system it is connected to.

OR alternatively, where the building does require the use of refrigerants, all the available credits can be awarded as follows:

Prerequisite

2 All systems (with electric compressors) must comply with the requirements of EN 378:2008+A2:2012[74] (parts 2 and 3) or ISO 5149:2014[75] and where refrigeration systems containing ammonia are installed, the Institute of Refrigeration Ammonia Refrigeration Systems Code of Practice[76]

One credit - Ozone depleting potential (ODP)

3 The refrigerants used must have an ozone depleting potential of zero.

Two credits - Impact of refrigerant

4 Where the systems using refrigerants have Direct Effect Life Cycle CO_2 equivalent emissions (DELC CO_2-eq) of ≤ 100 kg CO_2-eq/kW cooling or heating capacity. To calculate the DELC CO_2-eq., please refer to Relevant definitions on page 367 and Methodology on page 364. OR

5 Where air-conditioning or refrigeration systems are used to heat or cool the building the refrigerants used have a Global Warming Potential (GWP) ≤ 10.

OR

One credit - Impact of refrigerant

6 Where the systems using refrigerants have Direct Effect Life Cycle CO_2 equivalent emissions (DELC CO_2-eq) of ≤ 1000 kg CO_2-eq/kW cooling or heating capacity.

One credit - Leak detection

7 Where systems using refrigerants have a permanent automated refrigerant leak detection system installed; OR where an inbuilt automated diagnostic procedure for detecting leakage is installed. In all instances a robust and tested refrigerant leak detection system must be installed and must be capable of continuously monitoring for leaks.

8 The system must be capable of automatically isolating and containing the remaining refrigerant charge in response to a leak detection incident (see Other information on page 368).

Checklists and tables

None.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	Shell only: This issue is not applicable. Shell and core: All criteria relevant to the building type and function apply. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
CN1.1	Avoiding the need for refrigerants	Shell and core: If the building is designed in such a way that it avoids the need for refrigerant containing building services or connection to off-site systems, and therefore no 'refrigerant-using' building services or systems will be specified for the fit-out, then the available credits can be awarded by default.
Residential - Partially fitted & Fully fitted		
CN2	Applicable Assessment criteria - Single and multiple dwellings	Both options: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN3	Industrial buildings without offices & with untreated operational areas	This issue will be filtered from the scope of assessment for industrial units designed without offices and where the operational area will be untreated, i.e. not designed to be air-conditioned or contain a cold storage facility with refrigeration plant.

Ref	Terms	Description
CN3.1	Country regulations on the use of Ozone Depleting Substances (ODS)	Where legislation within the country of assessment prohibits the use of ozone depleting substances in new refrigeration systems, the credit for using substances with an ozone depletion potential of zero will be filtered out of the assessment. At the time of writing all European countries are known to fall into this category.
CN3.2	Refrigerant charge of less than 6kg	For installations of small multiple hermetic systems only where the refrigerant charge in each unit is less than 6kg, the credit for leak detection and containment can be awarded by default. This is on the basis that the risk of a large refrigerant leak due to system failure is minimised, as individual leaks from each system will be small where leakage occurs, and therefore there is little life cycle benefit of requiring leak detection equipment on each small system. Note: solutions such as this may be less energy efficient and as such may impact on the achievement of credits under .
CN3.3	Specification of multiple systems	Where more than one air-conditioning or refrigeration system is servicing the building, the assessor must source the relevant technical data for each system and enter it into the Pol 01 calculator. The calculator will then determine the weighted average DELC for the multiple installation and the BREEAM credits can be awarded or withheld accordingly.
CN3.4	Leak detection. See criteria 7 and 8 on the previous page.	The refrigerant leak detection criteria are still applicable in instances where any type of non-solid refrigerant is present, i.e. even if the refrigerant meets BREEAM's DELC CO_2-eq benchmarks. Exceptions to this are systems that use natural and environmentally benign refrigerants, such as air and water (for example lithium bromide or water absorption chillers) and installations of small multiple hermetic systems, where CN3.2 above applies. These types of system and refrigerants will achieve the leak detection credit by default.
CN3.5	ODP data not available	Where ODP data for the specified refrigerant are not available, the credit cannot be awarded on a default basis.

Methodology

The number of Pol 01 BREEAM credits achieved is determined by the assessor using the BREEAM Pol 01 calculator.

The Direct Effect Life Cycle CO_2-eq emissions (DELC) per kW of cooling and heating capacity are calculated using the following equation:

$$\frac{[RLO+RLSR] \text{ x } GWP}{CC}$$

Where:

Refrigerant loss operational (RLO) = (Ref_{charge} x $Sys_{op\text{-}life}$ x (L1 + L2 + S1 + S2))/100

Refrigerant loss system retirement (RLSR) = Ref_{charge} x (1 - Ref_{RecEff}/100)

Where:

1. Ref_{charge}: Refrigerant charge (kg)
2. $Sys_{op\text{-}life}$: System operational lifetime (years)
3. Ref_{RecEff}: Refrigerant Recovery Efficiency factor (%)
4. L1: Annual Leakage Rate (% Refrigerant charge)
5. L2: Annual Purge Release factor (% Refrigerant charge)
6. S1: Annual Service Release (% Refrigerant charge)
7. S2: Probability factor for catastrophic failure (% Refrigerant charge loss/year)
8. GWP: Global Warming Potential of refrigerant
9. CC: Cooling or heating capacity (kW).

The following default values must be used, where system specific data are not available:

$Sys_{op\text{-}life}$: System operational design life (years): see Table 56 below

Ref_{RecEff}: Refrigerant recovery efficiency factor (%): **95%**

L1: Annual leakage rates (% refrigerant charge): see Table 57 on the next page

L2: Annual purge release factor (% refrigerant charge): **0.5** (if the system does not require an annual purge, zero should be used)

S1: Annual service release (% refrigerant charge): **0.25** (this applies where the system requires opening up to carry out the annual service. For systems which do not require opening up, there will be no associated annual release of refrigerant, therefore a default of zero should be used)

S2: Probability factor for catastrophic failure (% refrigerant charge loss/year): **1%** (based on a failure rate of 1 in 100 systems).

The following information must be sourced from the design team's mechanical and electrical engineer or system manufacturer:

- System type
- Ref_{charge}: Refrigerant charge (kg)
- GWP: Global Warming Potential of refrigerants
- Cooling or heating capacity (kW).

Table 56: Default system operational design life values

System type	Default system operational design life values (years)
Small and medium capacity chillers	15
Large capacity chillers	20
Unitary split	15
Variable Refrigerant Flow (VRF) system	15
All other systems	10
These figures are based on those reported in LOT 6 for air-conditioning units and the British Refrigeration Association's (BRA) Guideline Methods of Calculating TEWI (2006)[77]. Note: The following should be considered when determining whether the system specified is defined as small or medium or large: — Large capacity chiller: centrifugal compressor — Medium capacity chiller: scroll or screw compressor — Small capacity chiller: scroll compressor.	

Table 57: Average annual leakage rates

System type	Annual leakage rate (% of charge per annum)
Cold storage and display systems	
Integral cabinets	3%
Split or condensing units	18%
Centralised	19%
Air-conditioning systems	
Unitary split	15%
Small-scale chillers	10%
Medium or large chillers	5%
Heat pumps	6%
These figures are based on those reported in LOT 6 for air-conditioning units and also Table 2 of the Market Transformation Programmes Briefing Note for Commercial Refrigeration no. 36, 'Direct Emission of Refrigerant Gases' (version 1.2). The figures are based on the average of the leakage rates from the four separate studies reported in Table 2 (where a range is reported, the higher value was used).	

Evidence

Criteria	Interim design stage	Final post-construction stage
All	The following as appropriate: 1. Confirmation of the absence of refrigerant in the development 2. A copy of the specification clause or letter from the M&E engineer or system manufacturer confirming relevant refrigeration type and system information 3. A completed copy of the BREEAM Pol 01 calculator.	As design stage. Assessor’s building or site inspection or as-built drawings. Manufacturer’s information.

Additional information

Relevant definitions

Direct effect life cycle (DELC) carbon dioxide equivalent

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: kg CO_2-eq). The calculation involves estimating the total refrigerant release over the period of operation and subsequent conversion to an equivalent mass of carbon dioxide. Should the system use several different refrigerants, e.g. a primary refrigerant and a secondary coolant, or a cascade system, individual calculations are made for all refrigerants which contribute to the direct effect (see Methodology on page 364 for a description of how DELC is calculated).

Global warming potential

GWP is defined as the potential for global warming that a chemical has relative to 1 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 (or ITH) should be applied.

Ozone depleting 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).

Ozone depleting substances (ODS)

"Substances known to deplete the stratospheric ozone layer. The ODSs controlled under the Montreal Protocol and its Amendments are chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), halons, methyl bromide (CH_3Br), carbon tetrachloride (CCl_4), methyl chloroform (CH_3CCl_3), hydrobromofluorocarbons (HBFCs) and bromochloromethane (CH_2BrCl).", extracted from IPCC/TEAP report, Special Report on Safeguarding the Ozone Layer and the Global Climate System, Cambridge University, 2006.

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 recovery

The process of removing refrigerant from a system and storing it in an airtight container.

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. Under the United Kingdom Environmental Protection Act 1990 unwanted refrigerant and refrigerating system oil are classified as either controlled or hazardous waste. Not only is it an offence to discharge them to the environment, but there are procedures regarding transport, storage, transfer of ownership and ultimate disposal. Article 16 of EC Regulation 2037/2000 specifies that used CFCs and HCFCs must be recovered for destruction or recycling or reclamation.

Robust and tested refrigerant leak detection system

This is normally defined as that included on the Enhanced Capital Allowance (ECA) Energy Technology Product List[78] (or an equivalent list). Where the system does not fall within the scope of the ECA energy technology product list or an equivalent list, the design team must demonstrate to the assessor that the system specified meets the principles of the scheme as far as is applicable.

Small-scale white goods

These should be defined as domestic-scale white goods and would also include small individual display cabinets, for example drinks cabinets in small retail shops.

Systems using refrigerants

The criteria of this issue apply to air-conditioning and refrigeration systems used to heat or cool the building for the following uses, regardless of the system's refrigerant charge (kg):

- Comfort cooling or space heating (including assessment of refrigerants in heat pumps)
- Cold storage, including commercial food and drink display cabinets but excluding small scale white goods (see definition above)
- Process-based cooling loads, e.g. servers, IT equipment
- Off-site facilities such as district heating or cooling systems.

Refrigerant

There are three main make-ups 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. The United Nations Environment Programme (UNEP) hosts a HCFC Help Centre which contains information about the management and phase out of HCFCs and alternatives to HCFCs in the refrigeration and air-conditioning sector.

Other information

Automatic isolation and containment of refrigerant

Any system that isolates and contains refrigerant within the system so as to minimise leakage to the atmosphere in the event of a systems failure. An example of a system which could meet criterion 8 on page 363 would be one which initiates an automated shut down and pump down of the refrigerant into a separate storage tank.

Common refrigerants

Table 58: List of some common refrigerant types with low GWP

R-Number	Chemical name	GWP 100-year
R-30	Dichloromethane	9
R-170	Ethane	3
R-290	Propane	3
R-600	Butane	3
R-600a	Isobutane	3
R-702	Hydrogen	5.8

R-Number	Chemical name	GWP 100-year
R-717	Ammonia	0
R-718	Water	<1
R-729	Air (nitrogen, oxygen, argon)	0
R-744	Carbon dioxide	1
R1150	Ethylene	3
R-1234yf	2,3,3,3-Tetrafluoropropene	>1
R-1270	Propylene	3
Sources: The United Nations Environment Programme (UNEP) '2010 Report of the Refrigeration, Air-conditioning and Heat Pumps Technical Options Committee' (pages 29-30). EN 378-1:2008+A2:2012: Refrigerating systems and heat pumps - Safety and environmental requirements. Part 1: Basic requirements, definitions, classification and selection criteria - Annex E. The Intergovernmental Panel on Climate Change 5th Assessment Report, Chapter 8, 'Anthropogenic and Natural Radiative Forcing', 2013. 'Global environmental impacts of the hydrogen economy', Derwent *et al*, 2006.		

The formula used to calculate the Direct Effect Life Cycle CO_2-eq 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).

Refer to EN 378-1[79] and the British Refrigeration Association's (BRA) Guideline Methods of Calculating TEWI for further details. The BRA publication also includes sectorial release factors for new systems designed to best practice standards.

REAL Zero

REAL Zero was a UK led project to investigate the causes of and solutions to refrigerant leakage, against the background of the EU F Gas Regulation. It brought together expertise across sectors and provided practical guides and training booklets. It was subsequently updated and developed into a European e-learning programme known as REAL Skills.

For further information including guidance notes, calculators, tools and case study information visit: http://www.realskillseurope.eu/

Ozone depleting potential refrigerants

Both CFCs and HCFCs are now tightly controlled or due to be phased out in the foreseeable future in all signatory countries to the Montreal Protocol on Substances That Deplete the Ozone Layer, BREEAM only recognises refrigerants that have an ODP of zero. Table 59 on the next page gives current ODP figures for a range of available substances that are capable of acting as refrigerants; assessors should use this to verify the ODP of the specified refrigerant. Substances not on this list should be referred to the BREEAM office so that an appropriate figure can be established.

Note: This table omits substances that are not typically used as refrigerants in buildings.

Table 59: Ozone depleting potential of refrigerants

Refrigerant type	Ozone depleting potential
R11 (CFC-11)	1.00
R12 (CFC-12)	1.00
R113 (CFC-113)	0.80
R114 (CFC-114)	1.00
R115 (CFC-115)	0.60
R125 (CFC-125)	0.00
Halon-1211	7.90
Halon-1301	15.90
Halon-2402	6.00
Ammonia	0.00
R22 (HCFC-22)	0.05
R123 (HCFC-123)	0.02
R134a (HFC-134a)	0.00
R124 (HCFC-124)	0.02
R141b (HCFC-141b)	0.11
R142b (HCFC-142b)	0.07
R143a (HFC-143a)	0.00
R32 (HCFC-32)	0.00
R407C (HFC-407)	0.00
R152a (HFC-152a)	0.00
R404A (HFC blend)	0.00
R410A (HFC blend)	0.00
R413A (HFC blend)	0.00

Refrigerant type	Ozone depleting potential
R417A (HFC blend)	0.00
R500 (CFC/HFC)	0.74
R502 (HCFC/CFC)	0.33
R507A (HFC azeotrope)	0.00
R290 (HC290 propane)	0.00
R600 (HC600 butane)	0.00
R600a (HC600a isobutane)	0.00
R290/R170 (HC290/HC170)	0.00
R1270 (HC1270 propene)	0.00
The United Nations Environment Programme (UNEP) '2010 Report of the Refrigeration, Air-conditioning and Heat Pumps Technical Options Committee' (pages 29-30). EN 378-1:2008+A2:2012: Refrigerating systems and heat pumps - Safety and environmental requirements. Part 1: Basic requirements, definitions, classification and selection criteria - Annex E.	

Pol 02 NO_x emissions

(all buildings)

Number of credits available	Minimum standards
2	No

Aim

To contribute to a reduction in local NO_x emission levels through the use of low emission heat sources in the building.

Assessment criteria

The following is required to demonstrate compliance:

Two credits (All building types other than Industrial)

1 Where the plant installed to meet the building's delivered heating and hot water demand has, under normal operating conditions, a NO_x emission level (measured on a dry basis at 0% excess O_2) as follows:

NO_x emission levels for heating and hot water (mg/kWh)	Credits
≤ 56 mg/kWh	1 credit
≤ 40 mg/kWh	2 credits
Note for residential developments: Each self-contained dwelling must meet the requirements.	

Two credits (Industrial building types only)

NO_x emission levels for heating and hot water (mg/kWh)	Credits
Office and associated areas ≤ 56 mg/kWh	1 credit
Operational areas ≤ 56 mg/kWh	1 credit

2 Report via the BREEAM scoring and reporting tool the direct and indirect NO_x emissions in mg/kWh and energy consumption in kWh/m²/yr arising from systems installed to meet the building's space heating, cooling and hot water demands.

Checklists and tables

None.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	Shell only: This issue is not applicable. Shell and core: All criteria relevant to the building type and function apply. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - Partially fitted & Fully fitted		
CN2	Applicable Assessment criteria - Single and multiple dwellings	Both options: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN3	New build extensions to existing buildings	If the heating/hot water demand for the new extension is being met by an existing system, then the NO_x emission level for the existing system must be assessed against the criteria of this issue.
CN3.1	NO_x data provided in different units	Where NO_x data are provided in different units or at a level of excess oxygen greater than zero, the manufacturer or supplier must be asked to convert this to comply with the BREEAM criteria. Alternatively, the assessor may adjust the figure using the relevant correction factors provided in Methodology on page 375. Where combined heat and power (CHP) systems are used, these conversion factors cannot be used and the information must be obtained from the system manufacturer.
CN3.2	Grid electricity	Heating systems powered by grid electricity can be considered to have zero NO_x emissions. If all heating in the building is provided by grid electricity the credits can be awarded by default. The reason for this is based on the aim of this issue, which is to improve local air quality.
CN3.3	Electricity from a renewable source	Where electricity used by the heating system is sourced from a zero emission renewable source such as PVs, wind etc., there are no resulting emissions. This source of heating can therefore be counted as having zero NO_x emissions.
CN3.4	Combined heat and power	Refer to Additional information on page 376 for guidance on calculating NO_x emission levels from CHP.
CN3.5	Heat recovery	Heat recovery can be considered as having zero NO_x emissions for the purpose of this issue.

Ref	Terms	Description
CN3.6	Open flues	No credits may be awarded for open flue heating or hot water systems.
CN3.7	Water heating benchmark and point of use heaters	Where the water heating can be demonstrated to be less than 10% of the building's total energy consumption, these credits can be awarded based solely on the NO_x emissions from space heating.
CN3.8	More than one heating system	Where more than one heating system is specified refer to Additional information on page 376 for guidance on calculating emission levels.
CN3.9	Assessment and reporting of a building's NO_x emissions from cooling	At present the Pol 02 issue does not benchmark and award credits for NO_x emission levels associated with a building's cooling demands. To facilitate possible future benchmarking of this kind and alignment with European Standards on the Sustainability of Construction Works, BREEAM does require, as a condition of achieving any credits for this issue, the reporting of both direct and indirect NO_x emissions resulting from meeting the building's heating, cooling and hot water demands. In the case of indirect emissions, this refers primarily to emissions associated with grid electricity, where grid electricity is a source of energy for the building's heating, cooling or hot water demands. Direct NO_x emissions are those resulting from the burning of fuel on site or in the assessed building to meet heating, cooling or hot water demands, for example via a gas, oil-fired or biomass boiler.
Building type specific		
CN4	Industrial Office or operational areas not present	**First credit** Where the assessed building is designed without an office area, the first credit does not apply. One credit is therefore available where compliance with the operational area benchmark is met. **Second credit** Where the operational area of the assessed building is designed to be untreated, the second credit does not apply. One credit is therefore available where compliance with the office area benchmark is met. Where there is no office area and no heating in the operational area, this issue is not assessed.
CN4.1	Residential buildings: Secondary water or space heating systems	If a secondary space or water heating system supplies less than 8% of the dwelling’s combined space heating and hot water demand, it can be omitted from the assessment. However, including a low NO_x heating system that supplies less than 8% of the combined demand can lower the average NO_x figure. Where this is the case inclusion of the secondary system is at the discretion of the developer and assessor.
CN4.2	Residential buildings: Post-construction stage exceptions	Where communal heating systems intended to supply a dwelling under assessment are due to be commissioned within a reasonable period following completion of an individual dwelling, then they should be the heat energy source assessed under this issue for NO_x, rather than the interim heat energy supply measure (which should also be noted). The communal system (e.g. CHP, district heating, etc.) must be the intended primary heating energy source for the dwelling. Evidence to confirm that future commissioning of such plant will occur within a reasonable period must be provided in the form of developer commitments and other pertinent technical documentation such as local service strategies; this reasonable period might be up to 18 months from completion of the dwelling.

Methodology

Calculating NO_x emission levels from combined heat and power (CHP) systems

Where CHP systems are specified, it is only necessary to consider the heat-related NO_x emissions for the assessment of this issue.

The NO_x emissions associated with heat generation should be calculated using the following formula:

$$X = A \times \left(\frac{B}{B+C}\right)$$

Where:

Term	Description
X	NO_x emissions per unit of heat generated (mg/kWh heat).
A	NO_x emissions per unit of fuel input (mg/kWh fuel input).
B	Heat output (kW).
C	Electrical output (kW).

The above methodology determines the net NO_x emissions from CHP-generated electricity compared with central generation of electricity and allocates this amount to the heat production. Where x is calculated to be negative, it should be assumed to be zero.

Calculating the average NO_x emission levels from multiple systems

Where the CHP or other heating system type operates in conjunction with another system, an average NO_x emission rate should be used based on the power output from each source, i.e. multiply the emissions of each system by the percentage of heat demand it supplies and total these values.

Where there are multiple sources of heat generation, an average NOx emission rate should be calculated based on the ratio of heat output (kW) from each heat source.

The following formula can be used for such cases:

$$NOx_{avg} = N_1 \times \left(\frac{H_1}{H_T}\right) + N_2 \times \left(\frac{H_2}{H_T}\right) \ldots + N_n \times \left(\frac{H_n}{H_T}\right)$$

Where:

Term	Description
NOx_{avg}	Average NO_x
N_1	NO_x emissions rate for source 1

Term	Description
N_2	NO_x emissions rate for source 2
N_n	NO_x emissions rate for source n
H_T	Total rated power output from all sources
H_1	Rated power output from source 1
H_2	Rated power output from source 2
H_n	Rated power output from source n

Evidence

Criteria	Interim design stage	Final post-construction stage
All	Relevant section or clauses of the building specification or contract. Manufacturer's product details. Calculations.	As design stage. report and photographic evidence.

Additional information

Relevant definitions

Approved building energy calculation software

Refer to BREEAM issue

NO_x emissions

NO_x emissions are pollutant gases produced by the combustion of fossil fuels. NO_x reacts with heat and sunlight to produce ozone that can cause serious respiratory problems. It also reacts with water to produce acid rain which has a detrimental effect on ecosystems. For the purposes of BREEAM, NO_x emission levels are required in units of mg/kWh, measured on a dry basis at 0% excess oxygen levels.

Conversion factors

Manufacturers should be asked to supply NO_x emissions data in mg/kWh, measured on a dry basis. Where this is not possible the assessor may use the following conversion factors to convert figures in parts per million (ppm), mg/MJ, mg/m³ or wet NO_x. It should be noted that these conversion factors assume worst case efficiencies and are likely to give conservative answers. This could have the effect of lowering the number of credits achieved. Note that these conversion factors are not applicable where combined heat and power (CHP) systems are being used. Please see the calculation procedures below for further details on assessing CHP systems for this issue.

1. Figures in mg/m³ should be multiplied by 0.859 in order to convert emissions into mg/kWh[80]. A conversion may also be necessary for data not calculated at 0% excess oxygen.
2. Figures in ppm should be multiplied by 1.76 in order to convert emissions into mg/kWh. A conversion may also be necessary for data not calculated at 0% excess oxygen.
3. Figures in mg/MJ should be multiplied by 3.6 in order to convert emissions into mg/kWh (1 kWh = 3.6 MJ). A conversion may also be necessary for data not calculated at 0% excess oxygen.

Wet NO_x conversion factor

This issue's criteria are based on dry NO_x values; almost all manufacturers will quote emissions measured on a dry basis. However, if wet NO_x figures are supplied, these will need to be converted to dry. The following formula should be used to determine the wet NO_x conversion factor[81]:

Conversion factor c = 100/(100-y)

Where y is the % water vapour content measured in the gas. This figure should be obtained from the manufacturer.

Excess oxygen correction

If a NO_x emission rate is quoted by the manufacturer in mg/m³ or ppm, then it should be established at what percentage excess oxygen this emission was measured. The greater the amount of excess oxygen in the flue gases at the time of measurement, the more 'diluted' the NO_x emissions. It is therefore important to convert any emission rate back to 0% excess oxygen. For the purpose of BREEAM, the following conversion factors can be used for the most frequently used rates supplied by manufacturers:

Table 60: Excess oxygen conversion factors

% excess O_2	Conversion (c)
3%	x 1.17
6%	x 1.40
15%	x 3.54

Conversion factor c = 20.9/(20.9 – x)

Where x = % excess O_2 (NOT excess air) and 20.9 is the percentage of O_2 in the air.

Other information

Some systems may find it difficult to achieve credits in this issue, including:

District heating

District heating systems that incinerate waste usually have NO_x emission rates higher than the levels set to achieve any BREEAM credits.

Biomass

Biomass systems are recognised as reducing the impact of fossil fuel depletion by employing a renewable fuel source (provided it is sustainably sourced). However, biomass can produce a significant amount of NO_x and so may not achieve this credit. They may, however, gain recognition in the energy section of BREEAM.

Pol 03 Surface water run-off

(all buildings)

Number of credits available	Minimum standards
5	No

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 and off-site, watercourse pollution and other environmental damage.

Assessment criteria

This issue is split into three parts:

- Flood risk (2 credits)
- Surface water run-off (2 credits)
- Minimising watercourse pollution (1 credit)

Up to two credits - Flood resilience

Two credits - Low flood risk

1 Where a site-specific flood risk assessment (FRA) confirms the development is situated in a flood zone that is defined as having a low annual probability of flooding (in accordance with current best practice national planning guidance). The FRA must take all current and future sources of flooding into consideration (see CN3.2 on page 382).

One credit - Medium or high flood risk

2 Where a site-specific FRA confirms the development is situated in a flood zone that is defined as having a medium or high annual probability of flooding and is not in a functional floodplain (in accordance with current best practice national planning guidance). The FRA must take all current and future sources of flooding into consideration (see CN3.2 on page 382).

3 To increase the resilience and resistance of the development to flooding, one of the following must be achieved:
   - 3.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 600mm above the design flood level of the flood zone in which the assessed development is located (see CN3.5 on page 383) OR
   - 3.b The final design of the building and the wider site reflects the recommendations made by an appropriate consultant.

Two credits - Surface water run-off

Prerequisite

4 An appropriate consultant is appointed to carry out, demonstrate or confirm the development's compliance with the following criteria:

One credit

5 Where drainage measures are specified to ensure 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.

6 Relevant maintenance agreements for the ownership, long term operation and maintenance of all specified sustainable drainage systems (SuDS) are in place.

7 Calculations include an allowance for climate change; this should be made in accordance with current best practice planning guidance (see Relevant definitions on page 388).

One credit

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

EITHER

9 Drainage design measures are specified to ensure that the post-development run-off volume, over the development lifetime, is no greater than it would have been prior to the assessed site's development for the 100-year 6-hour event, including an allowance for climate change (see criterion 14 below).

10 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 9 and 10 above for this credit cannot be achieved):

11 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.

12 Drainage design measures are specified to ensure 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:
- 12.a The pre-development 1-year peak flow rate; OR
- 12.b The mean annual flow rate Qbar; OR
- 12.c 2L/s/ha.

Note that for the 1-year peak flow rate the 1-year return period event criterion applies (as described in the peak run-off criteria above).

13 Relevant maintenance agreements for the ownership, long term operation and maintenance of all specified SuDS are in place.

14 For either option, above calculations must include an allowance for climate change; this should be made in accordance with current best practice planning guidance.

Two credits - Surface water run-off - Single dwellings only

For single dwellings, the below criteria should be applied in place of the surface water run-off criteria above (please see CN2.1 on page 381 for more information).

15 Either of the following criteria is met:
- 15.a There is a decrease in the impermeable area by 50% or more, from the pre-existing impermeable hard surfaces; OR
- 15.b Where all run-off from the roof for rainfall depths up to 5mm from all new and existing parts of the building have been managed on site using source control methods.

OR

One credit - Surface water run-off - Single dwellings only

16 Either of the following criteria is met:
- 16.a There is no increase in the impermeable surfaces as a result of the new construction; OR
- 16.b If there is an increase in the impermeable surfaces as a result of the new construction then the following must be met:

16.b.i Hard standing areas - where there is an extension or increase in the hardstanding areas and hence an increase in the total impermeable area as a result of the new construction, the hardstanding area must be permeable or be provided with on site SuDS to allow full infiltration of the additional volume, to achieve the same end result. The permeable hardstanding must include all pavements and public rights of way, car parks, driveways and non-adoptable roads, but can exclude small garden paths which will drain onto a naturally permeable surface.

16.b.ii Building (new-build or extension) - where there is an increase in building footprint, extending onto any previously permeable surfaces, the additional run-off caused by the area of the new-build or extension must be managed on site using an appropriate SuDS technique for rainfall depths up to 5 mm.

One credit - Minimising watercourse pollution

17 There is no discharge from the developed site for rainfall up to 5mm (confirmed by the appropriate consultant).

18 In areas with a low-risk source of watercourse pollution, an appropriate level of pollution prevention treatment is provided, using appropriate SuDS techniques.

19 Where there is a high risk of contamination or spillage of substances such as petrol and oil (see CN3.17 on page 385), separators (or an equivalent system) are installed in surface water drainage systems.

20 Where the building has chemical or liquid gas storage areas, a means of containment is fitted to the site drainage system (i.e. shut-off valves) to prevent the escape of chemicals to natural watercourses (in the event of a spillage or bunding failure).

21 A comprehensive and up-to-date drainage plan of the site will be made available for the building or site occupiers.

22 Relevant maintenance agreements for the ownership, long term operation and maintenance of all specified SuDS must be in place.

Checklists and tables

None.

Compliance notes

Ref	Terms	Description
Shell and core		
CN1	Applicable assessment criteria	Both options: All criteria relevant to the building type and function apply. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - Partially fitted & Fully fitted		

Ref	Terms	Description
CN2	Applicable assessment criteria - Single dwellings	**Criteria 1 to 3 on page 378 - Flood resilience** Both options: All criteria relevant to the building type and function apply. **Criteria 4 to 16 on page 379 - Surface water run-off** Both options: Only single dwelling criteria 15 on page 379 or 16 on page 379 apply. **Criteria 17 to 16 on page 379 - Minimising watercourse pollution** Both options: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
CN2.1	Applicable assessment criteria - Multiple dwellings	**Criteria 1 to 3 on page 378 - Flood resilience** Both options: All criteria relevant to the building type and function apply. **Criteria 4 to 16 on page 379 - Surface water run-off** Both options: Criteria 4 to 14 on page 379 apply only. **Criteria 17 to 16 on page 379 - Minimising watercourse pollution** Both options: All criteria relevant to the building type and function apply. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN3	Alternative standards and recommendations from an appropriate statutory body. See criteria 1 and 2 on page 378.	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 a recommendation given by the statutory body even where such a recommendation cannot be, or is not, statutorily enforced). Where the local authority (or other statutory body) has set more rigorous criteria than those above these must be met in order to achieve the relevant credits.
CN3.1	Contaminated sites. See criteria 5–16	Drainage designs for sites must take into account legislation relating to contaminated sites; however in many circumstances even on contaminated sites there may be opportunities for the installation of some SuDS techniques. Please see Other information on page 392 for more details.
Flood resilience		

Ref	Terms	Description
CN3.2	Sources of flooding. See criteria 1 and 2 on page 378.	The Flood Risk Assessment (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. Please see Other information on page 392 section which provides more detail on the above sources of flooding. The content of the FRA should be based on historic trends, but should also account for predicted changes to the climate which may impact on the flood risk to the site in the future.
CN3.3	Functional flood plain. See criterion 3 on page 378.	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.
CN3.4	Flood defences. See criteria 1, 2. and 3 on page 378.	**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.

Ref	Terms	Description
CN3.5	600mm threshold. See criterion 3.a on page 378.	It is accepted that, for buildings located in medium and high risk flood zones, areas of the car park and site access may be allowed to flood and therefore fall below the 600 mm threshold. 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) to ensure the building and site do not become an 'island' in the event of a flood. Where the development has been permitted and 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, provided there are 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, e.g. radioactive materials, microbiological facilities, server rooms, libraries, etc., must be located above the 600 mm threshold.
CN3.6	Level of detail required in the FRA for smaller sites. See criteria 1 and 2 on page 378.	For smaller sites, e.g. less than 1 ha (10,000 m^2), the level of detail required in an acceptable 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 m^2 and less), an acceptable FRA could be a brief report carried out by the contractor's engineer confirming the risk of flooding from all sources of flooding, including information obtained from the water company or sewerage undertaker, other relevant statutory authorities, site investigation and local knowledge.
Surface water run-off		
CN3.7	Sites with many 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. Note that 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.

Ref	Terms	Description
CN3.8	Discharge to the sea or tidal estuaries	The peak rate of run-off and volume run-off criteria can be deemed to be met by default if the site discharges rainwater directly to a tidal estuary or the sea. The site must discharge run-off directly into the tidal estuary or the sea, if these criteria are to be awarded by default. Typically, this would mean that drainage pipes would only carry run-off from the site and that they would not need to cross privately owned land outside the boundary of the development before reaching the sea. Please see Relevant definitions on page 388 section for a definition of tidal estuary.
CN3.9	No change in impermeable area	Where the man-made impermeable area draining to the watercourse (natural or municipal) has decreased or remains unchanged post-development, the peak and volume rate of run-off requirements for the surface water run-off credits will be met by default. Flow rate 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-development and post-development. In this instance a flood risk assessment must be carried out and any opportunities identified to reduce surface water run-off are implemented.
CN3.10	Limiting discharge flow rate. See criterion 12 on page 379.	For the surface water run-off credits, where the limiting discharge flow rate would require a flow rate of less than 5L/s at a discharge point, a flow rate of up to 5L/s may be used where required to reduce the risk of blockage.
CN3.11	Highways and impermeable areas	Where new non-adoptable highways are built, including those for developments with a mixture of buildings, all of the new impermeable surfaces must be included in calculations to demonstrate compliance with the peak rate of run-off and volume of run-off criteria. Where buildings are built beside existing highways or where adoptable highways are built, the impermeable area of the highway does not need to be included in the calculations.
CN3.12	Derelict sites. See criteria 5 on page 379, 7 on page 379, 11 on page 379, 12 and 14 on page 379.	If the site has been derelict for over five years, the appropriate consultant must assess the previous drainage network and make reasonable assumptions to establish probable flow rates and volumes. To do this they should use best practice simulation modelling to determine the 1-year and 100-year peak flow rates at the relevant discharge points. To complete the calculations, a site visit prior to development will be required unless accurate data already exist from a previous survey. The resultant professional report can then be used to determine the pre-development volumes and rates of run-off. Without this professional input, the site must be deemed greenfield pre-development, assuming Soil type 5 for the calculation of the pre-development site run-off.

Ref	Terms	Description
CN3.13	National best practice guidance on the design of SuDS and rainwater harvesting systems	Please refer to the Approved Standards and Weightings List (ASWL)to locate the appropriate national best practice standards in the country of assessment. Alternatively, please demonstrate applicability as follows: — The minimum requirements as set out in the approved standards and weightings list are covered by the proposed documents; OR — Where appropriate standards do not exist for a country, the design team should demonstrate compliance with the UK or European standards as listed in each relevant country reference sheet.
Minimising watercourse pollution		
CN3.14	5 mm discharge for minimising watercourse pollution. See criterion 17 on page 380.	In a small number of sites it may not be possible for the first 5mm of rainfall to be prevented from leaving the site completely. Where this is the case, an appropriately qualified professional must design the system to ensure that the intent of this criterion has been met as far as possible and provide justifications to explain why the criterion could not be fully achieved on the site. Where this can be justified, the awarding of the water quality credit would not be affected, provided all other relevant criteria have been achieved.
CN3.15	5mm requirement - end-of-pipe solutions. See criterion 17 on page 380.	End-of-pipe solutions, such as ponds and basins, will only be deemed to comply with the 5 mm criteria where the principal run-off control to prevent discharge from the first 5 mm of a rainfall event is achieved using source control and site control methods.
CN3.16	5mm requirement - green roofs. See criterion 17 on page 380.	Green roofs can be deemed to comply with this requirement for the rain that falls onto their surface. However, evidence is still required to demonstrate that the 5mm rainfall from all other hard surfaces on site is being dealt with, to allow this credit to be awarded.
CN3.17	Areas that are a source of pollution. See criteria 19 and 20 on page 380.	For the purpose of assessing the watercourse pollution credit, an area that presents a risk of watercourse pollution includes vehicle manoeuvring areas, car parks, waste disposal facilities, delivery and storage facilities or plant areas.
CN3.18	Extension or infill building on existing site	Where the assessment is of an individual building on an existing site, i.e. infill development, the watercourse pollution criteria apply to areas within the construction zone that present a risk of pollution, as well as any areas external to the construction zone that are affected by the new works, i.e. drainage onto or from the proposed development.
CN3.19	Suitable level of treatment. See criteria 15–18.	In all cases the appropriate consultant should use their professional judgment to determine the most appropriate strategy for minimising watercourse pollution.
CN3.20	Roof plant. See criteria 20, 21 and 15 on page 379.	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.

Ref	Terms	Description
CN3.21	Permeable paving system	Where it can be demonstrated that a permeable paving system designed to retain silts and degrade oils has been used, then this will meet the assessment criteria for minimising watercourse pollution for car parks and access roads.
CN3.22	Workshop areas in retail buildings	Where workshop areas are specified, they should be assessed against the above requirements (minimising watercourse pollution). This is due to circumstances where there may be some form of vehicle servicing as part of a car showroom or other type of retail space.

Methodology

Calculating peak rate of run-off

The assessor is not required to perform any calculations. Calculations should be provided by the appropriate consultant to demonstrate that they have sized the drainage facilities appropriately. Further guidance on calculating peak rate run-off for different sites and situations include:

1. The SuDS Manual [82].
2. Preliminary rainfall run-off management for developments.
3. National planning policy guidance or statement for the specific country.
4. IH Report 124, Flood estimation for small catchments (Marshall and Bayliss, 1994).
5. Flood Estimation Handbook (Centre for Ecology and Hydrology, 1999) [83].

Greenfield sites of less than 50 ha

The calculation of greenfield run-off rates must be in accordance with IH Report 124, Flood estimation for small catchments (Marshall and Bayliss, 1994). The pro-rata method on the size of catchment detailed in Table 4.2 in The SuDS Manual, CIRIA C697 (2007) must be followed.

Greenfield sites of 50 ha to 200 ha

The calculation of greenfield run-off rates must be in accordance with IH Report 124, Flood estimation for small catchments (Marshall and Bayliss, 1994). Flood Estimation Handbook (Centre for Ecology and Hydrology, 1999) can be used for these sites as an alternative, where there is a preference to do so, but only if the catchment is considered to be suitable for its application.

Greenfield sites of more than 200 ha

The calculation of greenfield run-off rates must be in accordance with the Flood Estimation Handbook (Centre for Ecology and Hydrology, 1999) and any subsequent updates. Where the Flood Estimation Handbook is not considered appropriate for the development, IH Report 124 can be used.

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 1-year and 100-year peak flow rates at discharge points (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.

Limiting discharge rate

The limiting discharge for each discharge point should be calculated as the flow rates from the pre-developed site. The calculation should include the total flow rate from the total area of the site feeding into the discharge point (this should include 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 (including rivers, streams, ditches, drains, cuts, culverts, dykes, sluices, public sewers and passages through which water flows, see Relevant definitions on the next page). Where this calculation results in a peak flow rate of less than 5L/s, the limiting discharge rate may be increased up to a level of no more than 5L/s at the point of discharge from the site to reduce the risk of blockage.

For example, if the flow rate for the 1-year and 100-year events were 4L/s and 7L/s respectively, then the limiting discharges would be 5L/s and 7L/s. Similarly, if it was calculated to be 2L/s and 4L/s, then a maximum of 5L/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, however, recognised that some sites may require more than one discharge point as a result of the local topography or existing surrounding drainage infrastructure, and in such cases, the limiting discharge flow rate may be increased to a level no more than 5L/s at each discharge point. The assessor should seek evidence that the number of discharge points is necessary, either due to topography, infrastructure limitations or both. 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.

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.

Evidence

Criteria	Interim design stage	Final post-construction stage
Flood Risk		
1– 3	Flood risk assessment. Design drawings. Where appropriate, correspondence from the appropriate statutory body confirming reduced annual probability of flooding due to existing flood defences.	Flood risk assessment updated as necessary. 'as-built' drawings. 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.
Surface Water Run-off		

Criteria	Interim design stage	Final post-construction stage
4–-16	Statement from the appropriate consultant confirming that they are qualified in line with the BREEAM definition. Consultant's report containing all information necessary to demonstrate compliance with the requirements.	Evidence to confirm that maintenance responsibilities have been defined for any SuDS solutions installed. AND EITHER Written confirmation from the developer or appropriate 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.
Minimising Watercourse Pollution		
17–22	Design drawings or relevant section or clauses of the building specification or contract indicating: 1. High and low risk areas of the site 2. Specification of SuDS, source control systems, oil or petrol separators and shut-off valves as appropriate.	Assessor’s building or site inspection and photographic evidence AND EITHER Written confirmation from the developer or appropriate 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.

Additional information

Please note this section will be revised when the National Standards for Sustainable Drainage and associated regulations come into force.

Relevant 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 which only carries 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) and only handle run-off from the adoptable highway. Where drainage within the highway will carry run-off from both the highway and housing, 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 the statutory organisation, legal organisation or entity whose duty it is to carry out the planning approval function for the project.

Catchment

The area contributing surface water flow to a point on a drainage or water course. It can be divided into sub-catchments.

Current best practice planning guidance

The document should include independently published figures for an allowance for climate change (based on a minimum period of 100 years) according to the annual probability of flooding in the area.

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 building 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 Flood Risk Assessment (FRA) should be prepared according to relevant planning policy and technical guidance documents. Confirmation must be based on historical, geological and geomorphic data (e.g. altitude) and take all sources of flooding into consideration. 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 would be 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 flood plain during a flood event.

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 and service yards and external hard landscaping. Footpaths less than 1.5m 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 and soakaways.

Limiting discharge
The limiting discharge is based upon the calculated pre-development flow rate at a discharge point.

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.

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 issue, roofs and small car parks may be considered as low-risk areas.

Peak run-off rate (referred to as Qp [m^3/sec])
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 (or, where the client has owned or occupied the site for a number of years, its 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
Rainwater discharge 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; 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 for management of 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 or harvesting
   - 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, including for example: wet ponds, infiltration basins, detention basins, swales, reed beds, pervious (porous or permeable) paving, soakaways, rainwater harvesting, 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.

Surface water run-off

Water flow over the ground surface to a drainage system. This occurs if the ground is impermeable, is 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 5mg/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 100mg/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 50mm/hr.

Bypass separators: These fully treat all flows generated by rainfall rates of up to 5mm/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. Pollution Prevention Guideline 3 contains more detailed guidance on the selection and sizing of an appropriate type of separator.

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-development and post-development.

Watercourses and sewers

A term that includes rivers, streams, ditches, drains, culverts, dykes, sluices, sewers and passages through which water flows.

Other information

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.

Contaminated sites

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 night time light pollution

(non-residential and residential institutions only)

Number of credits available	Minimum standards
1	No

Aim

To ensure that external lighting is concentrated in the appropriate areas and that upward lighting is minimised, reducing unnecessary obtrusive light pollution, energy consumption and nuisance to neighbouring properties.

Assessment criteria

The following is required to demonstrate compliance:

One credit

1 Where external obtrusive lighting has been eliminated through effective design that removes the need for external lighting without adversely affecting the safety and security of the site and its users.

OR alternatively, where the building does have external lighting, one credit can be awarded as follows:

2 All external lighting (except for safety and security lighting) can be automatically switched off between 23:00 and 07:00.

3 Illuminated advertisements, where specified comply with:
  - 3.a The maximum luminance (CD/m²) outlined in Table 61 below (please refer to Additional information on page 396 for a definition of the different zones)
  - 3.b In Zone E1 (see Table 61 below) the maximum luminance value shall be zero post-curfew.

4 If safety or security lighting is provided and will be used between 23:00 and 07:00:
  - 4.a Safety and security lighting complies with the lower levels of lighting recommended during these hours in accordance with CIE 150-2003 and CIE 126-1997, for example by using an automatic switch to reduce the lighting levels at 23:00 or earlier.

Checklists and tables

Table 61: Recommendations for maximum luminance (CD/m²)

Illuminated Area (m²)	Zone E1	Zone E2	Zone E3	Zone E4
< 10.00	100	600	800	1000
≥ 10.00	N/A	300	600	600

Table 62: Environmental lighting zone

Zone	Surrounding	Lighting Environment	Examples
E1	Natural	Intrinsically dark	National parks or protected sites
E2	Rural	Low district brightness	Industrial or residential rural areas
E3	Suburban	Medium district brightness	Industrial or residential suburbs
E4	Urban	High district brightness	Town centres and commercial districts

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)		
CN1	Applicable assessment criteria	Both options: All criteria relevant to the building type and function apply. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - Partially fitted and fully fitted		
CN2	Applicable Assessment criteria - Single and multiple dwellings	Both options: This issue is not applicable. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN3	Setting a curfew	The Commission Internationale d'Eclairage (CIE) guidance recommends the setting of 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 3 on the previous page) Where a different curfew time applies for other reasons (e.g. noise control), consideration should be given to the coordination of 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.

Ref	Terms	Description
CN3.1	Non-security lighting considered to be essential between 23:00 and 07:00	Where non-security lighting is considered to be essential between 23:00 and 07:00, i.e. for buildings which open or operate between these times, the lighting system is able to automatically switch to the lower levels of lighting recommended in CIE 150-2003 and CIE 126-1997 for lighting during these hours (or provide these lower levels at all times).
CN3.2	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 taken into account (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.

Methodology

The following provides guidance on when and how to apply the criteria to the external lighting associated with a building being assessed.

1. Where the assessment is of an individual building on an existing site then only those areas affected by the works, i.e. within the construction zone, need to be assessed. Where the assessment is of a building that forms part of an entire new development, the criteria apply site-wide.
2. If the scope of the assessment covers a new extension only, then only new lighting specified as part of the extended works needs to be assessed.
3. Flush stud lights used for safety purposes in vehicle manoeuvring areas may be excluded from the assessment.
4. Where light fittings are specified to comply with specific security standards and these conflict with the BREEAM criteria, they can be excluded from the assessment of this issue. In these circumstances the assessor must obtain evidence confirming the specific security standards, and that they are applicable to the assessed development.

Evidence

Criteria	Interim design stage	Final post-construction stage
All	Design drawings. Relevant section or clauses of the building specification or contract or external lighting design data or calculations. In the case of the external lighting design, the M&E engineer or lighting designer must provide indicative examples of where and how the strategy complies with the assessment criteria.	BREEAM Assessor's site inspection report and photographic evidence AND EITHER Written confirmation from the project team that the solutions assessed at the design stage have been implemented OR Where the design has changed, evidence is provided for post-construction and as-built details.
1 on page 393	Night-time lighting levels report or any other relevant study.	BREEAM Assessor's site inspection report and photographic evidence or as-built drawings. Night-time lighting levels report or any other relevant study.

Additional information

Relevant definitions

Advertisements

Any word, letter, model, sign, placard, board, notice, awning, blind, device or representation, in the nature of, and employed wholly or partly for the purposes of advertisement or announcement. This also includes any hoarding or similar structure used, or designed or adapted for use for the display of advertisements.

Construction zone

For the purpose of this issue the construction zone is defined as the site which is being developed for the BREEAM-assessed building and its external site areas, i.e. the scope of the new works.

Illuminated advertisements

An advertisement which is designed or adapted to be illuminated by artificial lighting, directly or by reflection.

Lighting zones

The contrast with the surrounding or background, and therefore the lighting environment of the building, changes the perception of luminance. The maximum luminance of the advertisement needs therefore to be adapted depending on the lighting environment.

Other information

The design should be checked for compliance against the Commission Internationale d'Eclairage (CIE) guidance.

This gives four sets of recommendations:

1. Limits to the average upward light ratio of the luminaires, to restrict sky glow
2. Limiting illuminance at the windows of nearby properties for which light trespass might be an issue
3. Limiting the intensity of each light source in potentially obtrusive directions beyond the site boundaries
4. Limiting the average luminance of the building, if it is floodlit.

In each case the limiting values depend on the location of the site of the building (for example rural, urban or city centre). A calculation of illuminance (b) or intensity (c) is not required if all luminaires are cut-off types and angled so that light in potentially obtrusive directions is blocked.

Compliance with the International Dark Skies Association Model Ordinance Guidance: www.darksky.org/assets/documents/MLO/MLO_FINAL_June2011.pdf may also ensure the requirements for this credit are met.

Pol 05 Reduction of noise pollution (non-residential, residential institutions and multiple dwellings)

Number of credits available	Minimum standards
1	No

Aim

To reduce the likelihood of noise arising from fixed installations on the new development affecting nearby noise-sensitive buildings.

Assessment criteria

Applicability:

The following is required to demonstrate compliance:

One credit

1 Where there are, or will be, no noise-sensitive areas or buildings within an 800m radius of the assessed site.

OR

2 Alternatively, where the building does have noise-sensitive areas or buildings within an 800m radius of the site, one credit can be awarded as follows:
   - 2.a Where a noise impact assessment has been carried out and the following noise levels measured or determined in accordance with the ISO 1996 series:
     - 2.a.i Existing background noise levels at the nearest or most exposed noise-sensitive development to the proposed development or at a location where background conditions can be argued to be similar
     - 2.a.ii The noise level resulting from the new noise source (see CN3.1 on page 399).

3 The noise impact assessment must be carried out by a suitably qualified acoustic consultant holding a recognised acoustic qualification and membership of an appropriate professional body (see Relevant definitions on page 400).

4 The noise level from the proposed site or building, as measured in the locality of the nearest or most exposed noise-sensitive development, is a difference no greater than +5dB during the day (07:00 to 23:00) and +3dB at night (23:00 to 07:00) compared to the background noise level.

5 Where the noise level from the proposed site or building is greater than the levels described in criterion 4 above, measures have been installed to attenuate the noise at its source to a level where it will comply with criterion 4 above.

Checklists and tables

None.

Compliance notes

Ref	Terms	Description
Shell and core (non-residential and residential institutions only)s		
CN1	Applicable assessment criteria	Shell only: This issue is not applicable. Shell and core: All criteria relevant to the building type and function apply. Refer to Appendix D – Shell and core project assessments on page 409 for a more detailed description of the shell and core assessment options.
Residential - Partially fitted & Fully fitted		
CN2	Applicable assessment criteria - Single dwellings	Both options: This issue is not applicable. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
CN2.1	Applicable assessment criteria - Multiple dwellings	Both options: These criteria will be applicable to multiple dwellings with communal HVAC systems only. Refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.
General		
CN3	Standard not appropriate or not applicable	Where a suitably qualified acoustician confirms that ISO 1996:2007 is not an appropriate standard of assessment for the proposed building or site, their assessment of the likelihood of complaints from noise impact can be accepted for the purpose of assessing this issue.

Ref	Terms	Description
CN3.1	Compliance at the design stage. See criterion 2 on page 397.	At the design stage of assessment, where noise-sensitive areas or buildings are present, actual measurement is unlikely to be possible due to the planned but non-existent installation. In such situations compliance can be demonstrated through the use of acousticians' calculations or by scale model investigations. For such cases ISO 1996-2:2007 states that 'as universally agreed prediction models do not exist, the method adopted should be carefully described in the acoustician's report' and that 'when available, prediction models accepted by relevant authorities should be used'. Where prediction through these methods is not possible, measurement will be necessary using either a noise source similar to that proposed or, alternatively, measurement of the actual noise from the installation (once installed). Compliance with the latter approach requires a written commitment to appoint a suitably qualified acoustician to carry out the required measurements post installation, and a further commitment to attenuate the noise source in compliance with criteria 4 and 5 of BREEAM (if proved necessary by the measurements).
CN3.2	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.
CN3.3	National or local alternative to ISO standard	It is possible to use a national or local equivalent to the ISO 1996 series; however this must be approved by BRE Global. The approved standards and weightings list can be used to check for previously approved standards or to propose a new national or local standard.

Methodology

None.

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.	As design stage. BREEAM Assessor’s site inspection report and photographic evidence.

<table>
<tr><th>Criteria</th><th>Interim design stage</th><th>Final post-construction stage</th></tr>
<tr><td>2–3</td><td>The acoustician’s report, acoustician’s qualifications and professional status OR Relevant section or clauses of the building specification or contract requiring a noise assessment by a suitably qualified acoustician in compliance with ISO 1996:2007
OR
A letter from the client or design team confirming that they will appoint an acoustician to carry out a noise assessment in compliance with ISO 1996.</td><td>The acoustician’s report with measurements based on installed and operating plant.</td></tr>
<tr><td>4–5</td><td>Acoustician’s report with recommendations for noise attenuation measures AND EITHER:
1. A marked-up design plan highlighting the specification of the acoustician’s attenuation measures
OR
2. 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.</td><td>BREEAM 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.</td></tr>
</table>

Additional information

Relevant 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 recognised as having outstanding natural beauty, scientific or ecological interest
8. Any other development that can be considered noise-sensitive.

Suitably qualified acoustician

An individual who holds a recognised acoustic qualification and membership of an appropriate professional body. Acousticians that meet the definition of a suitably qualified acoustician in Hea 05 Acoustic performance on page 120, will also meet the definition for the purposes of compliance with this issue.

Other information

None.

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 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.

Inn 01 Innovation

(all buildings)

Number of credits available	Minimum standards
10	No

Aim

To support innovation within the construction industry through the recognition of sustainability related benefits which are not rewarded by standard BREEAM issues.

Assessment criteria

The following is required to demonstrate compliance:

Up to a maximum of 10 credits are available, with the total BREEAM score capped at 100%, in aggregate from a combination of the following:

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 the following BREEAM assessment issues (please refer to the relevant BREEAM issue within this scheme document for details of the exemplary level performance assessment criteria):
- 1.a Man 03 Responsible construction practices on page 56
- 1.b Man 05 Aftercare on page 74
- 1.c Hea 02 Indoor air quality on page 98
- 1.d Ene 01 Reduction of energy use and carbon emissions on page 150
- 1.e Ene 10 Flexible demand side response on page 211
- 1.f Tra 03a Alternative modes of transport on page 226 or Tra 03b Alternative modes of transport on page 235
- 1.g Wat 01 Water consumption on page 253
- 1.h Mat 01 Life cycle impacts on page 276
- 1.i Mat 03 Responsible sourcing of construction products on page 282
- 1.j Wst 01 Construction waste management on page 306
- 1.k Wst 02 Recycled aggregates on page 313
- 1.l Wst 05 Adaptation to climate change on page 330

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.

Checklists and tables

None.

Compliance notes

Ref	Terms	Description
General		
CN1	Exemplary level of performance	Refer to the compliance notes within the individual assessment issues that contain exemplary performance levels.

Methodology

Exemplary level of performance in existing BREEAM issues

For information on the methodology for exemplary level credits refer to the Methodology section of the relevant BREEAM issues.

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 on the previous page	As defined within existing BREEAM issues.	As defined within existing BREEAM issues.
2 on the previous page	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.

Additional information

Relevant 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.

Other information

Applying for innovation credits

Refer to the BREEAM Innovation section documents available from BREEAM Projects for more information on BREEAM Innovation credit eligibility criteria, application process, application fees and previously approved innovations.

Appendices

Appendix A – National Scheme Operators (NSOs)

National Scheme Operators (NSOs) operate tailored, country-specific BREEAM schemes under licence from BRE Global. These organisations are selected to provide local knowledge, market presence and local stakeholder engagement through their governance structures.

BRE Global is the NSO for BREEAM UK and also for the pan country BREEAM International schemes. The BREEAM International schemes apply in any country in the world except the UK and countries where a NSO is operating a local scheme.

The schemes developed by National Scheme Operators must comply with the requirements of the BREEAM Core Technical Standard and the BREEAM Core Process Standard, both of which expand on the framework set out within the Code for a Sustainable Built Environment.

The NSOs and their local BREEAM schemes are listed on the BREEAM webpage: www.breeam.com, and there is a Technical Standards Finder tool available to help customers select the correct scheme. The local schemes must be used for assessments where appropriate; in these instances contact the local NSO for further information. Where a building falls outside of the scope of these local schemes, or there is no local NSO operating in a country, the pan country BREEAM International schemes are used.

Appendix B – Scope and education buildings

BREEAM International New Construction Version 6 has been tailored specifically for the assessment of the following educational establishments:

1. Preschools, including:
   a. Nursery schools[84]
   b. Children's centres[85]
2. Schools, including:
   a. Primary schools
   b. Secondary schools
   c. All age range schools (including education or teaching buildings at boarding schools)
   d. Non-acute special educational needs (SEN) schools
3. Universities and colleges
4. Higher education or vocational colleges and institutions, including:
   a. Teaching facilities
   b. Learning resource centres
   c. Laboratories, workshops or studios
   d. Student unions
   e. Or a mixture of the above types.

Acute special educational needs (SEN) schools

Acute SEN 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)).

This BREEAM scheme has not been specifically tailored to assess acute SEN schools. However assessment using the methodology is still possible, except where highly specialised accommodation is provided. Acute SEN schools therefore require a bespoke assessment.

For more information on SEN please refer to Building Bulletin 102 Designing for disabled children with special educational needs, published by the Department for Children Schools and Families (available from: www.education.gov.uk).

Student residential accommodation

BREEAM International New Construction Version 6 can be used to assess boarding school, college or University residential buildings. These types of building are classified as Residential institutions for the purpose of a BREEAM assessment.

Appendix C – Scope and residential institutions

BREEAM International New Construction Version 6 can be used to assess multi-occupancy residential buildings that are not suitable for assessment as residential dwellings. The BREEAM International New Construction Version 6 scheme provides a whole building assessment methodology which can also be applied to buildings which contain private living space, but also communal facilities within the same building, to allow assessment of the whole building.

BREEAM International New Construction Version 6 can be used to assess the following types of residential institutions:

1. Hotel, hostel, boarding and guest house
2. Student accommodation
3. Care homes that do not contain extensive or specialist medical facilities (limited consulting rooms and medical rooms are acceptable)
4. Sheltered housing
5. Other residential buildings that contain a mix of residential accommodation with communal areas such as some military accommodation.

Appendix D – Shell and core project assessments

Non-fitted, speculative new buildings (often referred to as shell only or shell and core buildings) can be assessed using the BREEAM International New Construction Version 6 scheme.

The BREEAM International New Construction Version 6 version can be applied to fully fitted, shell only and shell and core building projects. 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 is able to be occupied. This may include some or all of the following elements: the structure, building envelope, core building systems, including building servicing strategy and installations (such as HVAC) or plant support for installation of such systems and where present, fit-out of common areas.

In these projects, where areas of the development are not fully fitted, performance of the building and compliance with BREEAM is verified based on the developer's scope of works. This is measured using two standard project type options that in turn define appropriate assessment criteria applicable to that project type. While some projects will differ to some extent from the scope of these standard options, for the purpose of BREEAM, issues not included within the chosen option will be excluded from the assessment, even where they are within the developer's scope of works. This approach is necessary to ensure clarity, consistency and comparability within the property market. A fully filterable list of criteria or issues based on each individual project's scope would not enable comparability between BREEAM ratings, either in terms of performance benchmarking, or promotional or publicity purposes.

Defining the shell and core project type

For the purpose of defining the scope of assessment and BREEAM certification labelling, a non-residential new construction project that is not fully fitted out can be categorised in to 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 option is available where the developer's scope of works covers shell works, as described in option 1, plus core building services. Core building services relates to the installation of central or communal transport 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).

The shell only and shell and core assessment options are available for all building types, apart from residential individual dwellings and apartment blocks, refer to Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted on page 412 for a more detailed description of residential assessment options.

Assessing new-build shell and core projects

In the main, the assessment process and application of the majority of the BREEAM assessment issues will be unaffected by the scope of new build shell only or shell and core works. This is because most of the BREEAM criteria are concerned with impacts, processes and management procedures that occur with any new build development, regardless of whether it is a shell and core or fully fitted project. However, several BREEAM issues and criteria are tailored for the assessment of fitted out buildings, such as acoustic performance. Therefore, additional guidance is given within the assessment issues in the form of a compliance note. These shell and core compliance notes confirm whether the assessment issue applies to a shell only or shell and core project and, where it does apply, how to assess it for the options or project types defined above.

Shell and core building assessments and minimum BREEAM standards

All minimum BREEAM standards remain applicable to shell and core building assessments for the developer's scope of works. The only exception is minimum standards for BREEAM issues, credits or criteria which are not assessed in a shell only or shell and core project (confirmed by the shell and core compliance note in each relevant issue).

BREEAM International New Construction Version 6 and the BREEAM International Non-Domestic Refurbishment 2015 scheme

BRE Global have developed a standalone BREEAM scheme to cover the refurbishment and fit-out stages of the life cycle for non-domestic buildings. Under this scheme, only criteria that fall within the scope of the tenant's fit-out works would be assessed.

By having a two part assessment for the shell and core projects, where the shell and core parts and the fit–out parts are assessed separately, BREEAM provides a flexible yet robust way of assessing shell and core projects.

The diagram in Figure 6 below outlines the relationship between the International New Construction and the International Refurbishment and Fit-out schemes.

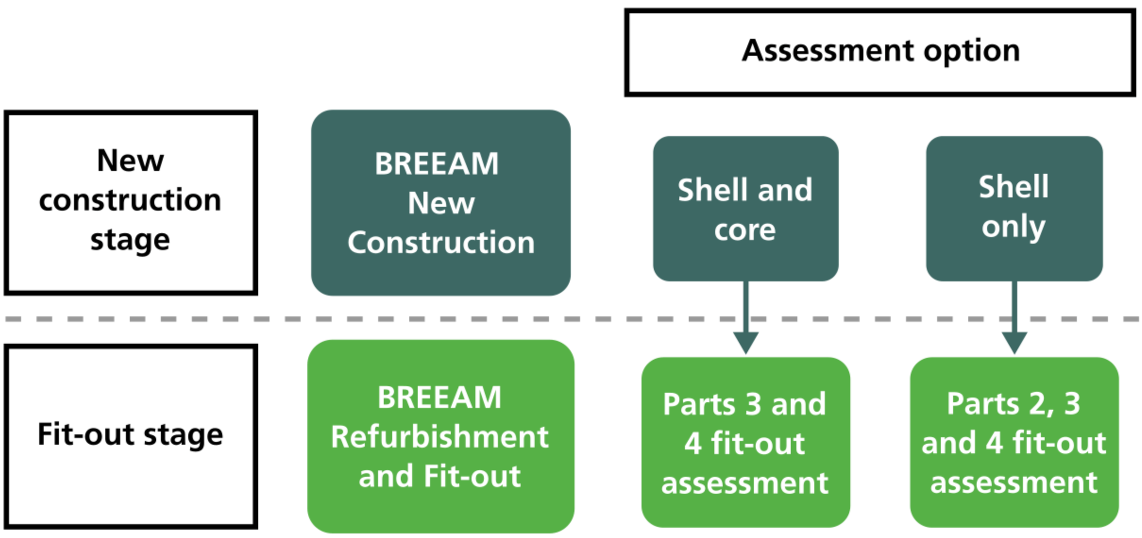

Figure 6: International New Construction and the International Refurbishment and Fit-out schemes and the assessment options

The scope of the BREEAM International New Construction, Shell only and Shell and core options, and BREEAM International Refurbishment and Fit-out schemes 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 variability and also the need to ensure a consistent definition is used for assessment comparability purposes, the BREEAM International 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 on 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 the BREEAM International Refurbishment and Fit-out scheme aligns with option 1, the shell only option of the BREEAM International New Construction scheme. Parts 1 and 2 combined align with option 2, the shell and core option of the BREEAM International New Construction scheme. Parts 3 and 4 then cover the scope of work that is covered under the tenants fit-out works and would, therefore, be used to 'top up' a Shell and Core Assessment post fit-out.

Assessment types of the BREEAM International Non-Domestic Refurbishment 2015 scheme:

- 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 the BREEAM International Non-Domestic Refurbishment 2015 scheme can be found on the BREEAM website (www.breeam.com).

Appendix E – Applicability of BREEAM New Construction to single and multiple dwellings, partially and fully fitted

Due to the diverse way homes are built and sold around the world, BREEAM International New Construction offers four different classification routes for residential assessments.

This section provides guidance to assessors and project teams on the application of BREEAM for residential developments.

To carry out an assessment the assessor and project team must first define the project as either a single or multiple dwelling, then state whether it will be 'partially' or 'fully' fitted out. This must be decided upon at the beginning of the assessment process, within the Scoring and Reporting tool.

Single or multiple dwellings

Definition of a single dwelling

A single dwelling is a permanent residential building, detached from any other building.

Otherwise referred to as a 'home' or 'family unit', the 'single dwelling' is intended to be occupied by one single household or family. Single dwellings must have no common areas or shared services with their surrounding dwellings.

Single dwellings are typically built on plots of land, greater in scale than the ground floor area, offering a privately owned, outdoor space. However, this may not always be the case for dwellings constructed on densely packed plots of land such as those built within towns or cities. For single dwellings that join onto other dwellings, as long as the other dwellings are not being assessed, then the 'single dwelling' criteria applies.

Allowances can be made for dwellings with additional extensions or suites intended for extended family members, without changing the description from 'single dwelling'.

Definition of multiple dwellings

Multiple dwellings are any number of permanent residential buildings greater than one. They must be located on the same plot of land and can either be joined together within the same building envelope or separated.

For example, a single, building envelope could consist of an apartment block or a row of terraces. Alternatively, it could be a group of 'single dwellings' built on the same plot of land.

Partially and fully fitted dwellings

The intention of the partial and fully fitted criteria is to recognise the need for greater flexibility during the 'Fit-out' stage in response to the Turn-key property market. Turn-key properties, are new homes sold on the open market as complete and intended for immediate occupation by the new homeowner.

Definition of Partially Fitted dwellings

These are new Turn-key homes intended to be occupied by the new homeowner where due to local building practices and cultural aspects, even though the property is considered 'complete' at the point of sale, the new homeowner is still required to fit-out their new property with specific fixtures and fittings.

While BREEAM Residential aspires to remain flexible with regards to the specification of different fixtures and fittings by the new homeowner; for the new dwelling to be certified as a BREEAM partially fitted home, particular elements must always be present during the scope of works regardless of building practice or cultural differences.

This assessment and certification option is available where the developer's scope of works covers new build works to the fabric, sub and superstructure of the building, plus the necessary core, central and localised systems for occupiers to live comfortably within each and every dwelling. Depending on climate and design features of the new home, those elements are:

Mandatory features of a partially fitted dwelling:

- Roof, external walls, internal and separating walls and structural floors, windows and external doors (for each dwelling)
- Potable water supply
- Plumbing and drainage
- Mechanical and electrical systems including:
  - Light fixtures and fittings
  - Heating, cooling and ventilation systems.

Mandatory features of a partially fitted dwelling (if present)

- Fit-out of communal areas
- Installation of central or communal transport systems
- Hard and soft landscaping areas.

For these assessments, the scope of works being undertaken must be specified clearly and provided for the accurate certification of the project.

Definition of Fully Fitted dwellings

A fully fitted dwelling is where, in addition to the core, central and localised systems, additional fixtures and fittings have also been provided to mitigate environmental impacts while the dwelling is in use throughout its lifespan.

- Interior finishes such as floor, wall and door finishes, and furniture (e.g. kitchens and bathrooms)
- Hot and cold potable and non-potable water fittings
- Internal fittings such as recycling bins, washing line and white goods
- Monitoring equipment such as energy meters and display devices.

Partially fitted and fully fitted dwelling assessments and minimum BREEAM standards

All minimum BREEAM standards remain applicable to partially fitted 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 partially fitted project (confirmed by the residential – partially and fully fitted compliance notes in each issue)
- Wat 01 Water consumption on page 253, where the minimum standard can be excluded if water fittings are not going to be installed on behalf of the new homeowner or occupant.

Appendix F – Examples of BREEAM New Construction certificates

Examples of BREEAM New Construction certificates for the interim Design Stage and final Post-construction stage are provided in Figure 7 below and Figure 8 below, respectively.

Figure 7: Example of Interim Certificate at Design Stage

Figure 8: Example of Final Certificate at Post-construction stage

Appendix G – Considerate constructor scheme requirements

Organisational, local or national considerate constructor scheme requirements (guidance for scheme administrators)

The purpose of this appendix is to provide guidance for considerate construction scheme administrators or operators, against which they can determine whether their scheme is potentially eligible for recognition by BREEAM as a 'compliant scheme' and therefore whether performance, as assessed or rated by that scheme, is appropriate for the purpose of awarding BREEAM credits.

Where the administrator has reviewed their scheme against the requirements below and wishes to have the scheme listed by BREEAM as a 'compliant scheme', they should contact the BREEAM office at BRE Global, providing the following information:

1. A description of the scheme's operation, including how it monitors and verifies compliance and to what standards it (or its assessors) are accredited
2. The scheme's requirements
3. How the scheme scores or rates contractor and site performance against that code of practice
4. If relevant, the number of projects that have used the scheme and the average score or level of performance achieved.

BRE Global will then inform the scheme operator of the next steps in the review and listing process.

Please note: BRE Global do not provide translation services and therefore considerate construction scheme administrators or operators must submit translated documents (in English) alongside the relevant sections of the original documents.

Operational scheme requirements

1. The scheme has a code of practice (see below for scope).
2. The assessment and scoring for the scheme is structured such that it is possible to determine and rate the performance of the contractor or site against the scheme as a whole, and for individual code of practice items, on the basis of:
    a. Non-compliance
    b. Compliance (level required to achieve two BREEAM credits)
    c. 'Beyond' compliance (if applicable), e.g. top quartile performance
    d. Exemplary practice, e.g. top 10% performance.
3. The scheme has defined a baseline of performance against which performance of individual items and overall project performance is determined. This baseline should broadly align with widely recognised good practice on construction sites within the country of assessment or wider international region.
4. The performance of contractors and sites are independently monitored and verified by individuals or service providers appointed by the scheme administrator.
5. The scheme administrator demonstrates what measures they have in place to ensure that those who undertake the assessment and verification have the necessary skills, knowledge and experience to do so competently.
6. Construction sites are visited at least once by the monitor during the construction phase to verify compliance with, and rate performance against, the scheme's code of practice (or more frequently for sites where the construction phase is longer than 12 months).
7. Construction site performance is reported by the monitor and an overall score or compliance determined for each site visit.
8. A certificate of performance or compliance is awarded to the contractor by the scheme administrator.
9. The scheme administrator operates a public complaints procedure and investigates complaints accordingly.

Scope of scheme's code of practice

The scheme's code of practice must include or account for the following categories and items:

Environmental awareness and impact mitigation

Demonstrate constructor awareness, consideration and mitigation of the impact of the site on the environment.

1. Environmental Management Systems or environmental policy
2. Management and prevention of light, noise, air, land and water pollution
3. Energy and water saving measures or processes
4. Waste reduction and diversion from landfill measures or processes
5. Responsibly sourced and low impact construction materials
6. Locally sourced labour and suppliers
7. Monitoring and targeting of environmental impacts
8. Protection of ecological features
9. Low or zero carbon sources of energy
10. Construction site operative awareness and training.

Safe and adequate access

Demonstrate that the constructor operates the site in a manner that ensures safe access to and around the site.

1. Site traffic management plan
2. Unobstructed, clearly signed and safe roads, footpaths and diversions
3. Accessible, safe and signed site and site accommodation for all genders or abilities
4. Secure site and boundary
5. Provision of safety information and emergency procedures
6. Provision of signs, notices and other information in the common local languages
7. Protection of the public from site activities, e.g. plant movement, debris etc.
8. Management of site visitors.

Safe and considerate working environment

Demonstrate that the constructor is operating the site in a clean, safe and accountable manner in order to ensure the wellbeing of site operatives and to minimise the risk to their health and safety.

1. Provision of clean, well maintained and appropriately sized or located or screened site facilities (showers, changing or drying facilities, or smoking areas or canteens)
2. Occupational health guidance and provision of emergency information or procedures, first aiders and first aid equipment
3. Clean and well maintained work areas and plant
4. Monitoring or preventing anti-social or criminal behaviour on site and around the perimeter, e.g. littering, abusive or offensive language, vandalism or graffiti
5. Provision of clean and appropriate Personal Protective Equipment (PPE)
6. Implementation, monitoring and compliance with a health and safety plan produced for the site (a plan which sets out procedures to ensure construction work is carried out safely for the protection and welfare of site workers and others who may be affected by the work)
7. Professional appearance and behaviour of site operatives
8. Training needs of site operatives.

Good neighbour

Demonstrate that the constructor operates the site in a manner that is considerate to the surrounding neighbours and those who visit the locality within the site's vicinity.

1. Communication, notification and accessible information concerning site activities or a programme or information, including emergency procedures or contacts
2. Accessible site management and comments procedure
3. Maintenance and cleanliness of the site, perimeter and adjacent roads, and site access
4. Dust and noise prevention measures
5. Site image, including visually appropriate and well maintained site hoardings and boundary and advertised scheme involvement
6. Wider community engagement.

Checklists

Checklist A1

See Man 03 Responsible construction practices on page 56.

1 Safe and adequate access

This section is intended to demonstrate that the constructor operates the site in a manner that guarantees safe and appropriate access to, around and on the site. The following items demonstrate compliance with this section:

Table 63: Checklist A1-1 - Safe and adequate access requirements

Ref	Criteria	Y	Evidence or reference required	Validation and justification
a	Appropriate and safe access to the site is provided. This must include as a minimum: — Provision of parking on or near to the site OR a public transport node with an average frequency under 30 minutes within 500m OR a dedicated transport service to a major public transport node provided by the contractor — Good lighting AND adequate barriers AND uniform surfaces, i.e. no trip hazards outside the site boundary — All accesses to be clean and mud free — Hoarding or scaffolding, which forms part of, or is external to the site boundary, to be well lit at night AND scaffold netting is in place and well maintained.		See copy of the parking plan and check transport and dedicated service timetables and view other facilities are on site.	
b	Appropriate and safe access on site is provided. This must include as a minimum: — Footpaths marked with ramps and signs — Pathways wide enough for wheelchairs — Accessibility of all areas by visually or hearing impaired visitors — All site hazards advertised at the site entrance.		View on site and check that the list of hazards is complete.	
c	Site entrances and exits are clearly marked for visitors and delivery drivers to see.		View on site.	

Ref	Criteria	Y	Evidence or reference required	Validation and justification
d	Site reception is clearly signposted OR all visitors are escorted to the reception.		Check on arrival for the signs OR see a copy of the induction procedure.	
e	The post box has been placed on the pavement to avoid the postman from entering the site.		View on site.	
f	Where there are minority communities speaking a different language in the area or working on site, notices are printed in the common local language.		Check the area and check that the staff register for a minority culture community. Where this is present on- or off-site, check for signs in the community's language.	
g	All road signs or names can be seen OR when a road sign or name is obstructed a replacement has been erected.		View on site.	
h	Where a site is in an area with severe congestion it has a delivery point remote from the site; deliveries are then made in smaller vehicles and timed to cause the least inconvenience.		View procedures on site.	

2 Good Neighbour

This section is intended to demonstrate that the constructor operates the site in a manner that is considerate to the surrounding neighbours. The following items demonstrate compliance with this section:

Table 64: Checklist A1-2 - Good neighbour requirements

Ref	Criteria	Y	Evidence or reference required	Validation and justification
a	Introductory letters have been or will be sent to all neighbours AND there is a commitment to write and thank neighbours at the end of the contract for their patience AND provide a feedback form.		See copies of letters with a list of addresses. A copy of this commitment should be provided or a copy of a standard letter that is always sent at the end of a project. A copy of the feedback form must be provided alongside a procedure to monitor the results and implement changes for future work.	
b	Site hours and noisy work restrictions are appropriate to the area, in particular when the site is located near: — Houses — Schools — Hospitals — Industrial units — Major public transport nodes — City centres — Shopping facilities.		Copy of statement of intent, policy, agreement etc. to be provided.	
c	The site boundary (which includes all areas affected by the works) is clearly and safely marked and appropriate to the environment: — The colour of the hoarding has been considered in terms of the surrounding environment — Pedestrians have a suitable, safe and protected passage around the site boundary — There are well lit warning signs for the benefit of the pedestrian and road user — The site's surroundings are seen by the public as being tidy and clean.		Ask the site manager if any thought was given to the hoarding and the location of the site. Is the hoarding clearly and safely marked, clean, neat and well maintained? Ensure that there are no complaints about the site being untidy or that if there were, this was quickly rectified and not repeated.	
d	There is a complaints book available AND evidence that complaints are being dealt with immediately.		Inspect the complaints book and check responses for timeliness.	

Ref	Criteria	Y	Evidence or reference required	Validation and justification
e	Local people are appropriately informed by the use of a notice board: — Of the site progress — Of the company contact details (telephone number or website or email address).		View on site.	
f	Light is shielded from the neighbours.		Copy of the temporary works indicating light shielding, or the site manager must demonstrate how the light shielding works or is not applicable.	
g	Site personnel are discouraged from using local facilities in their site clothes. Examples of how this might be achieved include : — A dedicated staff canteen — Staggered breaks for different gangs — Provision of showers or wash rooms — Provision of lockers — A request to leave PPE (Personal Protective Equipment) on site.		View on site. Check procedures with the site manager.	
h	There is a volume restriction on radio use or there is a radio ban in place.		Check if a restriction or ban is in place and how this is enforced.	

3 Environmentally Aware

This section is intended to demonstrate that the constructor has considered the impact of the site on the environment and has implemented measures to mitigate this impact. The following items demonstrate compliance with this section:

Table 65: Checklist A1-3 - Environmentally aware requirements

Ref	Criteria	Y	Evidence or reference required	Validation and justification
a	There are restrictions on the effects of light pollution and all lights are directional and non-polluting. If there is a site-specific environmental policy which sets restrictions on lighting, this point can be awarded.		View on site.	
b	Energy saving measures are implemented on site. Examples of this include: — Low energy lighting — Switching off equipment when not in use — Installing thermostats — Installing timers — Choosing energy efficient equipment. If there is a site-specific environmental policy which defines energy saving measures, this point can be awarded.		View on site.	
c	An impact minimisation strategy review is in place for the site. The review should consider the impact of the site in environmental terms and how any adverse effects are being minimised, e.g. protection of ecological features, pollution control.		View impact minimisation strategy.	
d	Water saving measures are implemented on site and monitored. If there is a site-specific environmental policy which indicates how water saving measures are managed and monitored on site, this point can be awarded.		View procedures on site.	
e	Alternative energy sources have been considered.		View on site.	
f	Fuel oil spillage equipment is available.		View on site. Ensure the spillage equipment is located where spillages may occur to ensure a rapid response time.	

Ref	Criteria	Y	Evidence or reference required	Validation and justification
g	Sumps are provided in cases of heavy water run-off. If there is a site-specific environmental policy which indicates how heavy water run-off will be minimised and dealt with on site, this point can be awarded.		View on site.	
h	Materials and equipment are tidily stacked and protected and covered where necessary AND there is adequate space for new materials to be stored in secured covered areas to avoid damage, theft and to protect from weather.		View on site. Ensure that where the space has been provided, it is being used correctly.	

4 Safe and considerate working environment

This section is intended to demonstrate that the constructor is operating the site in a clean and safe manner in order to ensure the wellbeing of its workers and to minimise the risk to their health and safety. The following items demonstrate compliance with this section:

Table 66: Checklist A1-4 - Safe and considerate working environment requirements

Ref	Criteria	Y	Evidence or reference required	Validation and justification
a	Adequate facilities are provided on site for workers and visitors. These must include as a minimum: — Separate male, female and disabled toilets — Working usable showers AND suitable changing areas — Lockers in the drying room — Dedicated smoking area — Suitable and safe accommodation (where provided).		View on site.	
b	Site facilities are well maintained and clean. This must cover as a minimum: — Areas around the canteen, offices and skips — Site welfare facilities (including toilets and changing areas) — Dedicated smoking area.		View on site.	

Ref	Criteria	Y	Evidence or reference required	Validation and justification
c	Private or visually-impacting areas are screened. These must include as a minimum: — Areas around the canteen, offices and skips, where necessary — Toilets — Dedicated smoking area.		View on site.	
d	Clean Personal Protective Equipment (PPE) is available for use by visitors.		Check company policy and procedure and if it is being implemented on site.	
e	Health and Safety procedures are in place for the following issues: — Appropriate training of all staff including non-native operatives to understand health and safety (H&S) best practices and information displayed on site — Operatives' exposure to the sun — Operatives' identification; all operatives to be provided with a photo identification clip card — Reporting of all incidents (minor and serious) and near misses — Ensuring that an appropriate number of first aiders and first aid equipment are available for the site.		Check company policy and procedures and how these are enforced. Check first aid book, in particular for minor accidents. Check the first aiders list and their qualifications (qualifications must have been obtained within the last three years). Check that each first aider has a box with basic equipment and that they have access to more equipment if necessary, and that they know where to find it.	
f	There is posted material indicating the nearest police station and hospital (with Accident & Emergency facilities) in the following areas as a minimum: — Site reception — Site canteen — Main site office.		Spot check managers, operatives, reception staff to check they know this information or at least where they would find it. Check induction talk.	
g	An inspection has been carried out by a Health and Safety inspector or equivalent.		View on site.	
h	Emergency escape routes are well identified and there is a clear emergency evacuation procedure AND drills are carried out regularly.		View on site. Written proof of the fire drill procedure.	

Checklist A2

See Man 04 Commissioning and handover on page 66.

Table 67: Checklist A2 - Home user guide requirements

Checklist A2 - Home user guide requirements		YES/NO
Part 1 – Operational issues		
a. Environmental strategy or design and features	1. Details of any specific environmental or energy design strategy or features including an overview of the reasons for their use (e.g. environmental and economic savings and restrictions on making alterations) and how they should best be operated. Strategies or features could include passive solar design, super insulation, energy efficient timber windows, heat recovery systems, solar hot water systems, photovoltaics, passive vents or the use of certified timber or SuDS within the boundary of individual properties.	
b. Energy	1. Sufficient information about the building, the fixed building services and their maintenance requirements, for example: a. Provide a suitable set of operating and maintenance instructions aimed at achieving economy in the use of fuel and power in a way that occupiers can understand. The instructions should be directly related to the particular systems installed in the dwelling and account for the different demands likely to be placed on the system during the year b. Details of any renewable systems and how they operate c. Details of low energy light fittings, their use and their benefits, e.g. energy and cost savings compared to traditional light fittings d. Details of any energy labelling scheme for domestic equipment or appliances e. General information on energy efficiency f. Details on how to use and maintain an energy meter where one is installed or provided.	
c. Water use	1. Details of water saving measures and tips. 2. External water use and efficiency, e.g. the use of water butts or other types of rainwater recycling systems.	
d. Recycling and waste	1. Information about a local authority or government collection scheme (if applicable). 2. If the home is not covered by a local collection scheme, details and location of communal recycling bins, skips or facilities. 3. Information on the location and use of any recycling and compost bins. 4. Information on where residents can obtain information or guidance on recycling and sustainable waste disposal, e.g. local authority or private organisation.	

Checklist A2 - Home user guide requirements		YES/NO
e. Links, references and further information	1. References or links to other information including websites, publications and organisations providing information on how to run the home efficiently and in the best environmentally sound way. As a minimum, this should include links to: a. Further good practice guidance on how to save energy b. The company responsible for the construction of the property c. The company responsible for the management of the home (where applicable). 2. In all instances both an address or telephone contact number and a URL should be provided.	
f. Provision of information in alternative formats	1. Include details of the procedure for obtaining a copy of the guide in alternative formats, including alternative languages, Braille, large print or audio cassette or CD. This should include the contact details of the person or organisation responsible for producing the guide.	
Part 2 – Site and surroundings		
a. Recycling and waste	1. Information on what to do with waste not covered by a standard weekly local authority collection scheme, for example fridges or freezers, computer equipment, batteries and other potentially hazardous equipment. In some areas the local authority will collect these items. If this is the case, details and information of such a collection should be provided. 2. Information and location of local recycling facilities and waste tips.	
b. Sustainable (urban) drainage systems (SuDS)	1. Details of SuDS within the site boundary including an overview of the reasons and benefits behind their use (e.g. prevention of localised flooding) and advice on maintenance and operation.	
c. Public transport	1. Details of local public transport facilities including maps and timetables and the location of nearby bus stops, trains, or subways or metro stations. 2. Details of cycle storage and cycle paths in the area including, if available, cycle path network maps for the whole town or local area. 3. Details of car parking and information on available park and ride schemes, car sharing schemes or car pools or car hire in the area. 4. Details on how to get to local amenities in the area by public transport or cycling.	
d. Local amenities	1. Details of the location of food shops, post boxes, postal facilities, bank or cash points, pharmacies, schools, medical centres, leisure centres, community centres, places of worship, public houses, children's play areas, outdoor open access public areas. 2. Other local amenities such as places of interest or cultural value, areas of beauty, wildlife, conservation, allotments etc.	

Checklist A2 - Home user guide requirements		YES/NO
e. Responsible purchasing	1. Include information about the purchasing of: a. Energy and water efficient domestic equipment or appliances b. Electrical equipment, including light fittings and bulbs c. Timber products from sustainable sources d. Organic food procurement or food growing or local produce or local food provision, e.g. farmers markets, organic box schemes etc.	
f. Emergency information	1. Contact details for emergency services including: a. Location of local minor injuries clinics or hospitals or similar facilities b. Location of nearest police and fire station.	
g. Links, references and further information	1. References or links to other information including websites, publications and organisations providing information on how to reduce the environmental impact in terms of transport, the use of local amenities, responsible purchasing etc. Such references or links may include links to: a. The local authority (including information about recycling and waste tips) b. Local transport providers (e.g. bus or train companies) c. Local amenities. In all instances both an address or telephone contact number and a web link should be provided.	
Developer confirmation		
By entering a 'YES' against the criteria above, I confirm that all dwellings of this specification type on the ENTER SITE NAME site meet the stated criteria.		
Signature: Date: Print Name:		

Checklist A3

See Hea 06 Accessibility on page 133.

Table 68: Checklist A3 - Access strategy checklist [86]

Ref	Requirements	YES/NO
1	**Approach**	
	The strategy sets out the approach that the applicant has adopted towards access, with particular reference to the inclusion of disabled people, people of different age groups, genders, ethnicity, stamina and fitness levels, and parents with children. This should include how relevant local, regional and national development or planning policies have been taken account of. The strategy indicates how the approach outlined within will inform decisions taken throughout the development process.	
2	**Consultation**	
	The strategy provides information on the results of any consultation carried out (or to be carried out) on access issues with (depending on the scale of development): 1. Relevant parties and bodies (see Compliance notes under Man 01) 2. Technical specialists, e.g. access, highway, crime prevention and urban design advice.	
3	**How access will be achieved**	
	The strategy explains how: 1. The layout provides practical access 2. Surrounding roads, footpaths and sight lines will be linked 3. Lighting, views, signs and desire lines are used to improve access.	
	Diagrams are produced to show: 1. How people can move to and through the place 2. Priority access arrangements for different users, e.g. pedestrians, cyclists and motorised vehicles.	
	The strategy explains how: 1. Internal access will be designed, provided and used. For speculative buildings the strategy should demonstrate options for proposed layouts and detail the flexibility of the design to take into account the speculative nature of the development.	
	The strategy explains how: 1. Visibility of entrances and entrance areas and facilities (e.g. toilets, conference rooms etc.) will be addressed in the design 2. Levels and gradients change within public spaces, including pavements and dropped kerbs, bus stops, parking spaces (including disabled parking spaces) 3. Symbols and pictures will be used (where appropriate) to help people navigate.	
	The strategy shows public and private spaces and explains how the design has helped make these areas safe.	

Ref	Requirements	YES/NO
	The strategy shows that disabled people will not be segregated but will be able to move up and down in a building and use the same entrances, corridors and rooms as everyone else without detours.	
	The strategy explains how access for the emergency services will be provided. This may include areas for congregation in the event of an emergency which should include provision for disabled refuge points.	

Checklist A4

See Hea 06 Accessibility on page 133

Lifetime homes design criteria

This checklist should not be used on its own. Please refer to the Lifetime Homes website to view the details of each of the 16 individual criteria. This checklist briefly summarises all 16 criteria.

Development Name:

Checklist A4 Hea 06 Accessibility		YES/NO
Lifetime Homes Design Criteria	**Lifetime Homes Standard**	
(1) Parking (width or widening capability)	(1)a 'On plot' (non-communal) parking: Where a dwelling has car parking within its individual plot boundary, at least one parking space length should be capable of enlargement to achieve a minimum width of 3300mm.	
	(1)b Communal or shared parking: Where parking is provided by communal or shared bays, spaces with a width of 3300mm, in accordance with the specification detailed on the Lifetime Homes - parking website, should be provided.	
(2) Approach to dwelling from parking (distance, gradients and widths)	The distance from the car parking space of Criterion 1 to the dwelling entrance (or relevant block entrance or lift core), should be kept to a minimum and be level or gently sloping. The distance from visitors' parking to relevant entrances should be as short as practicable and be level or gently sloping.	
(3) Approach to all entrances	The approach to all entrances should preferably be level or gently sloping, and in accordance with the specification detailed on the Lifetime Homes - approach to dwelling website.	
(4) Entrances	All entrances should: a) Be illuminated b) Have level access over the threshold c) Have effective clear opening widths and nibs as specified below. In addition, main entrances should also: d) Have adequate weather protection e) Have a level external landing.	

Checklist A4 Hea 06 Accessibility		YES/NO
Lifetime Homes Design Criteria	**Lifetime Homes Standard**	
(5) Communal stairs and lifts	(5)a Communal Stairs: Principal access stairs should provide easy access in accordance with the specification detailed on the Lifetime Homes - communal stairs website, regardless of whether or not a lift is provided.	
	(5)b Communal Lifts: Where a dwelling is reached by a lift, it should be fully accessible in accordance with the specification detailed on the Lifetime Homes website.	
(6) Internal doorways and hallways	Movement in hallways and through doorways should be as convenient to the widest range of people as possible, including those using mobility aids or wheelchairs, and those moving furniture or other objects. As a general principle, narrower hallways and landings will need wider doorways in their side walls. The width of doorways and hallways should conform to the specification detailed on the Lifetime Homes - internal doorways and hallways website.	
7) Circulation space	There should be space for turning a wheelchair in dining areas and living rooms and basic circulation space for wheelchair users elsewhere.	
(8) Entrance level living space	A living room or living space should be provided on the entrance level of every dwelling.	
(9) Potential for entrance level bed-space	In dwellings with two or more storeys, with no permanent bedroom on the entrance level, there should be space on the entrance level that could be used as a convenient temporary bed-space.	
(10) Entrance level WC and shower drainage	Where an accessible bathroom, in accordance with criterion 14 of this list, is not provided on the entrance level of a dwelling, the entrance level should have an accessible WC compartment, with potential for a shower to be installed, as detailed in the specification on the Lifetime Homes - entrance level shower and drainage website.	
(11) WC and bathroom walls	Walls in all bathrooms and WC compartments should be capable of firm fixing and support for adaptations such as grab rails.	
(12) Stairs and potential through-the-floor lift in dwelling	The design within a dwelling of two or more storeys should incorporate both: a) Potential for stair lift installation; and b) A suitable identified space for a through-the–floor lift from the entrance level to a storey containing a main bedroom and a bathroom satisfying Criterion (14) Bathrooms on the next page.	

Checklist A4 Hea 06 Accessibility		YES/NO
Lifetime Homes Design Criteria	**Lifetime Homes Standard**	
(13) Potential for fitting of hoists and bedroom or bathroom	Structure above a main bedroom and bathroom ceilings should be capable of supporting ceiling hoists and the design should provide a reasonable route between this bedroom and the bathroom.	
(14) Bathrooms	An accessible bathroom, providing ease of access in accordance with the specification detailed on the Lifetime Homes - bathrooms website should be provided in every dwelling on the same storey as a main bedroom.	
(15) Glazing and window handle heights	Windows in the principal living space (typically the living room), should allow people to see out when seated. In addition, at least one opening light in each habitable room should be approachable and usable by a wide range of people, including those with restricted movement and reach.	
(16) Location of service controls	Service controls should be within a height band of 450mm to 1200mm from the floor and at least 300mm away from any internal room corner.	
Developer Confirmation		
By entering a 'YES' against the above Lifetime Homes criteria, I confirm that all dwellings of this specification type on the [ENTER SITE NAME______________________] site meet the current Lifetime Homes criteria.		
Signature: Date: Print Name:		

Checklist A5

See Up to four credits – Basic route (option 2): Energy efficient design features on page 151.

To award credits all the criteria for that credit AND any previous credit(s) must have been achieved or filtered out. To get all four of the available credits from Checklist A5 all applicable criteria must have been achieved.

Table 69: Criteria to award credits using the energy efficient features checklist (Checklist A5)

Credits	Lighting	Hot water	LZC	Building fabric	Heating	Cooling and ventilation
1	Criterion 1 (Non-residential) Criterion 3 (Residential)	Criterion 7	-	Criterion 10	Criterion 16	Criterion 17 (Residential) Criterion 18 Criterion 21 (Non-residential)
2	Criterion 2 (Non-residential) Criterion 4 (Residential)		Criterion 8	Criterion 13 Criterion 15		Criterion 19 (Non-residential) Criterion 20 (Residential)
3	Criterion 5 (Residential - Multiple dwellings)		Criterion 9	Criterion 11 Criterion 14		Criterion 22 (Non-residential)
4	Criterion 5 (Residential - Single dwellings) Criterion 6 (Residential - Multiple dwellings)			Criterion 12		

Table 70: Checklist A5 - Energy efficient features for assessments using the basic route (option 2) in Ene 01

Ref	Energy efficient features - Criteria and notes	Building type
Lighting		
1	Internal daylit and non-daylit areas have switching controls that take account of absence or occupancy, or daylighting as recommended by ASHRAE Standard 90.1 and the California Energy Code. Adequate lighting controls must be provided to all ancillary areas (as applicable) such as: 1. Storerooms and cold stores. 2. Plant and control rooms. 3. Toilet, washroom, and shower areas. 4. Circulation areas, corridors, and stairwells.	Non-residential
2	Where at least 80% of general internal luminaires in fixed fittings achieve an efficacy of at least 80 luminaire lumens per watt or greater. *Note: General internal lighting refers to all internal light fittings, but excludes those used for emergency purposes. The assessor should note that the benchmark is for individual fittings, not the average lumens per circuit watt.*	
3	An information leaflet explaining efficacy in terms of lighting and the benefits of purchasing high efficacy Low Energy Lamps (LELs) is provided in each dwelling.	Residential
4	75% of the fixed internal fittings as a percentage of the total number of fixed light fittings within habitable rooms have been fitted with LELs. *See note on habitable rooms below.*	
5	100% of the fixed internal fittings as a percentage of the total number of fixed light fittings within habitable rooms have been fitted with LELs. *Note: Habitable rooms are defined as follows:* *1. Living rooms or dining rooms* *2. Kitchen or utility rooms* *3. Bedrooms* *4. Hallways* *5. Studies* *6. Offices* *7. Playrooms, games rooms or leisure rooms* *8. Bathrooms* *9. WCs.*	
6	All internal space lighting in the communal areas, excluding statutory safety lighting, has fixed fittings fitted with: 1. LELs 2. Movement detecting control devices (PIR) 3. Daylight cut-off sensors OR timers. *Note: For residential lighting criteria, LELs are deemed as bulbs that have a luminous efficacy greater than 65 lumens per circuit watt.*	Residential - Multiple dwellings

Ref	Energy efficient features - Criteria and notes	Building type
Water heat generator efficiency		
7	Hot water is supplied via a self-contained system that has an efficiency of ≥ 85% (either central or decentralised) OR where decentralised gas fired storage heaters are specified that have an efficiency of ≥ 85%. OR Where heat pumps are specified for hot water the criteria can be awarded provided that the COP is ≥ 4.5. *Note: The water heating system is designed in accordance with the recommendations of ASHRAE Standard 90.1 and the controls specified comply with the guidance for hot water systems. Where the building is not heated, this criterion is not applicable.*	All buildings
Low and zero carbon technologies		
8	At least 10% of the total electricity or heating and cooling demand is generated by on-site or near-site LZC technologies. *See note on LZC technologies below.*	All buildings
9	At least 20% of the total electricity or heating and cooling demand is generated by on-site or near-site LZC technologies. *Note: The low and zero carbon technologies listed in BREEAM issue Ene 04 Low carbon design on page 178 can be used to demonstrate compliance. Other systems may be acceptable as part of a LZC strategy under this issue but are not inherently considered as LZC technologies. Acceptability will be dependent on the nature of the system proposed. The BREEAM Assessor must confirm acceptability with BRE Global if in doubt.*	

Ref	Energy efficient features - Criteria and notes	Building type
Building fabric		
10	5% improvement on the U-value requirements for walls, roofs, ground floor, windows, and doors, in ASHRAE Standard 90.1 (for all buildings except low rise residential buildings) or ASHRAE Standard 90.2 (for low rise residential buildings).	All buildings
11	10% improvement on the U-value requirements in ASHRAE Standard 90.1 or 90.2 (as applicable).	
12	15% improvement on the U-value requirements in ASHRAE Standard 90.1 or 90.2 (as applicable).	
13	Pressure test shows air permeability ≤ 50% of leakage value of current national standards. If national standards are not available, $2m^3/h/m^2$@ 50Pa is the maximum value for air permeability to achieve this criterion.	
14	Pressure test shows air permeability ≤ 75% of leakage value of current national standards. If national standards are not available, $1.5m^3/h/m^2$@ 50Pa is the maximum value for air permeability to achieve this criterion.	
15	The average g-value of the glazing is ≥ 60%.	

Ref	Energy efficient features - Criteria and notes	Building type
Space heat generator efficiency		
16	The seasonal efficiency of the source of space heating is ≥ 90%. The system must also comply with ALL of the following: 1. The heating system is to be designed in accordance with the recommendations of ASHRAE Standard 90.1. 2. At least 75% of the heat demand must be sourced by the heating system with the highest efficiency; the remaining top-up heat must be supplied by a high efficiency heating source ≥ 90%. 3. Where the heating system is comprised of an arrangement of multiple boilers or heat sources, the seasonal efficiency of the multiple boiler system must be ≥ 90%. 4. The overall system efficiency, i.e. the distribution and seasonal boiler efficiency, is ≥ 70% 5. The heating system controls must comply with ASHRAE Standard 90.1. 6. A form of variable flow control is fitted, i.e. variable speed pumps. Where CHP is specified, the criteria can be awarded provided that: 1. The CHP operates as the main boiler. 2. Remaining output is provided by boilers with an efficiency of ≥ 85%. 3. Boost output is provided by high efficiency boilers ≥ 80%. 4. The CHP plant must have an efficiency of ≥ 85%. 5. The system controls comply with the requirements outlined in ASHRAE Standard 90.1. OR Where heat pumps are specified for heating, the criteria can be awarded provided that the COP is ≥ 4.5. *Note:* *1. To determine the seasonal efficiency of the boiler used for space heating the link below provides a list of boilers and their associated efficiencies. If the boiler used in the assessment is not on this list, the closest match can be used to demonstrate compliance: www.ncm-pcdb.org.uk/sap/.* *2. Where demand is partly met by on-site LZC or near-site LZC forms of heating (e.g. solar hot water), then that system's output should be counted towards the overall system output for calculating system efficiency.* *3. Where the building is not heated this criterion is not applicable.*	All buildings
Cooling and ventilation		
17	Criteria 1-4 in Hea 04 Thermal comfort have been achieved. AND Air-conditioning systems specified have: 1. A form of variable flow control fitted, i.e. variable speed drives. 2. Controls to prevent simultaneous heating and cooling. 3. Temperature and humidity (where applicable) set points selected for minimum energy consumption consistent with comfort conditions.	Residential

Ref	Energy efficient features - Criteria and notes	Building type
18	Where the design incorporates a system of providing low carbon cooling to completely displace the need for a mechanical cooling system. OR The cooling generator has a coefficient of performance (COP) of > 3.5. *Note: Compliance with this criterion will be shown if the design has used a low carbon cooling technology, such as, but not exclusively limited to:* *1. Night-time cooling, i.e. requires fabric to have a high thermal mass* *2. Ground coupled air cooling* *3. Displacement ventilation (not linked to any active cooling system)* *4. Ground water cooling* *5. Surface water cooling* *6. Evaporative cooling, direct or indirect* *7. Passive house (Passivhaus) cooling strategies* *8. Desiccant dehumidification and evaporative cooling, using waste heat* *9. Absorption cooling, using waste heat* *10. The building does not require any form of cooling* *The assessment of this criterion excludes specialist cooling systems (such as server rooms, cold food storage etc.). The assessor should confirm with BRE which specialist cooling systems may be excluded from the assessment of this criterion.*	All buildings
19	All ductwork and air handling units (AHUs) are certified to meet the best leakage standards. OR No mechanical ventilation (apart from where required as part of national building regulations; such systems should also comply with the leakage standards below). *Note: Examples of best practice standards are ductwork tested to EN 16798-3 class ATC 4 and AHUs tested to EN 1886 class L1 or ASHRAE Standard 62.1 Ventilation for acceptable indoor air quality and ASHRAE Standard 90.1 Energy standard for buildings.*	Non-residential
20	Where the specific fan power for the mechanical ventilation system specified is: 1. ≤ 0.5 W/litre/second for continuous extract ventilation systems. 2. ≤ 1.0 W/litre/second for whole house MVHR when running at each of its settings AND achieves a heat recovery efficiency of at least 85%. OR No mechanical ventilation (systems required as part of national building regulations are excluded from the requirements). *Note: Where the mechanical ventilation systems specified for the residential building are complex and more akin to the systems specified in item 21 on the facing page, then the criteria listed for item 21 should be applied to the assessment instead.*	Residential

Ref	Energy efficient features - Criteria and notes	Building type
21	Where the specific fan power for the mechanical ventilation system specified is: 1. ≤ 1.4 W/litre/second for central mechanical ventilation systems including heating only 2. ≤ 1.8 W/litre/second for central mechanical ventilation systems including heating and cooling AND The system: 1. Has a form of variable flow control fitted, i.e. variable speed drives. 2. Can be controlled in accordance with the recommendations of ASHRAE Standard 90.1. OR No mechanical ventilation (systems required as part of national building regulations are excluded from the requirements). *Note: Where the mechanical ventilation systems specified for the non-residential building are simple and more akin to the systems specified in item 20 on the previous page, then the criteria listed for item 20 should be applied to the assessment instead.*	Non-residential
22	Where a method of heat recovery is integrated into the design of the mechanical ventilation system it must: 1. Achieve a heat recovery efficiency of at least 75%. 2. Have a form of variable flow control fitted, i.e. variable speed drives. 3. Be controlled in accordance with the recommendations of ASHRAE Standard 90.1. *Note: Where the building is naturally ventilated this criterion is not applicable.*	

Checklist A6

See Wst 02 Recycled aggregates on page 313.

To demonstrate that the local best practice guidance for defining "granular fill and capping as a high grade use" is appropriate, the local guidance or standard must cover the requirements set out in Table 71 below and Table 72 below. Note: The extent and scope of this local guidance or standards will be checked by BRE waste experts to ensure that the overall effect is equivalent to the BREEAM requirements.

Table 71: Sampling and testing of processed or recovered product

Property description	Basic principle
General description	-
Aggregate composition (including organics)	Visual sorting of the plus 8mm fraction.
Particle size and grading	Size distribution of particles in an aggregate sample determined using test sieves (sieves meeting a national or equivalent standard for test sieves).
Fines content	Percentage of aggregate by mass passing a 0.063mm sieve.
Particle shape	Determination of the proportion (by mass) of flat or elongated particles.

Table 72: Requirement for additional testing of processed or recovered aggregate products by end use (note that tests and properties given in brackets are only required where the test is relevant to the end application or the local climate or is considered otherwise essential)

Test or property	Basic principle
(Surface abrasion resistance)	Determination through testing of the ability of aggregate particles to retain their shape characteristics under construction conditions and traffic (when relevant to the end use).
(Alkali silica reaction)	Aggregate reactivity in concrete (RILEM AAR3 or equivalent method) where there is concern about the possibility that the aggregate is alkali reactive.
(Resistance to freezing and thawing)	Resistance to fragmentation due to freezing and thawing action. Accelerated freeze-thaw test, magnesium sulfate soundness value or equivalent method.
(Polishing resistance)	Susceptibility of an aggregate to polishing (resistance to smoothing or loss of surface friction) when relevant to end use.
Bulk density	Determination of the loosely compacted bulk density of oven dry aggregate.
(Bearing capacity)	Determination of strength or bearing capacity of compacted aggregate or soil. Relevant to use of unbound aggregates in building or road foundations.
(Chlorides)	Determination of water soluble chloride content (relevant to use in concrete or mortar).

Test or property	Basic principle
Evidence that there is no release of dangerous substances	In particular emission of radioactivity, release of heavy metals, release of polyaromatic hydrocarbons. Evidence to be provided when required and in case of doubt.
Water solubility	Water solubility of aggregate (percentage by mass).
(Organic contamination)	Relevant to use in mortar or concrete. Determination of constituents affecting the setting and hardening of concrete; presence of lightweight organic contaminators.
Particle density	Specific gravity or relative density of aggregate.
(Plasticity of fines)	A high proportion of plastic fines may be detrimental in asphalt or road construction. Testing may not be necessary where the total fines content of the aggregate does not exceed an agreed value which has been determined from local satisfactory use. Where the amount of fines may be considered plastic or harmful, apply one of the following or other equivalent method: (a) sand equivalent value; (b) plasticity index; or (c) methylene blue value.
(Resistance to fragmentation or impact)	Test to assess resistance of aggregate particles to degradation under impact.
(Resistance to heat or thermal shock)	Relevant to application of aggregate in asphalt or bitumen. Change in physical properties of aggregates subjected to 700°C environment.
Sulfates and sulphides	When required, determination of acid soluble sulfate or total sulfur.
Water absorption	Increase in mass of a sample of oven dried aggregate due to the penetration of water into the water accessible voids.

Checklist A7

See LE 01 Site selection on page 339.

Table 73: Checklist A7-1 - Likelihood of significant contamination on site

Item No	Questions	Response	
Instruction: Items 1–5 below can be used to determine the likelihood of significant contamination being present in or on the ground across the total site for the purposes of a rapid evaluation against the LE 01 Site selection: Criterion 3 requirements: — If the construction zone records a YES against any of the questions then nationally recognised strategies for investigation of contamination should be followed, or where such strategies do not exist, a robust site investigation, risk assessment and appraisal should be carried out by a competent contaminated-land specialist covering the requirements of Table 74 on the facing page as a minimum. — If NO is recorded against all questions for the construction zone, then the site may be defined as having no significant contamination and further investigation is not required; in such a case the credit cannot be awarded. This checklist is a simple review and in such instances the option remains for a site investigation, risk assessment and appraisal to be carried out as defined in Table 74 where the client wishes to do so.			
1	Is the site registered by the local authority or any other appropriate organisation as contaminated?	Yes	No
2	Does the site have any historical or previous uses that may have caused the site to become contaminated (see LE 01 Site selection – Additional information on page 342 and also Checklist A7-3 below)? Where this cannot be answered because of a lack of information please tick 'yes', i.e. assume the worst case scenario.	Yes	No
3	Is the site within 250m of landfill (e.g. active, not active, capped)?	Yes	No
4	Is the site known or suspected to be contaminated (e.g. have studies already been undertaken on the site)?	Yes	No
5	Does the local authority or other appropriate organisation possess any information on the site that may give suspicions of contamination? Where this cannot be answered because of a lack of information please tick 'yes', i.e. assume the worst case scenario.	Yes	No

Table 74: Checklist A7-2 - Scope of site investigation, risk assessment and appraisal report

Item No	Content	Response	
Section 1: Preliminary investigation (desk study and site reconnaissance)			
Instruction: Historical research and review of available information from sources such as archives, plans and records from regulatory authorities to discover the past and current activities at a site and in the surrounding area to determine the potential for the presence of contamination. If the preliminary investigation gives cause to believe there may be contamination (or no records can be found) then further more detailed investigations will be required (sections 2 and 3). If not, then the site will not be considered contaminated for the purposes of this BREEAM issue and the credit cannot be awarded. The study must be carried out by a contaminated-land specialist as defined in the relevant definitions; ISO 10381:5[87] gives guidance on what the preliminary investigation should cover. For the purposes of BREEAM it should cover the following as a minimum:			
1.1	Purpose and aim of study.	Yes	No
1.2	Site location and layout plans.	Yes	No
1.3	Appraisal of site history.	Yes	No
1.4	Assessment of environmental setting, covering: — Geology, hydrogeology, hydrology — Industrial activity — Location of controlled waters (canals, estuaries, lakes, ponds, rivers, springs, aquifers) — Pollution incidents, landfill sites within 250m etc.	Yes	No
1.5	Assessment of current or proposed site use and surrounding land uses.	Yes	No
1.6	Review of any previous site contamination studies (desk-based or intrusive) or remediation works.	Yes	No
1.7	Preliminary (qualitative) assessment of risks: — Appraisal of potential contaminant sources, pathways and receptors — Conceptual site model — Identification of significant contamination.	Yes	No
1.8	Recommendations for intrusive contamination investigation if necessary.	Yes	No
Section 2: Site investigation report			
Instruction: The report must investigate each aspect highlighted by the desk study, this comprises exploratory holes constructed using the most appropriate method for the site to investigate the local subsurface strata (see ISO 10381-5:2005 for further information). The report must cover the following as a minimum:			

Item No	Content	Response	
2.1	Site investigation methodology: — Methods of investigation — Plan showing exploration locations — Justification of exploration locations — Sampling and analytical strategies.	Yes	No
2.2	Results and findings of investigation: — Ground conditions (soil and groundwater) — Discussion of soil, groundwater and surface water contamination.	Yes	No
2.3	Risk assessment: — As a minimum, based on contaminant pathway receptor model — Takes account of severity of consequences and likelihood of occurrence.	Yes	No
2.4	Where applicable, recommendations for remediation based on: — Proposed site use — Risk assessment findings — Technical and financial appraisal.	Yes	No
Section 3: Options for remediation			
Instruction: If remediation is deemed necessary following the site investigation, then a site-specific remediation methodology must be produced and followed. Consultation with the regulatory authorities may be required to ensure satisfactory design and implementation of the remediation programme. The report must cover the following as a minimum:			
3.1	Detailed outline of the works to be carried out: — Type, form and scale of contamination to be remediated — Remediation methodology — Site plans or drawings — Phasing of works and approximate timescales.	Yes	No
3.2	Consents, agreements and licences (discharge consents, waste management licence etc.).	Yes	No
3.3	Site management procedures to protect site neighbours, environment and amenity during works: — Health and safety procedures — Dust, noise and odour controls — Control of surface run-off.	Yes	No
3.4	Details of how the works will be validated to ensure the remediation objectives have been met: — Sampling strategy — Use of on site observations, visual or olfactory evidence — Chemical analysis — Proposed clean-up standards (i.e. contaminant concentrations).	Yes	No

Table 75: Checklist A7-3 - Previous site uses which can cause significant contamination

Polluting activity	**Y/N**	**Polluting activity**	**Y/N**	**Polluting activity**	**Y/N**
A list of the most common polluting activities and types of land contamination can be found in the list below or in Table 1 of the UNEP document: 'Identification and Management of Contaminated sites, A methodological guide'[88], UNEP and ADEME, ADEME editions, Paris, 2005 (www.unep.fr/scp/waste/land.htm)					
Agricultural uses		Manufacturing of asbestos		Timber and timber products industry	
Chemical works		Metal processing		Use as a scrap metal store	
Energy industry - Power stations		Paper, pulp and printing industries		Waste disposal	
Engineering and manufacturing processes		Petrol stations		Waste management facility	
Extractive industry and mineral processing		Premises for dry cleaning		Wood preserving yards	
Food processing industry		Production of metal		Works non-specified	
Gas works		Production of non-metals and their products		Demolition of buildings for any of the above uses	
Glass making and ceramics		Railway land		Mining	
Hospitals and cemeteries		Road vehicle maintenance		Waste management	
Infrastructure		Rubber industry		Mills	
Laboratories		Sewerage treatment		Oil refineries	
Landfill		Textile industry			

Schedule of changes to the scheme document

The BREEAM International New Construction Technical Manual may, from time to time, be revised and reissued. A reissue of a BREEAM version may be required for the following reasons:

1. To clarify criteria, compliance notes or schedule of evidence requirements
2. To update a reference or relevant definition
3. To update or amend calculation procedures
4. To amend the scope to allow for the inclusion of additional building types

This document provides details of any additions or changes made to the BREEAM International New Construction Version 6 scheme that have resulted in a reissue of the technical manual. It is important to note that in general a reissue does not result in changes, deletions or additions to the main assessment criteria or assessment issues. Fundamental changes to assessment criteria are typically made as part of a formal scheme update, resulting in a new BREEAM scheme version.

Scheme document reference	Version	Date
SD250	6.0.0	01/12/2021

Where a client or assessor has been referencing an issue of the Technical Manual that has subsequently been superseded, they may either continue to use and reference the superseded issue of the Technical Manual or, if deemed appropriate by the assessor, switch to the latest issue. When submitting their certification report the BREEAM Assessor must clarify in their report which issue of the Technical Manual they have used to complete the formal assessment of the building. If two different issues were used throughout the course of the assessment, reference the latest issue used.

Endnotes

1 For some assessment issues the number of credits available will vary by building type. Furthermore, some issues may not be applicable to certain building types or buildings which do not contain a particular function or area, e.g. a laboratory.
2 For schools and higher education buildings, see also Appendix B – Scope and education buildings.
3 For residential institutions, see also Appendix C – Scope and residential institutions.
4 ISO 15686-5:2008. Buildings and constructed assets. Service life planning - Part 5: Life cycle costing.
5 ISO 9972:2015 Thermal performance of buildings - Determination of air permeability of buildings - Fan pressurisation method
6 The Soft Landings Framework, for better briefing, design, handover and building performance in-use, Usable Buildings Trust (UBT), BSRIA BG 4/2009.
7 BREEAM 2011 and Soft Landings, an interpretation note for clients and designers, BSRIA BG 28/2011
8 CIBSE Lighting Guide LG10 Daylighting and window design, 1999.
9 EN 13779:2007 Ventilation for non-residential buildings - Performance requirements for ventilation and room-conditioning systems
10 EN 13779:2007 Ventilation for non-residential buildings - Performance requirements for ventilation and room-conditioning systems
11 World Health Organization, Regional Office for Europe. Selected pollutants: WHO guideline for indoor air quality Internet. 2010 cited 2015 Oct 26. Available from: www.who.int/indoorair/publications/9789289002134/en/
12 ISO 16000-2:2006 Indoor air. Part 2: Sampling strategy for formaldehyde (2006). International Organization for Standardisation (ISO).
13 ISO 16000-3:2011 Indoor air. Part 3: Determination of formaldehyde and other carbonyl compounds in indoor air and test chamber air - Active sampling method (2011). International Organization for Standardisation (ISO).
14 European Concerted Action on Indoor Air Quality and its Impact on Man – Report No. 11: Guidelines for Ventilation Requirements in Buildings (1992). Commission of the European Communities.
15 ISO 16000-5:2007 Indoor air. Part 5: Sampling strategy for volatile organic compounds (VOCs) (2007). International Organization for Standardisation (ISO).
16 ISO 16000-6:2011 Indoor air. Part 6: Determination of volatile organic compounds in indoor and test chamber air by active sampling on Tenax TA® sorbent, thermal desorption and gas chromatography using MS or MS-FID (2011). International Organization for Standardisation (ISO).
17 ISO 16017-1:2001 Indoor, ambient and workplace air - Sampling and analysis of volatile organic compounds by sorbent tube or thermal desorbtion or capillary gas chromatography - Part 1: Pumped sampling (2001). International Organization for Standardisation (ISO).
18 EN 16402:2013 Paints and varnishes - Assessment of emissions of substances from coatings into indoor air - Sampling conditioning and testing (2013). European Committee for Standardisation (CEN).
19 ISO 16000-9:2006 Indoor air. Part 9 - Determination of the emission of volatile organic compounds from building products and furnishing - Emission test chamber method (2006). International Organization for Standardisation (ISO).
20 CEN/TS 16516:2013 Construction products - Assessment of release of dangerous substances - determination of emissions into indoor air (2013). European Committee for Standardisation (CEN).
21 Standard method for the testing and evaluation of volatile organic chemical emissions from indoor sources using environmental chambers Version 1.1 (Emission testing method for California Specification 01350) (2010). California Department of Public Health (CDPH).
22 ISO 16000-9:2006 Indoor air. Part 9 - Determination of the emission of volatile organic compounds from building products and furnishing - Emission test chamber method (2006). International Organization for Standardization (ISO).
23 CEN/TS 16516:2013 Construction products - Assessment of release of dangerous substances - determination of emissions into indoor air (2013). European Committee for Standardization (CEN).
24 Standard method for the testing and evaluation of volatile organic chemical emissions from indoor sources using environmental chambers Version 1.1 (Emission testing method for California Specification 01350) (2010). California Department of Public Health (CDPH).

25 EN 717-1:2004 Wood-based panels - Determination of formaldehyde release - Part 1: Formaldehyde emission by the chamber method (2004). European Committee for Standardisation (CEN).
26 EN 13999-1:2013 Adhesives - Short term method for measuring the emission properties of low-solvent or solvent-free adhesives after application - Part 1: General procedure (2013). European Committee for Standardisation (CEN).
27 EN 13999-2:2013 Adhesives - Short term method for measuring the emission properties of low-solvent or solvent-free adhesives after application - Part 2: Determination of volatile organic compounds (2013). European Committee for Standardisation (CEN).
28 EN 13999-3:2007+A1:2009 Adhesives - Short term method for measuring the emission properties of low-solvent or solvent-free adhesives after application - Part 3: Determination of volatile aldehydes (2009). European Committee for Standardisation (CEN).
29 EN 13999-4:2007+A1:2009 Adhesives - Short term method for measuring the emission properties of low-solvent or solvent-free adhesives after application - Part 4: Determination of volatile diisocyanates (2009). European Committee for Standardisation (CEN).
30 EN 16402:2013 Paints and varnishes - Assessment of emissions of substances from coatings into indoor air - Sampling conditioning and testing (2013). European Committee for Standardization (CEN).
31 EN 717-1:2004 Wood-based panels - Determination of formaldehyde release - Part 1: Formaldehyde emission by the chamber method (2004). European Committee for Standardization (CEN).
32 ISO 10580:2010 Resilient, textile and laminate floor coverings - Test method for volatile organic compound (VOC) emissions (2010). International Organization for Standardization (ISO).
33 EN 13999-1:2013 Adhesives - Short term method for measuring the emission properties of low-solvent or solvent-free adhesives after application - Part 1: General procedure (2013). European Committee for Standardization (CEN).
34 EN 13999-2:2013 Adhesives - Short term method for measuring the emission properties of low-solvent or solvent-free adhesives after application - Part 2: Determination of volatile organic compounds (2013). European Committee for Standardization (CEN).
35 EN 13999-3:2007+A1:2009 Adhesives - Short term method for measuring the emission properties of low-solvent or solvent-free adhesives after application - Part 3: Determination of volatile aldehydes (2009). European Committee for Standardization (CEN).
36 ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories (2005). International Organization for Standardisation (ISO).
37 EN 15457:2014 Paints and varnishes - Laboratory method for testing the efficacy of film preservatives in a coating against fungi (2014). European Committee for Standardisation (CEN).
38 EN 15458:2014 Paints and varnishes - Laboratory method for testing the efficacy of film preservatives in a coating against algae (2014). European Committee for Standardisation (CEN).
39 Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 (2008). European Union.
40 prEN 16516:2015 Construction products - Assessment of release of dangerous substances - Determination of emissions into indoor air (2015). European Committee for Standardisation (CEN).
41 Approved Document F, Means of Ventilation, HM Government, 2010
42 ISO 16000-2:2006 Indoor air. Part 2: Sampling strategy for formaldehyde (2006). International Organization for Standardization (ISO).
43 EN 14175-1:2003 Fume Cupboards, Vocabulary EN 14175-2:2003 Fume Cupboards, Safety and performance requirements EN 14175-3:2003 Fume Cupboards, Type test methods EN 14175-4:2004 Fume Cupboards, on-site test methods DD CEN/TS 14175-5:2006 Fume Cupboards, Recommendations for installation and maintenance EN 14175-6:2006 Fume Cupboards, Variable air volume fume cupboards EN 14175-7:2012 Fume Cupboards, Fume cupboards for high heat and acidic load
44 EN 12469:2000 Biotechnology. Performance criteria for microbiological safety cabinets, BSi.
45 EN ISO 14644-7:2004 Clean rooms and associated controlled environments. Separative devices (clean air hoods, gloveboxes, isolators and mini-environments)
46 PD CEN/TR 16589 Laboratory installations - Capture devices with articulated extract arm
47 The Biological Agents and Genetically Modified Organisms (Contained Use) Regulations 2010, HSE.
48 Guidelines on Discharge Stack Heights for Polluting emissions, HMIP Technical Guidance Note (Dispersion) D1, 1993.

49 ISO 7730, Ergonomics of the thermal environment - analytical determination and interpretation of thermal comfort using calculation of the PMV and PPD indices and local thermal comfort criteria
50 CTG065 Technology Guide, Heating control: maximising comfort, minimising energy consumption, The Carbon Trust, 2011
51 BS 8233:2014 Sound insulation and noise reduction for buildings - Code of practice. BSI, 2014.
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55 TM54 Evaluating operational energy performance of buildings at the design stage. CIBSE, 2013.
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74 EN 378 Refrigerating systems and heat pumps – Safety and environmental requirements, 2008+A2:2012
75 ISO 5149 Refrigerating systems and heat pumps – Safety and environmental requirements. ISO, 2014.
76 Ammonia Refrigeration Systems Code of Practice. Institute of Refrigeration, 2009.
77 Guideline Methods of Calculating TEWI Issue 2, (2006), BRA Specification.
78 Energy Technology List
79 EN 378-1 Refrigerating systems and heat pumps - Safety and environmental requirements Part 1: Basic requirements, definitions, classification and selection criteria. 2008 + A2:2012
80 EN 15502-1:2012 Gas-fired heating boilers Part 1: General requirements and tests.
81 EN 14792:2005 Stationary Source emissions - Determination of mass concentration of nitrogen oxides (NO_x) - Reference method: Chemiluminescence.
82 C697 The SuDS Manual. CIRIA, 2007.
83 Flood Estimation Handbook. Centre for Ecology and Hydrology, 1999.
84 Nursery school or education means full-time or part-time education suitable for children who have not attained compulsory school age (whether provided at schools or elsewhere), i.e. facilities or buildings for the teaching of children who are between the ages of two or three to five years old.
85 Children's centres are multi-agency service hubs where young children and their families can receive early education, full day childcare, parental support and child and family health services, such as access to health visitors

and health screening. Children's centres will often be allied to a local primary school, on or adjacent to the school site.

86 Adapted from Design & Access Statements: How to write read and use them (CABE, 2006)

87 ISO 10381-5:2005, Soil quality - Sampling - Part 5: Guidance on the procedure for the investigation of urban and industrial sites with regard to soil contamination

88 UNEP and ADEME, Identification and Management of Contaminated sites, A methodological guide, ADEME editions, Paris, 2005 (http://www.unep.fr/scp/waste/land.htm)