



## SD 5066A: ISSUE 1.1

# BREEAM Europe Commercial 2009 Assessor Manual

*The BREEAM Assessor Manuals are technical guidance documents which have been created to aid licensed BREEAM Assessors in carrying out BREEAM Buildings Assessments.*

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## Changes to the BREEAM Europe Standard

A list of changes between this version (issue 1.1 of 2009) and the previous issue (issue 1.0 of 2009) of the BREEAM Europe standard is published in section 15 of this document.

Issue number	Date of issue
1.0	05/10/2009
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# 1.0 Introduction

## 1.1 What is BREEAM?

BREEAM (Building Research Establishment's Environmental Assessment Method) is the world's leading and most widely used environmental assessment method for buildings, with over 115,000 buildings certified and nearly 700,000 registered. It sets the standard for best practice in sustainable design and has become the de facto measure used to describe a building's environmental performance. Credits are awarded in ten categories according to performance. These credits are then added together to produce a single overall score on a scale of Pass, Good, Very Good, Excellent and Outstanding. The operation of BREEAM is overseen by an independent Sustainability Board, representing a wide cross-section of construction industry stakeholders.

### **Aims of BREEAM:**

- To mitigate the 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 for sustainable buildings

### **Objectives of BREEAM:**

- To provide market recognition to low environmental impact buildings
- To ensure best environmental practice is incorporated in buildings
- To set criteria and standards surpassing those required by regulations and challenge the market to provide innovative solutions that minimise the environmental impact of buildings
- To raise the awareness of owners, occupants, designers and operators of the benefits of buildings with a reduced impact on the environment
- To allow organisations to demonstrate progress towards corporate environmental objectives

## 1.2 Governance and Quality Standards

The BRE Global "Sustainability Board" oversees BRE Global's guides, publications, standards and certification schemes in the area of sustainability and the environment.

Current standards and schemes include BREEAM, EcoHomes, Environmental Profiles and ISO 14001. One of the main responsibilities of this Board is to ensure that standards, guides and the way BRE Global operates meet the needs of stakeholders. The Board meets three times a year to review these issues.

The Sustainability Board reports to the BRE Global Governing Body, which has an independent overview of all BRE Global's schemes and activities. Specific responsibilities of the Sustainability Board and other Boards include:

- advising on the need for new certification schemes, standards and publications, including updates to existing ones
- advising BRE Global on relevant legislation and technical matters
- promoting certification
- advising on issues that may affect the reputation and integrity of BRE Global
- approving certification schemes, standards, publications or approvals and reviewing outputs from Expert Groups and Working Groups
- ensuring a balanced participation with no single interest predominating
- providing comments and guidance, where appropriate, on methods of assessment and testing, to review the progress of assessments and advise on content of certificates, prior to publication; and
- reviewing and advising on complaints and appeals as requested.

The Board represents a wide cross section of stakeholders from the construction industry including designers, developers, end users, financiers, insurers and regulators. The first independent chairman elected by the members is Bill Gething. Bill is one of the most respected figures in sustainable architecture and is the RIBA President's Sustainability Advisor, Chair of the Institute's Sustainable Futures Committee and a partner of Feilden Clegg Bradley Architects LLP.

### **ISO 9001**

BRE Global has ISO 9001 certification for its BREEAM Buildings schemes and also for the assessment and certification of construction materials under the BREEAM LCA (Life Cycle Analysis) environmental profiles. The certification for the BREEAM schemes covers the operations relating to assessor training, licensing, quality management, and record keeping.

### **UKAS Accreditation**

Assessors qualified to deliver the BREEAM buildings schemes are also covered under a UKAS accredited competent persons scheme. In addition, the operations relating to the certification of the BREEAM buildings versions and the environmental profiles are also covered under UKAS accredited product certification schemes.

## 1.3 BREEAM Credibility

### Technical Credibility

BREEAM is tried and tested, both in terms of its robust technical standards and its commercial delivery, and expert advice (based on scientific evidence) continues to inform almost every issue in BREEAM.

In the UK there are over 115,000 buildings certified and over 700,000 homes and buildings currently registered for assessment. BREEAM can be used to assess any building type anywhere in the world.

### Robust Technical Standards

BREEAM has always used objective criteria to recognise good environmental performance:

- Issues for assessment are agreed to be significant, and offer worthwhile reductions in environmental impact
- Issues must be assessable at the relevant stage in the building's life
- Performance levels are based on scientific evidence wherever possible
- Performance levels must exceed demands of law and regulations and encourage innovation
- Improvements encouraged by BREEAM are achievable and cost effective

Where specific targets cannot be set using hard science or research, sensible practical measures are recommended to minimise environmental impact or enhance the environment of the building and its users.

### Commercial Credibility

Assessments are undertaken by organisations and individuals trained and licensed by BRE Global (Assessors). This ensures:

- Competition in the market for assessment services
- Engagement with the whole of the industry
- Assessors work to the same quality standards (monitored by BRE)

BRE Global has gained UKAS (United Kingdom Accreditation Service) accreditation for all its BREEAM schemes. This means that its management of BREEAM is monitored and overseen by UKAS.

## 1.4 The BREEAM Manuals

The following BREEAM scheme manuals are available for free download from the BREEAM website:

**For the United Kingdom:**

BREEAM Courts

BREEAM Education

BREEAM Industrial

BREEAM Healthcare

BREEAM Offices

BREEAM Retail

BREEAM Prisons

BREEAM Multi-residential

**For international:**

BREEAM Gulf (for any building type)

BREEAM Europe Commercial (Offices, Retail and Industrial)

**What is in the BREEAM Manuals?**

- A definition of the scope of each BREEAM scheme
- Full information on the technical standards and criteria of each BREEAM scheme (summarised below)
- Rating & scoring information
- Technical checklists

Country appendix sheets with further information and guidance specific to each country are provided in a separate document.

**Using the BREEAM Manuals**

The BREEAM Assessor Manuals are technical guidance documents which have been created to aid licensed BREEAM Assessors in carrying out Assessments. Please note that the manuals and the information detailed therein has been designed for, and to be used by trained and licensed BREEAM Assessors.

This document must be used by non assessors for reference only (in accordance with the Terms and Conditions of use).

## Understanding the BREEAM Manuals

A BREEAM standard covers ten categories of sustainability including:

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

Each category is detailed in this technical manual and consists of a number of issues (summarised below). Each issue seeks to mitigate the impact of a new or refurbished building on the environment by defining a performance target and assessment criteria that must be met to confirm the target has been achieved. Where a performance target has been achieved the number of available BREEAM credits can be awarded.

**Table 1 Summary of BREEAM categories and main issues**

<b>Management</b> <ul style="list-style-type: none"> <li>• Commissioning</li> <li>• Construction site impacts</li> <li>• Building User Guide</li> </ul>	<b>Waste</b> <ul style="list-style-type: none"> <li>• Construction waste</li> <li>• Recycled aggregates</li> <li>• Recycling facilities</li> </ul>
<b>Health and Wellbeing</b> <ul style="list-style-type: none"> <li>• Daylight</li> <li>• Occupant thermal comfort</li> <li>• Acoustics</li> <li>• Indoor air and water quality</li> <li>• Lighting</li> </ul>	<b>Pollution</b> <ul style="list-style-type: none"> <li>• Refrigerant use and leakage</li> <li>• Flood risk</li> <li>• NO<sub>x</sub> emissions</li> <li>• Watercourse pollution</li> <li>• External light and noise pollution</li> </ul>
<b>Energy</b> <ul style="list-style-type: none"> <li>• CO<sub>2</sub> emissions</li> <li>• Low or zero carbon technologies</li> <li>• Energy sub metering</li> <li>• Energy efficient building systems</li> </ul>	<b>Land Use and Ecology</b> <ul style="list-style-type: none"> <li>• Site selection</li> <li>• Protection of ecological features</li> <li>• Mitigation/enhancement of ecological value</li> </ul>
<b>Transport</b> <ul style="list-style-type: none"> <li>• Public transport network connectivity</li> <li>• Pedestrian and Cyclist facilities</li> <li>• Access to amenities</li> <li>• Travel plans and information</li> </ul>	<b>Materials</b> <ul style="list-style-type: none"> <li>• Embodied life cycle impact of materials</li> <li>• Materials re-use</li> <li>• Responsible sourcing</li> <li>• Robustness</li> </ul>
<b>Water</b> <ul style="list-style-type: none"> <li>• Water consumption</li> <li>• Leak detection</li> <li>• Water re-use and recycling</li> </ul>	<b>Innovation</b> <ul style="list-style-type: none"> <li>• Exemplary performance levels</li> <li>• Use of BREEAM Accredited Professionals</li> </ul>

The performance targets go beyond the minimum standard needed to satisfy Building Regulation or other legislation. The targets represent good or best practice in the field of sustainable design and procurement.

The majority of BREEAM issues are tradable, meaning that a design team/client can pick and choose which to comply with in order to build their BREEAM performance score. Several BREEAM issues do have minimum standards meaning that, to achieve a particular BREEAM rating, a defined number of credits for that issue must be achieved (BREEAM's minimum standards are outlined in section 3.0 Scoring and Rating).

Each BREEAM issue is structured as follows:

- **Issue Information:** Issue ID, issue title, number of credits available for meeting the performance target and whether the issue forms part of BREEAM's minimum standards.
- **Aim:** Broadly outlines the objective of the issue i.e. the impact it intends to mitigate
- **Assessment Criteria:** outlines the building performance target/benchmark and its criteria. Some issue have *Exemplary Level Criteria*. Where a building demonstrates that it meets *Exemplary Level Criteria* an Innovation Credit can be awarded (refer to section 13 *Innovation* for more detail)
- **Schedule of Evidence Required:** outlines typical examples of the type of information that must be collected from the design team/client by the BREEAM assessor so they can assess if the building complies with the issue criteria.
- **Additional Information:** details relevant definitions of BREEAM terminology and contains information to support the assessment and compliance of the building.

The following pages contain an example BREEAM issue.

### Example of a BREEAM Issue

Please note: this BREEAM issue has been edited for the purpose of demonstration.

This box indicates the total number of BREEAM credits available for each scheme. These credits can be awarded if the assessed building complies with the assessment

Information box appears at the top of each BREEAM issue. Each issue has a unique ID and title.

This box states whether or not minimum standards apply to the BREEAM issue. Section 3.3 of the guidance details the specific minimum standards for each relevant BREEAM issue. For example, one of the two available credits for the Man 2 issue must be achieved to obtain an Excellent BREEAM rating.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
3	3	2	Pol 4 - NO <sub>x</sub> emissions from heating source	-	-	-	-	-

The Aim describes the objective of the issue and the impact that the Assessment Criteria seeks to mitigate.

#### Aim

To encourage the supply of heat from a system that minimises NO<sub>x</sub> emissions, and therefore reduces pollution of the local environment.

#### Assessment Criteria

The following demonstrates compliance:

- Where manufacturer's details demonstrate that the plant installed to meet the building's space heating demand has dry NO<sub>x</sub> emission levels at 0% excess O<sub>2</sub> as follows:

Credits	Nominal heat input < 70kW		Nominal heat input > 70kW	
	Dry NO <sub>x</sub> level (mg/kWh)	Boiler class (EN 297:1994)	Dry NO <sub>x</sub> level (mg/kWh)	Boiler class (EN 676:2003)
1	100	4	120	2
2	70	5	80	3
3	40	-	50	-

The emissions should be estimated under normal operating conditions (not standby).

#### Exemplary level criteria

The following outlines the exemplary level criteria to achieve an innovation credit for this BREEAM issue.

An exemplary credit can be awarded where manufacturer's details demonstrate that the plant installed to meet the building's space heating demand has zero dry NO<sub>x</sub> emission levels at 0% excess O<sub>2</sub>.

Some BREEAM issues have Exemplary Level Criteria. If the assessed building complies with the Exemplary Level Criteria an additional BREEAM credit can be awarded for Innovation. See section 13 Innovation

#### Compliance Notes

<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new build projects.
<b>Refurbishment</b>	If the heating demand for the refurbished building is being met by an existing system, then the NO <sub>x</sub> emission level for the existing system must be assessed against the criteria of this issue.
<b>Extensions to existing buildings</b>	The rule above for refurbishment projects also applies to new build extensions to existing buildings.

The Assessment Criteria details the requirements that the assessed building must demonstrate compliance with for the available BREEAM credits to be awarded.

Occasionally international or national publications and standards will be referred to within the Assessment Criteria followed by a reference number or a link to a compliance note. Full references to the international publications are provided in section 16 of this document and references to the national standards are provided in the relevant country appendix sheet.

Each BREEAM issue contains a Compliance Notes table. This table provides additional guidance on the application and interpretation of the Assessment Criteria.



The *Schedule of Evidence Required* table describes the types of information that must be provided to the BREEAM assessor as evidence of the assessed building's compliance with the *Assessment Criteria*.

The *Schedule of Evidence* table is split in to two sections. The first details the type(s) of evidence required at the interim design stage of assessment. The second describes the type(s) of evidence required at the final post construction stage of assessment. The numbers in the table correspond to the numbered assessment criteria in the above sections.

Schedule of Evidence Required		
Req.	Design Stage	Post Construction Stage
1	<p>A copy of the specification clause confirming:</p> <ul style="list-style-type: none"> <li>Type of heating system(s) installed.</li> </ul> <p>For each system specified, a letter, email or literature from the manufacturer(s) confirming:</p> <ul style="list-style-type: none"> <li>Dry <math>NO_x</math> emissions rate in mg/kWh.</li> </ul> <p>If more than one system is providing heat, design team calculations confirming:</p> <ul style="list-style-type: none"> <li>The average <math>NO_x</math> emission rate.</li> </ul>	<p>Assessor's building/site inspection and photographic evidence confirming:</p> <ul style="list-style-type: none"> <li>Heating system(s) installed.</li> </ul> <p><b>OR</b></p> <p>A letter from the design team or main contractor confirming:</p> <ul style="list-style-type: none"> <li>No changes to the specification.</li> </ul>

**Additional Information**

**Relevant definitions**

**Appropriate energy modelling software:** Refer to BREEAM issue Eng 1 for a definition.

**$NO_x$  emissions:** are pollutant gases produced by the combustion of fossil fuels and sunlight to produce ozone that can cause serious respiratory problems and produce acid rain which has a detrimental effect on ecosystems.

**Dry  $NO_x$  Levels:** the  $NO_x$  emissions (mg/kWh) resulting from the combustion of fuel at 0% excess oxygen levels.

**Calculating  $NO_x$  emission levels from fossil energy fired boilers:**  
 For fossil fuel boilers, the  $NO_x$ -emission rate for heat production can either be directly obtained from manufacturers data or calculated from measurements. It is only possible to measure  $NO_x$ -emissions in mg/m<sup>3</sup> combustion air. Please find conversion rates below.

**Calculating  $NO_x$  emission levels from Combined Heat & Power (CHP) systems**  
 Where CHP systems are present or specified, only the heat-related emissions are considered for the assessment of this issue. For a combined heat and power production unit, it is not possible to clearly charge  $NO_x$  emissions to either heat or electricity, as both are produced at the same time with a certain  $NO_x$  emission. Therefore it is necessary to use a reference  $NO_x$ -emission for the produced electricity in the country of assessment, subtract it from the total  $NO_x$ -emission produced by the plant and then allocate the remaining  $NO_x$  emissions to the heat output. The following formula should be used to determine this:

$$m_{Heat} = \frac{M - W_{el} \times m_{el.ref.}}{W_{Heat}}$$

Where:

- $m_{Heat}$  =  $NO_x$  emissions per unit of heat generated in mg/kWh<sub>Heat</sub>
- M = total  $NO_x$  emissions generated by plant in mg
- $W_{el}$  = total quantity of electricity produced in kWh<sub>el</sub>
- $m_{el.ref.}$  = country-specific electricity reference  $NO_x$ -emissions in mg/kWh<sub>el</sub> – please refer to Checklist A9 to find the relevant information
- $W_{Heat}$  = total quantity of electricity produced in kWh<sub>Heat</sub>

The *Additional Information* section contains definitions of terms used in the *Assessment Criteria* and *Compliance Notes* section. This section will also contain further information relevant to the issue e.g. assessment guidance and relevant websites

## 2.0 Scope

This section of the guidance outlines the scope of this international BREEAM scheme and the type of buildings that it can be applied to. The following information is provided in this section:

- The BREEAM assessment and certification stages
- Type of building projects that can be assessed using BREEAM
- Type of buildings that can be assessed using this BREEAM scheme

The BREEAM Europe Commercial scheme can be used to assess the environmental impacts of a commercial building in Europe in accordance with this scope document. For the purposes of BREEAM, Europe is defined as follows;

- Any member state of the European Union. This includes the Republic of Ireland where it is not appropriate to use a UK scheme.
- EFTA Member States i.e. Iceland, Norway and Switzerland
- Current EU candidates: Turkey, Croatia and Macedonia
- Others: Albania, Belarus, Bosnia & Herzegovina, Moldova, Montenegro, Serbia and Ukraine

All assessments undertaken within the UK should use the UK BREEAM schemes, these have been tailored to the UK's construction sector. Where a project is located in a country that is not listed above, please contact BRE to confirm applicability.

Where the building requiring assessment does not fall within the scope of this international BREEAM scheme or one of the other standard UK BREEAM schemes (domestic or non-domestic) or Code for Sustainable Homes, it can be assessed using the BREEAM *Bespoke* scheme. BRE Global can also assist in creating a BREEAM scheme specific for a country or region.

Further information on the BREEAM Bespoke and BREEAM International schemes is available at [www.breeam.org](http://www.breeam.org) or via the BREEAM International helpdesk [breeaminternational@bre.co.uk](mailto:breeaminternational@bre.co.uk).

## 2.1 Stages of assessment

This BREEAM scheme can be used to assess the environmental impacts arising as a result of an individual building development (including external site areas) at the following stages:

1. Design Stage (DS) - leading to an Interim BREEAM Certificate
2. Post-Construction Stage (PCS) – leading to a Final BREEAM Certificate

### **Design Stage**

The DS assessment and subsequent interim BREEAM Certification represents the performance of the building at the design stage of assessment, typically prior to the beginning of operations on site. Certification at this stage does not, therefore, represent the building's final 'as built' BREEAM performance.

To complete an assessment at this stage the design must be advanced to the point where the relevant information is available to enable the BREEAM assessor to demonstrate, in a robust manner, the building's performance against the reporting and evidential criteria of the technical guidance. The interim DS assessment will therefore be completed and certified at the scheme design or detailed design stages.

### **Post-Construction Stage**

The PCS assessment and subsequent BREEAM Certification represents the final 'as built' performance and BREEAM Rating. 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 of an interim design-stage assessment
2. A post-construction assessment

A post-construction review serves to confirm the interim BREEAM rating achieved at the design stage in accordance with the reporting and evidential criteria of the technical guidance. Where a formal interim DS assessment has not been carried out and a BREEAM assessment and rating is required, a full PCS assessment can be conducted.

## 2.2 Type of projects that can be assessed using BREEAM

A BREEAM assessment can be carried out at the above stages for the following types of building project only:

- Whole new buildings
- Major refurbishments of existing buildings
- New build extensions to existing buildings
- A combination of new-build and existing building refurbishment
- New build or refurbishments which are part of a larger mixed use building
- Existing building fit-out

### **Major refurbishments to existing buildings**

For the purposes of a BREEAM assessment, a major refurbishment project is a project that results in the provision, extension or alteration of thermal elements and/or building services and fittings.

- Thermal elements include walls, roofs and floors.
- Fittings include windows (incl. rooflights), entrance doors
- Building services include lighting, heating and mechanical ventilation/cooling

### **Minor refurbishments**

This BREEAM scheme is not designed to assess a minor refurbishment of an existing building, i.e. works that do not result in the provision, extension or alteration of thermal elements and/or building services and fittings; or a change of use.

Please note the Offices, Retail, Industrial and Bespoke schemes can be used to carry out an assessment of a building fit-out (see guidance below).

### **New build extensions to existing buildings**

BREEAM can be used to assess new build extensions to existing buildings and, where the existing building is undergoing major refurbishment, the new build extension and existing building.

When assessing only a new-build extension to an existing building, in some BREEAM issues it is necessary to consider services/facilities within the existing building, where such services/facilities will be integral to the new extension or used by the occupants of the new extension. Assessment guidance is provided in the *Compliance Notes* table within the specific BREEAM issue for such instances, where relevant.

### **Building Fit-out**

BREEAM can be used to assess a fit out of an existing building. An assessment can be carried out on the first fit-out of the shell of a new building/unit or subsequent re-fit of an existing building/unit. A building fit-out can be certified at the interim stage, based on the fit-out design and specification and/or post fit-out based on an assessment of the actual finished, fitted-out unit/building.

The methodology for a fit-out assessment includes issues core to the BREEAM assessment and rating of a building. This includes the assessment of building-related impacts that may not be affected by the scope of the fit-out works. This approach serves to highlight the intrinsic environmental performance of the existing building/unit and recognise the opportunity that a fit-out presents to improve the environmental performance of an existing building.

In the technical guidance the assessment criteria for a building fit-out, for the most part, is the same as that for a new build/major refurbishment assessment. In some BREEAM issues there is building '*fit out only assessment*' criteria, including; *Construction Site Impacts, Materials Specification and Responsible Sourcing*; and some issues contain *fit out only* compliance notes and guidance. Furthermore, some BREEAM issues are not applicable to *fit-out only* assessments, including; *Land Use and Ecology, re-use of facades and structure, recycled aggregates and Flood Risk*.

The assessor should note that if the building is undergoing a first fit-out and the shell and core of the building has previously been BREEAM assessed using the same version of BREEAM, it is permissible to use the existing shell and core building assessment performance and couple this with an assessment of the fit out specification to produce a BREEAM rating for the fully fitted building.

### **Shell and Core / Speculative Assessments**

Non fitted-out buildings of a speculative nature, more commonly referred to as **Shell and Core** buildings, can be assessed using this BREEAM scheme. For the majority of issues the assessment of a Shell and Core building against BREEAM criteria will be straightforward. However, several of the BREEAM issues and their criteria are tailored to assess a building that is being fitted out. These **Fit Out related BREEAM issues** will not be scoped out for the BREEAM assessment of a speculative building, as ultimately the building will be used in a fitted out state, therefore the BREEAM rating must account for this.

It is recognised that it may not be possible to assess compliance with some of the fit out related BREEAM issues, as fit out decisions relating to certain aspects of the building will be made by the future tenant, who at the time of the formal assessment of the Shell and Core building may not be known. Subsequently BREG recognise that there is a need for a degree of flexibility in applying BREEAM to Shell and Core buildings, to recognise the scope of limitations and opportunities open to the developer to influence the final fitted-out performance of the building.

There are four options available to clients who wish to use BREEAM to assess a shell and core building. Each option provides a different level of robustness to assessing BREEAM fit out issues and therefore value in terms of a contribution towards the BREEAM percentage score and rating.

### **Option 1 – Use of a tenancy lease agreement between the developer and tenant/s**

BREEAM aims to encourage a mutually beneficial relationship between the Shell and Core developer/owner of a building and its future tenant/s so that the fully fitted operational building can demonstrate performance against the highest possible environmental standards. In order to achieve this, BREEAM encourages and rewards the use of formal legally binding **Green Lease Agreements** between a developer/owner and their tenant/s, although we recognise that these agreements are currently not widely used within the market place. As such, Green Lease Agreements can be used as evidence demonstrating compliance with the relevant BREEAM issues criteria at the interim and post construction stages of assessment.

BREEAM will only be assessing the fit out specifications of the first tenants to occupy the building after construction, and whether they comply with the tenancy lease agreement. However, green lease agreements should be considered within a long-term strategy wherever possible and future tenants should also be covered by the agreement. Where the developer chooses to use BREEAM In Use to assess the operation of the building after construction, green leases will also be recognised as an acceptable way to demonstrate compliance.

Where a legally binding tenancy agreement, that commits the tenant's fit out to meet the BREEAM criteria, is provided as evidence, the **full value** of the available BREEAM credits covered by the criteria can be awarded.

### **Option 2 – A Green Building Guide for tenant fit outs**

As an alternative to a Green Lease, developers may demonstrate part compliance with BREEAM credits where they produce a building specific **Green Building Guide** that is distributed to all future tenant/s of the assessed building. This formal, but non legally binding document must provide development specific guidance to the tenant on carrying out their fit out in a manner that upholds the BREEAM criteria of the credits sought, and encourages tenants to play their role in maintaining and improving the overall buildings environmental performance.

A Green Building Guide does not provide conclusive evidence that the tenant will implement the suggestions when compared to a Green Lease Agreement and this needs to be reflected in the relative score achieved by the building. Subsequently, where relying on a Green Building Guide to demonstrate compliance with a BREEAM fit out issue or requirement, **half of the value** of the available credits can be achieved and contribute towards the overall BREEAM score and rating.

**Option 3 – Developer/Tenant collaboration**

Where the future tenant(s) of a building is/are known a collaborative assessment may be carried out. The performance of the building and compliance with the BREEAM criteria can be assessed using the design and procurement evidence for the shell and core elements of the building and evidence provided by the future tenant(s) e.g. their fit-out design and specification. Where compliance is sought via this route, the **full value** of the available credits can be achieved and contribute towards the overall BREEAM score and rating.

**Option 4 – No evidence provided for tenant/s fit out specification**

Where a Shell and Core developer cannot confirm compliance with a particular issue or chooses not to produce a Green Lease Agreement or a Green Building Guide to cover the content of a particular issue (or where one or more of the above documents are produced but a particular BREEAM issue is excluded from the content), the BREEAM credits available for the particular issue must be withheld.

**Shell and core assessments of developments with multiple tenants**

It is accepted that in developments with multiple tenants, provided at least 75% of the net lettable floor area within a multiple tenanted building/development is covered by the tenants lease agreement, this will be acceptable for the purposes of awarding full BREEAM credits. Where some of the tenants are covered by the tenants lease agreement, but these do not account to 75% of the net lettable floor area, the total score for each issue might be area-weighted provided that all other tenants are covered by Option 2 (see example below).

**Example – Hea 4 High frequency lighting**

The aim of Hea 4 is to reduce the risk of health problems related to the flicker of fluorescent lighting. Using the BREEAM Europe Retail scheme as an example, the criteria of this issue state that all fluorescent and compact fluorescent lamps in the building (ie in both common and tenanted areas) must be fitted with high frequency ballasts. In this case, tenant areas are likely to account for the majority of the building, therefore this issue is considered as a fit-out related BREEAM issue but common areas will also need to comply for the credit to be awarded.

Case 1 - Where 80% of the tenants (in terms of net lettable area) have signed a lease that includes a legally binding clause stating specifically that the tenant will need to specify high frequency ballasts on all fluorescent and compact fluorescent lamps, the full credit for Hea 4 may be awarded provided that all common areas are also compliant.

Case 2 - Where 26 tenants accounting for 60% of the net lettable area of the building have signed the lease previously described, but all other tenants have refused to sign a lease including that clause, the BREEAM credit for Hea4 might be lost, unless the client develops a green building guide that explains the benefit of fitting high frequency ballasts on fluorescent and compact fluorescent lamps and hands it

over to the tenants in the remaining 40% of the building. In this case, credits may be awarded on an area-weighted basis, ie 60% of the area would get 1 full credit, and the remaining 40% half a point. The total score for issue Hea 4 would therefore be  $0.6 \times 1 + 0.4 \times 0.5 = 0.6 + 0.2 = 0.8$ .

Case 3 - Where those 26 tenants account for only 30% of the net lettable floor area, the total score for issue Hea 4 would be:  $0.3 \times 1 + 0.7 \times 0.5 = 0.3 + 0.35 = 0.65$

Case 4 - Where some tenants are covered by the tenancy lease agreement but no green building guide has been developed to encourage other tenants to consider the issue, the Hea 4 credit must be withheld.

### **Shell and core building assessments and minimum BREEAM standards**

Please note that all minimum BREEAM standards remain applicable for Shell and Core buildings. For issues with minimum standards, compliance can be demonstrated for the areas of the Shell and Core building that are directly under the influence of the Shell and Core developer. For issues reliant upon compliance of tenant areas/fit out items, the minimum standards will still be applied to those areas and compliance can be demonstrated via the lease agreement, green building guide or tenants fit out specification (as demonstrated using example below).

#### **Example - Wat 2 Water Meter**

The aim of Wat 2 is to ensure that water consumption can be monitored and managed therefore encouraging reductions in water consumption. Using the BREEAM Europe Retail scheme as an example, the criteria of this issue state that buildings with multiple tenants are required to provide separate pulsed meters on the water supply to each letting area, common area and service areas where they exist. The installation of a water meter for each of the areas listed above is not carried out by the developer, perhaps because the tenants are responsible for the water consumption in their own unit and pay rates accordingly. However, BREEAM still sets a requirement for these areas to be separately sub-metered and compliance can be demonstrated for each option as follows:

Option 1 - In order to demonstrate compliance with the criteria of this issue and receive the full value of the available BREEAM credits a green lease agreement can be provided as evidence to the BREEAM assessor. The agreement will need to include a clause which requires the tenants to install a water meter for each of the relevant areas they are responsible for. The clause in the tenancy agreement must demonstrate to the BREEAM assessor that the BREEAM criteria will be met. At the post construction stage of assessment it is recognised that if the tenant is unknown then the Green Lease cannot and does not have to be signed by the tenant to demonstrate compliance. The developer/landlord must however confirm that all prospective tenants will be required to sign the Green Lease Agreement to secure compliance with, and the full value of the relevant BREEAM issues. This evidence will allow the development to achieve one credit for this issue.



In developments with multiple tenants, where only some tenants have signed the Green Lease Agreement, and a Green Building Guide has been developed as an informative document for all other tenants as explained below, the score can be area-weighted and the minimum standards will be reduced to half the value. This will be referred to option 1a in the scoring tool.

Option 2 - As an alternative way of demonstrating compliance the developer may decide to produce a green building guide as an informative document for each tenant explaining the benefits of fitting a water meter for the tenanted areas and how the information it provides can be used to encourage reductions in water consumption. They would also need to provide details of the main water consumption monitoring system with sufficient detail that enables the tenant to connect to the system or use a similar system if they choose. The section in the green building guide must demonstrate to the assessor that the BREEAM criteria would be met if the tenant decided to act upon the recommendations given in the guide. This evidence will allow the development to achieve half the value of the available credits, in this instance 0.5 credits.

Option 3 - If the developer and tenants choose to undertake a collaborative assessment then the shell and core specification and the fit out design specification can be used as evidence to demonstrate compliance. If this evidence demonstrates compliance with the BREEAM criteria, it will allow the development to achieve one credit for this issue.

Option 4 - The developer may choose to take no action and subsequently, unless they meet the criteria of this issue through the shell and core specification, no recognition can be given as the assessment criteria will not be met. Subsequently the development will achieve zero credits for this issue.

### **Shell and Core assessments and BREEAM issue Ene 1: Energy Efficiency**

When calculating the Energy Performance Rating for a shell and core building, where HVAC/ lighting variables for the tenanted areas are not known, a developer is required to assume for the shell only spaces the most energy intensive fit-out specification permissible under local building regulations i.e. the maximum design fit-out specification.

For the purposes of the BREEAM assessment it is permissible, when conducting the energy modelling and calculating the Building Energy Performance Index, to substitute specifications confirmed within a Green Lease Agreement, and therefore legally committed to by the tenant(s), in place of the maximum design fit-out specification. This rule applies only to those areas of the building that the scope of the Lease Agreement covers. Tenanted areas not covered by the scope of the Green Lease must assume the maximum design fit-out specification as defined under local building regulations.

The use of a Green Building Guide for tenants fit out (described above) cannot be used to substitute the maximum design fit out specification, for the purpose of assessing BREEAM issue Ene 1 Energy Efficiency, as such a Guide is not legally enforceable.

## Definitions

**Shell and Core** – Typically a Shell and Core building covers base building elements such as structure, envelope and fit out of common areas. A core HVAC system may be provided to allow for tenant connections.

**Fit Out related BREEAM issues** – In BREEAM the following are the typical BREEAM issues which are either specific to, or contain criteria that rely on or are influenced by the tenants fit out of a building. Please refer to each issue's specific compliance note for further guidance on how to assess the issue for a shell only development. Please note that there may be other issues that are relevant in certain circumstances. If the design team and the BREEAM International assessor believe that an issue should be considered as a fit-out related BREEAM issue but isn't considered as such in the manual, please contact BRE with a justification, and the guidance and scoring tool will be amended where appropriate.

Man 1 – Commissioning

Man 4 – Building User Guide

Hea 1 - Daylighting

Hea 2 – View Out

Hea 3 – Glare Control

Hea 4 – High Frequency Lighting

Hea 5 – Internal and External Lighting Levels

Hea 6 – Lighting Zones & Controls

Hea 9 – Volatile Organic Compounds

Hea 10 – Thermal Comfort

Hea 11 – Thermal Zoning

Hea 12 – Microbial Contamination

Hea 13 – Acoustic Performance

Hea 14 – Office Space (Industrial & Retail schemes)

Ene 1 – Energy Efficiency

Ene 2 – Sub-metering of substantial energy uses

Ene 3 – Sub-metering of high energy load and tenancy areas

Ene 4 – External Lighting

Tra 8 – Deliveries and Manoeuvring

Wat 1 – Water Consumption

Wat 2 – Water meter

Wat 4 – Sanitary Supply Shut Off

Wat 5 – Water Recycling

Mat 6 - Insulation

Wst 4 – Compactor Baler

Pol 1 – Refrigerant GWP – Building Services

Pol 2 – Preventing Refrigerant Leaks

Pol 3 – Refrigerant GWP – Cold Storage

Pol 4 – NOx emissions from heating source

Pol 7 – Reduction of night time light pollution

Pol 8 – Noise attenuation

**Green Lease Agreements** - A 'green lease' is a lease for a commercial or public building which incorporates an agreement between the landlord and tenant as to how the building is to be fitted out,

managed and occupied in a sustainable way. Green leases include a schedule containing specific provisions for monitoring and improving energy performance, achieving efficiency targets (e.g. energy, water, waste) and minimising the environmental impacts of the building. The provisions represent an agreement between the landlord and the tenant to adopt procedures to ensure that a building operates at an agreed level through regular monitoring and addressing issues as they arise.

For the purpose of BREEAM a Green Lease Agreement must confirm to the BREEAM assessor that, in entering in to the agreement, the tenant will be required to meet the relevant BREEAM criteria (therefore providing adequate justification for awarding the BREEAM credits). The developer/landlord must confirm that such a lease will be a requirement of tenancy in the building.

The Better Building Partnership (BBP), a group of leading property owners, has produced a Green Lease toolkit: [www.lda.gov.uk/upload/pdf/BBP\\_Green\\_Lease\\_Toolkit.PDF](http://www.lda.gov.uk/upload/pdf/BBP_Green_Lease_Toolkit.PDF)

The toolkit includes non prescriptive best practice recommendations, model Memorandum of Understanding for owners/tenants and model form Green Lease Clauses.

**Green Building Guide** – A formal document that provides detailed advice to the proposed/actual tenant/s of the building on how to minimise the environmental impacts of the building. The Guide will have a particular focus on those impacts that can be influenced by the tenant(s) as a result of their building fit out. For the purposes of assessing this document within BREEAM an assessor will need to be provided with a copy of the guide clearly outlining the BREEAM issues covered within the guide. The assessor will need to determine which of the issue criteria within BREEAM will be achieved if the tenant puts the recommendations of the Guide into practice.

#### **Similar buildings (or units) on the same site**

It is possible to assess a number of separate but similar buildings, or individual units within a larger building development, within one BREEAM assessor's report. This is subject to the following conditions:

1. The buildings/units must all be on the same site
2. The buildings/units must be of the same building type e.g. an office, with the same building functions/spaces and fitted out to a similar specification and therefore assessed using the same BREEAM issues
3. Each BREEAM issue must be assessed, and its credits awarded, based on the worst performing building/unit
4. The assessment and assessors report produces a single BREEAM rating covering all buildings/units assessed

For the above scenario, a single BREEAM certificate will be issued listing all the buildings/units covered by the single BREEAM assessor's report.

Where required, a duplicate of the certificate can be produced for the purposes of display in each individual building/unit. Duplicates of certificates are not chargeable provided they are requested by the BREEAM assessor along with the initial certification request to BRE Global.

Alternatively, a certificate can be produced specific to each individual building/unit. In such cases an additional charge will be made for each individual certificate requested.

In either case the certification criteria must be confirmed by the assessor on the Certificate Request Form submitted with their formal assessment report to BRE Global.

If one or more building/unit performs markedly better than another on the same site and the client wishes to recognise this, a separate BREEAM assessment and therefore certificate is required.

## 2.3 Type of buildings that can be assessed using this BREEAM scheme

### 2.3.1 Offices

BREEAM Europe Offices can be used to assess buildings that consist of office areas and associated functions/areas.

The building functions/spaces listed below are covered by the scope of BREEAM Offices where they form a part of an office development:

#### Office areas

- Cellular or open plan offices
- Meeting rooms
- Training/presentation rooms

#### Other associated functions/areas

- Reception and waiting areas
- Staff restaurant and/or kitchen facilities
- Restrooms, WCs and changing facilities
- Storage and waste management areas
- I.T suites, server rooms
- Staff gym or crèche
- Ancillary areas e.g. plant room, circulation space

The office areas must make up >50 % of the gross internal floor area of the building.

The above list is not exhaustive, but serves to indicate the type of areas covered by the scope of this BREEAM scheme. Where a proposed building contains a small additional function/area that is not listed above, the building can still be assessed using this scheme. If the assessor has reason to believe that this scheme is not appropriate given the small additional function/area type, BRE Global should be contacted for advice.

#### Mixed use developments

Office space within a mixed use development/building can be assessed using BREEAM Offices, provided the office space is separable from the other mixed use elements of the building.

### Floors within a larger office development

Single or multiple floors of office space 'sandwiched' between other floors that do not form a part of the assessment can be assessed using this scheme. An example of this situation may be in the case of a tenanted building where part of the building is undergoing refurbishment or a re-fit and the remaining parts are not undergoing such change, or they are undergoing refurbishment/fit out but do not require a BREEAM assessment.

### Data centres

There is a separate UK BREEAM scheme for the assessment of buildings whose primary function will be to act as data centres i.e. the floor area of such buildings consists predominantly of data hall. As such BREEAM Offices cannot be used to assess data centres, the BREEAM Bespoke International should be used to adapt the existing UK criteria to the location.

### Building does not fit the scope of BREEAM Offices

Building types not covered by the scope of BREEAM Offices could be assessed using another BREEAM scheme. All BREEAM scheme manuals can be downloaded from [www.breeam.org](http://www.breeam.org), each manual details the scope of that scheme. Alternatively, if the building does not fall within the scope of an existing BREEAM standard it can be assessed using the BREEAM Bespoke scheme.

## 2.3.2 Industrial

BREEAM Europe Industrial can be used to assess one or a combination of the following types of Industrial building:

1. **Storage and distribution warehouses:** (including cold food storage)
2. **Light industrial/factory units** e.g. manufacturing, assembly, packaging etc. and small 'starter' or 'nursery' units.
3. **Workshops:** e.g. manual workshops and vehicle workshops.

The building functions/areas listed below are covered by the scope of BREEAM Industrial where they form a part of one of the above industrial building types:

#### Operational areas

- Storage/warehousing
- Light industrial/factory uses
- Workshops and cold storage
- Delivery yard
- Waste management areas

#### Office areas (see also figure 1 and guidance below)

- Cellular or open plan offices
- Meeting rooms
- Training/presentation rooms

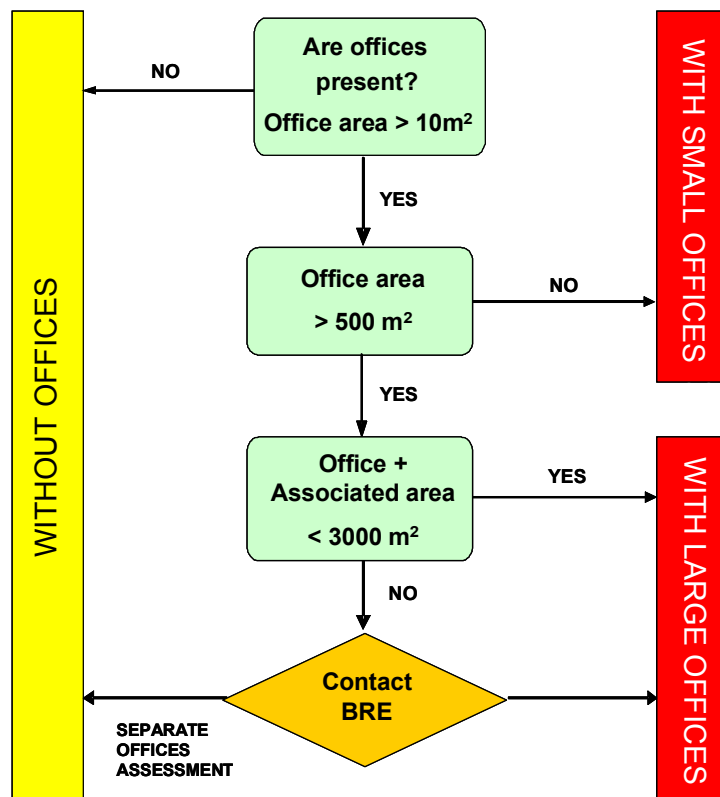
**Other associated functions/areas**

- Reception, counter/customer services and waiting area
- Staff restaurant and/or kitchen facilities
- Restrooms, WCs and changing facilities
- I.T. suites, server rooms
- Staff gym
- Staff crèche/nursery
- Ancillary areas e.g. plant room, circulation space

The operational areas must make up >50% of the total gross internal floor area of the building.

The above list is not exhaustive, but serves to indicate the type of areas covered by the scope of this BREEAM scheme. Where a proposed building contains a small additional function/area that is not listed above, the building can still be assessed using this scheme. If the assessor has reason to believe that this scheme is not appropriate given the small additional function/area type, BRE Global should be contacted for advice.

Unless otherwise stated, BREEAM Industrial cannot be used to assess any of the above functions/spaces as standalone developments, i.e. the Industrial scheme cannot be used to assess and certify an office or gym that does not form a part of one of the above industrial building types. Such buildings can be assessed using one of the other standard BREEAM schemes or, where appropriate, the BREEAM Bespoke scheme.



**Figure 1: Determining the type of BREEAM *Industrial* assessment**

The approach to the assessment of office areas within an industrial building differ depending on the size of office space provided. The BREEAM Assessor's spreadsheet tool selects the appropriate BREEAM issues for assessment based on the scope of the building requiring assessment, as defined by the BREEAM assessor.

### **Trade Warehouse**

A building used for trade only with a counter and customer service area can be assessed using the BREEAM Industrial scheme. A building with goods display areas must be assessed using the BREEAM Retail scheme.

### **Automotive servicing and repair workshops**

Buildings with a vehicle workshop service and repair area, counter and customer waiting area and staff office/room should be assessed using the BREEAM Industrial scheme.

### **Automotive showrooms**

Automotive showrooms that meet the following must be assessed using the BREEAM Retail scheme:

- a. The majority of the gross internal floor area (excluding 'office areas' and 'other associated function areas') consists of vehicle sales and display areas.
- b. The remaining gross internal floor area consists of vehicle workshops and offices areas.

Where the vehicle sales and display area is less than 50% of the gross internal floor area, BRE Global should be contacted for advice on which BREEAM scheme to use.

### **Building does not fit the scope of BREEAM *Industrial***

Building types not covered by the scope of BREEAM Industrial could be assessed using another BREEAM scheme. All BREEAM scheme manuals can be downloaded from [www.breeam.org](http://www.breeam.org), each manual details the scope of that scheme. Alternatively, if the building does not fall within the scope of an existing BREEAM standard it can be assessed using the BREEAM Bespoke scheme.

## **2.3.3 Retail**

BREEAM Europe Retail can be used to assess one or a combination of the following types of retail building:

1. **General display and sale of goods:** covers general shops and retail units selling non-food goods
2. **Food retail:** covers supermarkets/superstores and other convenience stores i.e. building types which display food or food and non-food goods
3. **Food preparation and service:** covers restaurants, cafes, public houses, bakeries, takeaways i.e. building types where food is prepared on site and served for consumption either on or off site
4. **Service provider:** covers banks, post office, bookmakers, dry cleaners, travel agencies.



The Retail scheme can assess the above types of retail where they combine to form part of a larger retail development e.g. shopping centre/district, department store or retail park.

The building functions/areas listed below are covered by the scope of BREEAM Retail where they form a part of one of the above retail building types:

**Retail areas**

- Retail sales and display areas
- Counter and customer service areas
- Customer dining and seating areas
- Petrol station & vehicle wash

**Operational support areas**

- Goods storage/warehousing
- Workshops
- Cold storage
- Commercial kitchen/food preparation and servery
- Commercial laundry/dry cleaner
- Delivery yard
- Waste management areas

**Office areas** (see also figure 1 and guidance below)

- Cellular or open plan offices
- Meeting rooms
- Training/presentation rooms

**Associated functions/areas**

- Cinema
- Health and fitness suite
- Staff restaurant and/or kitchen facilities
- Restrooms, WCs and changing facilities
- Reception and waiting areas
- I.T. suite, server room
- Crèche/Nursery
- Ancillary areas e.g. plant room, circulation space

The retail and operational support areas must make up >50 % of the gross internal floor area of the building.

The above list is not exhaustive, but serves to indicate the type of spaces covered by the scope of this BREEAM scheme. Where a proposed building contains a small additional function/area that is not listed above, the building can still be assessed using this scheme. If the assessor has reason to believe that this scheme is not appropriate given the small additional function/area type, BRE Global should be contacted for advice.

Unless otherwise stated BREEAM Retail cannot be used to assess any of the above functions/spaces as standalone developments, i.e. the Retail scheme cannot be used to assess and certify an office or gym that does not form a part of one of the above retail building types. Such buildings can be assessed using one of the other standard BREEAM schemes or, where appropriate, the BREEAM Bespoke scheme.

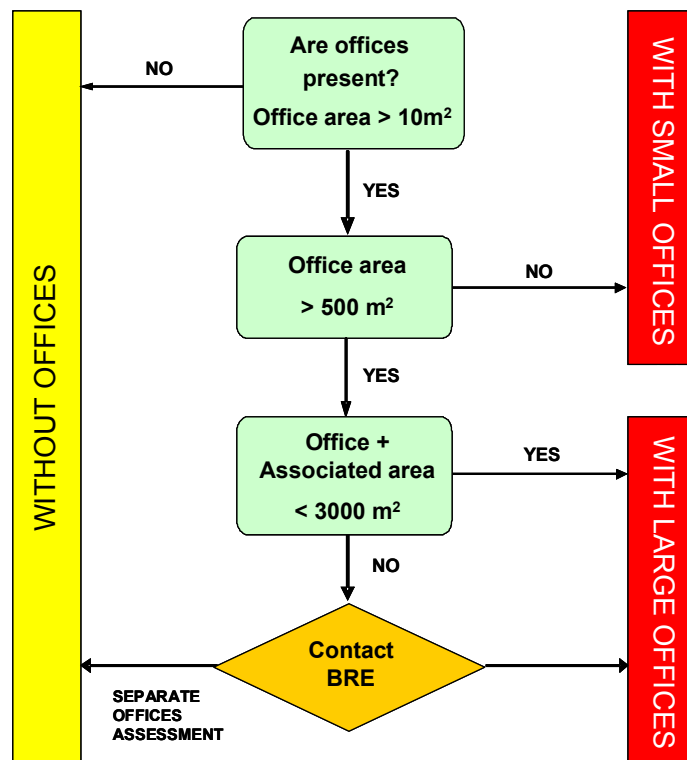


Figure 1: Determining the type of BREEAM Retail assessment

The approach to the assessment of office areas within a retail building differ depending on the size of office space provided. The BREEAM Assessor's spreadsheet tool selects the appropriate BREEAM issues for assessment based on the scope of the building requiring assessment, as defined by the BREEAM assessor.

### Trade Warehouse

A building used for trade only with a counter and customer service area can be assessed using the BREEAM Industrial scheme. A building with goods display areas must be assessed using the BREEAM Retail scheme.

### Automotive servicing and repair workshops

Buildings with a vehicle workshop service and repair area, counter and customer waiting area and staff office/room should be assessed using the BREEAM Industrial scheme.

### Automotive showrooms

Automotive showrooms that meet the following must be assessed using the BREEAM Retail scheme:

- The majority of the gross internal floor area (excluding 'office areas' and 'other associated function areas') consists of vehicle sales and display areas.
- The remaining gross internal floor area consists of vehicle workshops and offices areas.

Where the vehicle sales and display area is less than 50% of the gross internal floor area, BRE should be contacted for advice on which BREEAM scheme to use.

### **Mixed use developments**

Retail space within a mixed use development/building can be assessed using BREEAM Retail, provided the retail space is separable from the other mixed use elements of the building.

### **Floors within a larger retail development**

Single or multiple floors or units of retail space 'sandwiched' between other floors that do not form a part of the assessment, can be assessed using this scheme. An example of this situation may be in the case of a tenanted building where part of the building is under-going refurbishment or a re-fit and the remaining parts are not undergoing such change, or they are undergoing refurbishment/fit out but do not require a BREEAM assessment.

### **Building does not fit the scope of BREEAM Retail**

Building types not covered by the scope of BREEAM Retail could be assessed using another BREEAM scheme. All BREEAM scheme manuals can be downloaded from [www.breeam.org](http://www.breeam.org), each manual details the scope of that scheme. Alternatively, if the building does not fall within the scope of an existing BREEAM standard it can be assessed using the BREEAM Bespoke scheme.

## 3.0 Scoring and Rating

This section of the BREEAM manual explains how an assessed building's certified BREEAM rating is calculated.

There are a number of elements that determine the BREEAM rating; these are as follows:

- BREEAM rating benchmarks
- BREEAM environmental weightings
- Minimum BREEAM standards
- BREEAM credits for Innovation

Each of these elements is described in the sections on the following pages; this is followed by guidance and an example describing how a BREEAM rating is calculated.

In addition, there is a section describing the conditions that must be met in order to award an assessed building a 'BREEAM Outstanding' rating, the highest achievable BREEAM rating.

### 3.1 Rating benchmarks

The rating benchmarks for the 2009 version of BREEAM Europe are outlined in table 2 below for new buildings, major refurbishments and fit-out projects:

**Table 2 BREEAM 2009 rating benchmarks**

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

\* Please note: there are additional criteria for achieving a BREEAM Outstanding rating. Please refer to the guidance below.

### 3.2 Environmental section weightings

Table 3 below outlines the environmental weightings for the nine BREEAM sections for the type of building projects that BREEAM Buildings can be used to assess (refer to scope of the scheme document):

**Table 3 BREEAM 2009 environmental weightings**

BREEAM Section	Weighting (%)	
	New builds, extensions & major refurbishments	Building fit-out only
Management	12	13
Health & Wellbeing	15	17
Energy	19	21
Transport	8	9
Water	6	7
Materials	12.5	14
Waste	7.5	8
Land Use & Ecology	10	N/A
Pollution	10	11
Innovation	10	10

### 3.3 Minimum standards

To achieve a BREEAM rating, the minimum percentage score must be achieved (as outlined in table 2 above) and the minimum standards (i.e. number of credits achieved) applicable to that rating level (below) complied with.

**Table 4 Minimum BREEAM standards**

BREEAM issue	BREEAM Rating / Minimum number of credits				
	PASS	GOOD	VERY GOOD	EXCELLENT	OUTSTANDING
Man 1 - Commissioning	-	-	-	1	2
Man 3 - Construction site impacts	-	-	-	1	2
Man 4 - Building user guide	-	1	1	1	1
Hea 4 - High frequency lighting	1	1	1	1	1
Ene 1 - Energy Efficiency	-	-	-	6	10
Ene 2 - Sub-metering of substantial energy uses	-	-	1	1	1
Ene 5 - Low or zero carbon technologies	-	-	-	1	1
Wat 1 - Water consumption	-	-	1	1	2
Wat 2 - Water meter	-	-	-	1	1
Wst 3 - Storage of recyclable waste	-	-	-	1	1
LE 4 - Impact on site ecology	-	-	-	2	2

Please refer to the relevant part of the scope section of this manual (section 2.2) for guidance on how BREEAM's minimum standards are applied and assessed for speculative (shell and core) building assessments.

### 3.4 BREEAM credits for innovation

Innovation credits provide additional recognition for a building that innovates in the field of sustainable performance, above and beyond the level that is currently recognised and rewarded within standard BREEAM issues. Innovation credits therefore enable clients and design teams to boost their building's BREEAM performance and in addition, help support the market for new innovative technologies and practices.

An additional 1% score can be added to a building's final BREEAM score for each Innovation credit achieved. The maximum number of Innovation credits that can be awarded for any one building assessed is 10; therefore the maximum available score achieved for 'innovation' is 10%. Innovation credits can be awarded regardless of the final BREEAM rating i.e. they are awardable at any BREEAM rating level.

A building can achieve an Innovation credit by meeting exemplary performance criteria for an existing BREEAM issue (table 5 outlines the BREEAM issues with exemplary performance criteria). Further detail is available in section 13 *Innovation*.

**Table 5 BREEAM issues with exemplary level criteria.**

<b>Man 3</b> – Construction Site Impacts
<b>Hea 1</b> – Daylighting
<b>Hea 9</b> – Volatile Organic Compounds
<b>Hea 14</b> - Office Space (BREEAM Retail & Industrial Schemes only)
<b>Ene 1</b> - Energy Efficiency
<b>Ene 5</b> - Low or Zero Carbon Technologies
<b>Tra 3</b> – Alternative modes of transport
<b>Wat 2</b> - Water Meter
<b>Mat 1</b> - Materials Specification
<b>Mat 5</b> - Responsible Sourcing of Materials
<b>Wst 1</b> - Construction Site Waste Management
<b>Pol 4</b> – NOx emissions of heating source

### 3.5 How to calculate a building's rating

A BREEAM assessor must determine the BREEAM rating using the BREEAM Assessor's Spreadsheet Tool and associated calculators. An indication of performance against the BREEAM standard can also be determined using a BREEAM Pre-Assessment Estimator. The Pre-Assessment Estimators are available from the BREEAM website for each scheme.

The process of determining a BREEAM rating is outlined below and in table 6:

1. For each BREEAM section the number of credits awarded must be determined by a BREEAM assessor in accordance with BREEAM's assessment criteria (detailed in the technical sections of the scheme manual).
2. The percentage of the credits achieved is calculated for each BREEAM section.
3. The percentage of credits achieved is then multiplied by the corresponding BREEAM section weighting (see note below). This gives the section score.
4. The section scores are then added together to give the overall BREEAM score. The BREEAM score is compared to the benchmarks in table 2 and, provided all minimum standards have been met, the relevant BREEAM rating is achieved.
5. An additional 1% can be added to the final BREEAM score for each Innovation credit achieved (up to a maximum of 10%).

Note: *Fit-Out only* assessments do not assess the BREEAM issues under the Land Use & Ecology section. The section weighting for Land Use and Ecology is re-distributed amongst the remaining eight sections. The re-distribution is determined based on the relative weighting of the remaining sections, so for example, the Energy section receives a greater proportion of the Land Use and Ecology weighting than the Water section. See Table 3 above for details of the respective section weighting.



Table 6 Example BREEAM score and rating calculation

<b>BREEAM Section</b>	<b>Credits Achieved</b>	<b>Credits Available</b>	<b>% of Credits Achieved</b>	<b>Section Weighting</b>	<b>Section score</b>
Management	7	10	70%	0.12	8.40%
Health & Wellbeing	11	14	79%	0.15	11.79%
Energy	10	21	48%	0.19	9.05%
Transport	5	10	50%	0.08	4.00%
Water	4	6	67%	0.06	4.00%
Materials	6	12	50%	0.125	6.25%
Waste	3	7	43%	0.075	3.21%
Land Use & Ecology	4	10	40%	0.10	4.00%
Pollution	5	12	42%	0.10	4.17%
Innovation	1	10	10%	0.10	1%
<b>Final BREEAM score</b>				<b>55.87%</b>	
<b>BREEAM Rating</b>				<b>VERY GOOD</b>	
<b>Minimum Standards for BREEAM 'Very Good' rating</b>					
<b>Man 4 – Building User Guide</b>				✓	
<b>Hea 4 - High frequency lighting</b>				✓	
<b>Ene 2 Sub-metering of substantial energy uses</b>				✓	
<b>Wat 1 - Water consumption</b>				✓	

## 3.7 BREEAM Outstanding Rating

The following conditions must be met in order to certify a building at the Outstanding BREEAM rating level:

1. The building must achieve a final BREEAM Score  $\geq 85\%$
2. The minimum performance standards (table 4) for the Outstanding rating level must have been met
3. Provision of material for the production and publication of a case study (refer to guidance below) on the Outstanding rated building.

### **Production of case study**

One of the most important aspects of the Outstanding BREEAM rating will be that projects receiving this rating will act as exemplars for the industry. It is therefore a very important aspect of the new rating that a good-quality case study is produced that design teams can refer to.

The design team and client will be asked via the certificate request form to agree to provide relevant building/project information to allow BRE Global to produce a case study. This information will be required with the formal post construction stage BREEAM assessor's report for the assessed building.

Subject to approval from the design team/client, BRE Global will publish the case study on either the BREEAM website, Green Book live website and other BRE/BREEAM-related publications (as appropriate).

Where information is not provided for the production of a case study, the building will be certified to a BREEAM Excellent rating level.

## 4.0 Management

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
			Man 1 - Commissioning	P	G	VG	E	O
2	2	2		-	-	-	1	2

### Aim

To recognise and encourage an appropriate level of building services commissioning that is carried out in a co-ordinated and comprehensive manner, adhering to national best practise guidelines, thus ensuring optimum performance under actual occupancy conditions.

### Assessment Criteria

The following demonstrates compliance:

#### First credit

1. An appropriate project team member(s) is appointed as *commissioning agent* to monitor and programme pre-commissioning, commissioning and, where necessary, re-commissioning of the following key services (where they are present in the building) on behalf of the client:
  - Heating systems
  - Water Distribution systems
  - Lighting systems
  - Ventilation systems
  - Refrigeration systems
  - Automatic controls
  - Cold storage
2. The main contractor accounts for the commissioning programme, responsibilities and criteria within the main programme of works. In particular, an *adequate period of time* has been allowed for commissioning in the project programme.
3. A *specialist commissioning manager* is appointed (by either client or contractor) at design stage for *complex systems* (where they exist – please refer to compliance notes for a definition of complex systems). The scope of their responsibility includes:
  - Design input: commissionability design reviews
  - Commissioning management input to construction programming
  - Commissioning management input during installation stages
  - Management of commissioning, performance testing and handover/post handover stages.

#### Second credit

1. The first credit has been achieved.
2. Commissioning is carried out in line with *national best practise commissioning codes*, or alternative commissioning guidance as outlined in Checklist A10.

3. Where a Building Management System (BMS) is specified, the following commissioning procedures must be carried out:
  - a. Commissioning of air and water systems is carried out when all control devices are installed, wired and functional
  - b. 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
  - c. The BMS/controls installation should be running in auto with satisfactory internal conditions prior to handover
  - d. All BMS schematics and graphics (if BMS is present) are fully installed and functional to user interface before handover
  - e. The occupier will be fully trained in the operation of the system.
4. The above appointment(s) include the following seasonal commissioning responsibilities over a minimum 12 month period, once the building becomes occupied:

#### **Complex Systems –Specialist commissioning manager**

- a. Testing of all building services under full load conditions, i.e. heating equipment in mid-winter, cooling/ventilation equipment in mid-summer, and under part load conditions (spring/autumn)
- b. Where applicable, testing should also be carried out during periods of extreme (high or low) occupancy
- c. Interviews with building occupants (where they are affected by the complex services) to identify problems or concerns regarding the effectiveness of the systems
- d. Re-commissioning of systems (following any work needed to serve revised loads), and incorporating any revisions in operating procedures into the O&M manuals.

Where specialist building services systems such as fume cupboards, microbiological safety cabinets and a cold storage system are present then the assessor must ensure that these systems are included in the specialist commissioning agent's responsibilities.

#### **Simple Systems (naturally ventilated) – External Consultant/Facilities Manager**

- a. Review thermal comfort, ventilation, and lighting, at three, six, nine and twelve month intervals after initial occupation, either by measurement or occupant feedback.
- b. Take all reasonable steps to re-commission systems following the review and incorporate any relevant revisions in operating procedures into the O&M manuals.

<b>Compliance notes</b>	
<b>New Build</b>	There are no additional or different requirements to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different requirements to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	There are no additional or different requirements to those outlined above specific to the assessment of extensions to existing buildings.
<b>Shell Only</b>	<p>An assumption has to be made that the shell only spaces of the building will contain heating, ventilation and air conditioning systems (HVAC), domestic hot water systems (DHWS) and/or Lighting and therefore both credits must be assessed.</p> <p>Compliance with this BREEAM issue can be demonstrated via one of the following means in shell only buildings/areas:</p> <ul style="list-style-type: none"> <li>• Option 1 – Use of a tenancy lease agreement between the developer and tenant/s (full value of available credits)</li> <li>• Option 2 – A Green Building Guide for tenant fit outs (half the value of the available credits)</li> <li>• Option 3 – Developer/Tenant collaboration (full value of available credits)</li> </ul>

	<p>Where compliance with the assessment criteria cannot be demonstrated the available credits must be withheld (option 4).</p> <p>Refer to the <i>Scope</i> section 2.2 <i>Types of project that can be assessed using BREEAM</i> (Shell and Core / Speculative Assessments) for further description of the above options.</p>
<b>Fit Out only</b>	<p>The criteria at this stage of assessment are the same as those identified at the design stage, subject to the following;</p> <ol style="list-style-type: none"> <li>1. The criteria apply to the existing services, to encourage re-commissioning of those services following additional installation works, and to any new systems specified or integrated into the services strategy as part of the fit-out works.</li> <li>2. Where the existing services have been commissioned or re-commissioned within the three years prior to the assessment, and therefore further commissioning or re-commissioning would be of little benefit, then this credit can be awarded by default. This is provided that the scope of the current fit-out works does not result in any of the following: <ol style="list-style-type: none"> <li>a. Changing of layout which could enhance or reduce daylight, ventilation and zone controls such as partitioning, relocation of HVAC units etc;</li> <li>b. Changing perimeter services;</li> <li>c. Changes to zoned areas for HVAC equipment;</li> </ol> </li> </ol> <p>Specification of additional or replacement plant/controls that affect HVAC or DHW systems.</p>
<b>Adequate period of time</b>	<p>The time allocated for commissioning, performance testing and handover may vary depending on the scope of building services within the building. However, at least two weeks should be allocated for commissioning where a building contains complex servicing systems.</p>
<b>National best practice commissioning codes</b>	<p>Please refer to the country specific reference sheet to locate the appropriate national building regulations and best practice commissioning codes in the country of assessment. Alternatively, please demonstrate applicability as follows;</p> <ul style="list-style-type: none"> <li>• The minimum requirements as set out in Checklist A10 are covered by the proposed documents</li> </ul> <p>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.</p>
<b>Commissioning agent</b>	<p>The role of the commissioning agent is to monitor and programme commissioning of the building services as part of the global programme of works to ensure that the commissioning carried out is adequate to the systems installed in the building, as well as to carry out commissioning of the simple systems. The commissioning agent can be:</p> <ul style="list-style-type: none"> <li>• A person from within the contractor or sub-contractor organisation,</li> <li>• A member of the design team</li> <li>• The project manager</li> </ul> <p>provided they are not involved in the general installation works. Please contact BRE for clarification on the suitability of other individuals.</p>
<b>Specialist commissioning manager</b>	<p>This individual must be appropriately qualified to carry out commissioning of complex systems, <u>but also</u> manage the commissioning requirements of those systems from early design stage to post handover of the building, in particular the specialist commissioning manager must work with the design team, the commissioning agent and the contractor to ensure commissioning requirements are appropriately taken into account at each stage of the project and that the systems will operate as per design. Examples of these individuals include:</p>

	<ul style="list-style-type: none"> <li>• Building services engineer</li> <li>• M&amp;E engineer</li> <li>• Specialist contractor</li> <li>• Specialist commissioning agency</li> </ul> <p>They may be part of the design team or a specialist design contractor but cannot be directly involved in the installation works. Please contact BRE for clarification on the suitability of other individuals.</p>
<b>Complex systems</b>	<p>Complex systems are systems that typically involve interaction between a number of components to ensure proper operation. They will usually require specific knowledge and expertise to be designed and installed. They may depend on other systems such as control systems to work effectively. Typical complex systems are:</p> <ul style="list-style-type: none"> <li>• Air conditioning</li> <li>• Mechanical ventilation, displacement ventilation, complex passive ventilation</li> <li>• Building management systems (BMS)</li> <li>• Renewable energy sources</li> <li>• Microbiological safety cabinets and fume cupboards</li> <li>• Cold storage enclosures and refrigeration plant</li> </ul> <p>Simple systems which may be commissioned by the commissioning agent include gas condensing boilers or water pipes.</p>
<b>Naturally ventilated buildings</b>	<p>Where the building is largely naturally ventilated, using simple cross-flow ventilation relying solely on openable windows and/or trickle vents (except in areas where mechanical ventilation is legally required), the appointment of a specialist commissioning agent is not required to award this credit. If a BMS system is employed, however, to control the natural ventilation and/or if renewable energy sources are utilised in the development, the requirement for a specialist commissioning agent remains.</p>
<b>Process related equipment</b>	<p>Any process- or manufacture-related equipment specified as part of the building fit-out may be excluded from this requirement except where they form an integral part of the building HVAC services, such as some heat recovery systems.</p>

### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
<b>First Credit</b>		
1&3	<p>A copy of a letter or commissioning responsibilities schedule confirming the appointment of [or commitment to appoint]:</p> <ul style="list-style-type: none"> <li>• Commissioning agent and scope of their commissioning role.</li> <li>• Specialist commissioning manager and scope of their commissioning role.</li> </ul>	<p>Commissioning records/reports confirming:</p> <ul style="list-style-type: none"> <li>• Monitoring actions carried out by the nominated design team member.</li> <li>• Specialist commissioning manager's actions/role.</li> </ul>
2	<p>A copy of the specification clause confirming:</p> <ul style="list-style-type: none"> <li>• The managing contractor's responsibilities with respect to this requirement.</li> </ul> <p><b>OR</b></p>	<p>A copy of the main contract programme highlighting;</p> <ul style="list-style-type: none"> <li>• Commissioning, performance testing and handover period.</li> </ul>

	A copy of a commissioning schedule highlighting: <ul style="list-style-type: none"> <li>Managing contractor's commissioning responsibilities.</li> <li>Sufficient time will be allocated for commissioning, performance testing and handover.</li> </ul>	
<b>Second Credit</b>		
1	Evidence (as outlined above) confirming compliance with the first credit.	Evidence (as outlined above) confirming compliance with the first credit.
2	A copy of the specification clause stating: <ul style="list-style-type: none"> <li>The standards and codes of practice to which commissioning procedures are to comply with.</li> </ul> Where applicable, a copy of Checklist A10 confirming the national best practice commissioning standards used.	Commissioning records/reports confirming: <ul style="list-style-type: none"> <li>Commissioning procedures executed in compliance with relevant standards.</li> </ul> Where applicable, a copy of Checklist A10 confirming the national best practice commissioning standards used.
3	A copy of the specification clause/commissioning schedule confirming: <ul style="list-style-type: none"> <li>The stages of the BMS/Controls commissioning procedures.</li> </ul>	Commissioning records/reports confirming that; <ul style="list-style-type: none"> <li>BMS/controls commissioning activities were carried out in compliance with the commissioning schedule/specification clause.</li> </ul>
4	Refer to evidence requirements for 1, 2 & 3 of the first credit. This evidence must confirm the scope of seasonal commissioning responsibilities/tasks (as required).	A copy of the seasonal commissioning schedule/programme.  <b>OR</b>  A copy of the letter appointing the commissioning manager and scope of their responsibilities.

### Additional Information

#### Relevant definitions

None.

Commissioning is a vital stage of most construction projects in ensuring that building services and fabric operate as intended by the design team, i.e. in a safe **but also** efficient and effective way. A poorly commissioned building can consume significantly more resources, and is likely to provide a significantly poorer indoor environment than one that is properly commissioned.

Many projects suffer from inadequate commissioning due to a lack of clear responsibilities. BREEAM seeks to ensure that such responsibilities are clearly assigned. Whilst rarely in a position to control commissioning work, design team professionals are in an ideal position to witness it and give feedback on its relevance, robustness, and effectiveness. On more complex projects, the appointment of a specialist agent can give significant benefits in ensuring that systems work together and avoid unnecessary conflicts through poor installation and setting.

Once a building is occupied, the actual internal environmental conditions may be different from those anticipated at the design stage, and seasonal commissioning of the building allows the building services to be fine tuned to provide optimum conditions under all actual weather/occupancy conditions..

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
2	2	2	Man 2 - Constructors' Environmental & Social Code of Conduct	-	-	-	-	-

### Aim

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

### Assessment Criteria

The following demonstrates compliance:

1. The main contractor complies with Checklist A2, credits awarded as follows:
  - a. One credit where 6 items are achieved in each of the four sections.
  - b. Two credits where all items are achieved in each of the four sections.

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	There are no additional or different criteria to those outlined above specific to the assessment of extensions to existing buildings.
<b>Shell Only</b>	There are no additional or different criteria to those outlined above specific to shell only assessments.
<b>Fit Out Only</b>	The criteria at this stage of assessment are the same as those identified at the design stage.
<b>Contractor not yet appointed</b>	At the interim design stage of assessment, where the contractor is not yet appointed, the client must either include within the specification, or commit to including, a requirement for the appointed contractor to comply with specific criteria of Checklist A2. A general commitment to satisfy Checklist A2 will not be acceptable. The assessor must then use this information to complete Checklist A2.
<b>Site clearance</b>	The scope of this issue applies to the main contractor and their scope of works. If the scope of the main contractor's works includes demolition and site clearance then this stage of work falls within the scope of the credit criteria.
<b>Assessment of Checklist A2</b>	The site must be assessed by the BREEAM International assessor using Checklist A2 along with a nominated individual on site, e.g. site manager. This individual will confirm that the procedures outlined are in place and will therefore be responsible for demonstrating the veracity of the checklist.



<b>Local or national construction site management schemes</b>	<p>Where there is a nationally recognised certification scheme in place in the country of assessment to assess the environmental/social management of a construction site, this might be recognised as an alternative for the purposes of assessing this BREEAM issue. The scheme must be a third party certification scheme to ensure independence and transparency, and cover health, safety and environment issues related to construction sites. Please contact BRE for review and approval. Checklist A2 will be used to define the scope required for any such scheme to be recognised under BREEAM.</p> <p>At the time of publication, BRE Global is not aware of any equivalent scheme adequately covering environmental and social issues relating to construction sites.</p>
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**Schedule of Evidence Required**

Req.	Design Stage	Post Construction Stage
1	<p>A copy of completed checklist A2.</p> <p><b>AND</b></p> <p>A formal letter from the client/developer confirming:</p> <ul style="list-style-type: none"> <li>• The main contract includes a clause requiring compliance with specific requirements of Checklist A2.</li> <li>• Individuals responsible for third party assessment of site compliance.</li> <li>• The scope of the main contractor's works.</li> </ul>	<p>A copy of the compliance report.</p>

**Additional Information**

None.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
			Man 3 - Construction Site Impacts	P	G	VG	E	O
4	4	4		-	-	-	1	2

### Aim

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To recognise and encourage construction sites managed in an environmentally sound manner in terms of resource use, energy consumption and pollution.

### Assessment Criteria

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The following demonstrates compliance:

#### New build and refurbishment projects

1. One credit where evidence provided demonstrates that 2 or more of items a-g (listed below) are achieved. **OR**

Two credits where evidence provided demonstrates that 4 or more of items a-g (listed below) are achieved. **OR**

Three credits where evidence provided demonstrates that 6 or more of items a-g (listed below) are achieved:

- a. Monitor and report and set targets for CO<sub>2</sub> or energy arising from site activities
- b. Monitor, report on CO<sub>2</sub> or energy arising from transport to and from site
- c. Monitor, report and set targets for water consumption arising from site activities
- d. Implement best practice policies in respect of air (dust) pollution arising from the site
- e. Implement best practice policies in respect of water (ground and surface) pollution occurring on the site
- f. Main contractor has an environmental materials policy, used for sourcing of construction materials to be utilised on site
- g. Main contractor operates an Environmental Management System.

The Assessment Criteria for items a-g are detailed in the relevant section of Checklist A3.

2. One credit where evidence provided demonstrates that at least 80% of site timber is responsibly sourced and 100% is legally sourced.

#### Fit Out only assessments

1. One credit where evidence provided demonstrates that the fit-out contractor adopts best practice policies in respect of air (dust) pollution arising from the site.
2. One credit where evidence provided demonstrates that the fit-out contractor has an environmental materials policy, used for sourcing of construction materials to be utilised on site.
3. One credit where evidence provided demonstrates that the fit-out contractor operates an Environmental Management System.

The Assessment Criteria for each of the above items are detailed in the relevant section of Checklist A3.

**Exemplary level criteria – new build and refurbishment projects only**

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

1. Evidence provided demonstrates that all of the items a-g listed previously are achieved and at least 80% of site timber is responsibly sourced and 100% is legally sourced.

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	There are no additional or different criteria to those outlined above specific to the assessment of extensions to existing buildings.
<b>Shell Only</b>	There are no additional or different criteria to those outlined above specific to shell only assessments.
<b>Fit Out Only</b>	There are no additional or different criteria to those outlined above specific to fit-out-only assessments.
<b>Site timber</b>	<p>The fourth credit (for responsibly sourced site timber) is not dependent on any of the first three credits being achieved.</p> <p>For the purpose assessing this issue, site timber is considered to be timber used to facilitate construction, including formwork, site hoardings and other temporary site timber used for the purpose of facilitating construction. It does not cover structural timber and timber used for fit-out items (this is addressed in BREEAM issue Mat 5).</p>
<b>Site clearance</b>	The scope of this issue applies to the main contractor and their scope of works. If the scope of the main contractor’s works includes demolition and site clearance then this stage of work falls within the scope of the assessment criteria.

**Schedule of Evidence Required**

Req.	Design Stage	Post Construction Stage
All	<p>A copy of the relevant section from the main contract specification confirming:</p> <ul style="list-style-type: none"> <li>• Contractor’s obligations in respect to each item on the checklist</li> <li>• Site timber will be sourced from suppliers capable of providing certification to the level required for the particular tier claimed (see table 13 of BREEAM issue MAT 5)</li> <li>• All timber will come from a ‘legal source’ and is not on the CITES list*.</li> </ul> <p><b>OR</b></p> <p>Where the main contract specification is not</p>	<p>Site records demonstrating monitoring and recording of the following (where relevant):</p> <ul style="list-style-type: none"> <li>• Site energy/CO<sub>2</sub> consumption</li> <li>• Site deliveries</li> <li>• Site water consumption</li> </ul> <p>Copies of the documented procedures used on site for working to best practice pollution management guidelines.</p> <p>A letter from the main contractor confirming:</p> <ul style="list-style-type: none"> <li>• Procedures for pollution management and mitigation were implemented</li> <li>• Name/job title of individual responsible for monitoring and managing</li> </ul>

	<p>yet available, a formal letter from the client/developer including:</p> <ul style="list-style-type: none"> <li>• Completed checklist A3 identifying which items will form part of the main contractor's obligations.</li> <li>• The policy for sourcing site timber for the project.</li> <li>• Confirmation that the above will be implemented in compliance with BREEAM's criteria.</li> </ul> <p>* Or in the case of Appendix III of the CITES list, it has not been sourced from the country seeking to protect this species as listed in Appendix III.</p>	<p>construction site impacts throughout the project.</p> <p>A copy of the certification document or Chain of Custody (CoC) certificate(s) for the site timber.</p> <p>Where any non-certified timber is used, written confirmation from the supplier(s) confirming that:</p> <ul style="list-style-type: none"> <li>• All timber comes from a legal source.</li> <li>• All timber species and sources used in the development are not listed on any of the CITES appendices for endangered or threatened species (Appendix I, II, or III*).</li> </ul>
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## Additional Information

### Relevant definitions

**CITES** (Convention on International Trade in Endangered Species)<sup>1</sup> 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 development is on Appendix III it can be included as part of the assessment as long as the timber is not obtained from the country(s) seeking to protect this species.

**Chain of Custody:** This is a process used to maintain and document the chronological history of the evidence/path for products from forests to consumers. Wood must be tracked from the certified forest to the finished product. All the steps, from transporting wood from the forest to a sawmill, until it reaches the customer, must maintain adequate inventory control systems that allow for separation and identification of the certified product. Chain-of-custody certification ensures that a facility has procedures in place to track wood from certified forests and avoid confusing it with non certified wood. Chain-of-custody is established and audited according to relevant forest certification systems rules.

### Pollution

BRE publishes guidance on construction site dust management, and the Environment Agency publishes guidance on water pollution control measures. There are significant statutory criteria in this area under environmental health legislation and the Environmental Protection Act. The Environment Agency and local Environmental Health Officers police these.

### Energy

Monitoring and reporting at site level are the key factors in raising awareness of the impacts of energy consumption. Whilst total energy is frequently monitored, this information is predominantly used to feedback into the tendering process and is seldom used to seek improvements on the site in question.

### Targets

Targets are requested in the BREEAM criteria as an Exemplary Level Criteria to complete the process of setting, monitoring and achieving targets. BREEAM does not set targets, as these are very project specific. For some guidance on how to set targets, contractors may find it useful to refer to [http://www.ccinw.com/sites/kpi\\_pages.html?site\\_id=5&section\\_id=171](http://www.ccinw.com/sites/kpi_pages.html?site_id=5&section_id=171).

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
			Man 4 - Building User Guide					
1	1	1		-	1	1	1	1

### Aim

To recognise and encourage the provision of guidance for the non technical building user so they can understand and operate the building efficiently.

### Assessment Criteria

The following demonstrates compliance:

1. A Building User Guide that contains the information described under the '*User Guide Contents*' heading (see additional guidance) has been developed.
2. The *guide* is relevant to the non-technical building user and appropriate to the stakeholder(s) that will occupy the building.

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	There are no additional or different criteria to those outlined above specific to the assessment of extensions to existing buildings.
<b>Shell Only</b>	For speculative developments it may not be possible to include all information outlined below. The Guide must be developed, including all relevant sections and completed as far as is possible given the services and fabric installed, so that it can be handed over to the fit-out team who will then be able to complete the relevant sections based on the fit-out strategy before handing over to the tenant/building owner.
<b>Fit Out Only</b>	The criteria at this stage of assessment are the same as those identified at the design stage. Where there is an existing Building User Guide this must be updated in line with the scope of the fit-out work that will be undertaken and comply with the BREEAM criteria. The guide must be developed/updated by, or in collaboration with, the fit-out project team/contractor. Where there is not an existing Building User Guide this must be prepared to cover all aspects of the building, including aspects included in the shell construction/systems (if relevant).
<b>Operation and Maintenance manual</b>	The presence of a building O&M manual does not meet this requirement. The latter provides the detailed specialist information required by technical Facilities Managers (FMs) and maintenance staff/contractors. The guide can be contained in the Operation & Maintenance (O&M) manual, but must be an extractable or 'stand alone' section.

<b>Multiple tenanted buildings</b>	Where the building will be divided in to multiple tenancies, one central building user guide should be provided covering the scope of landlord controlled areas/responsibilities. A separate subsidiary guide should be provided for each tenant's space, appropriate to the status/responsibility of the tenant(s) and their building/unit.
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### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
1&2	<p>A copy of the specification clause confirming:</p> <ul style="list-style-type: none"> <li>Requirement to develop a Building User Guide</li> <li>Scope of the Guide's contents.</li> </ul> <p><b>OR</b></p> <p>A formal letter from the client/developer confirming:</p> <ul style="list-style-type: none"> <li>That the design team will be required to develop a Building User Guide.</li> <li>The contents of the Guide will be developed in compliance with the BREEAM criteria.</li> </ul>	<p>A copy of the Building User Guide.</p> <p>Written confirmation from the design team that the guide has been distributed to the building's owner, tenant(s) or fit out contractor (for completion), as appropriate.</p>

### Additional Information

#### User Guide Contents

The list below indicates the type of information that should be included to meet the needs of the Facilities Management (FM) Team/Building Manager and the general users (staff).

#### 1. Building Services Information

- General User - Information on heating, cooling and ventilation in the building and how these can be adjusted, e.g. thermostat location and use, implications of covering heating outlets with files, bags etc., and use of lifts and security systems.
- FM – As above, plus a non-technical summary of the operation and maintenance of the building systems (including BMS if installed) and an overview of controls.

#### 2. Emergency Information

- General User - Include information on the location of fire exits, muster points, alarm systems and fire fighting systems.
- FM - As above, plus details of location and nature of emergency and firefighting systems, nearest emergency services, location of first aid equipment.

#### 3. Energy & Environmental Strategy

This should give owners and occupiers information on energy-efficient features and strategies relating to the building, and also provide an overview of the reasons for their use, e.g. economic and environmental savings. Information could include:

- General User – Information on the operation of innovative features such as automatic blinds, lighting systems etc., and guidance on the impacts of strategies covering window opening and the use of blinds, lighting and heating controls.
- FM - As above, plus information on airtightness and solar gain (e.g. the impact of leaving windows/doors open in an air conditioned office, or use of blinds in winter with respect to solar gain); energy targets and benchmarks for the building type, information on monitoring such as the metering and sub-metering strategy, and how to read, record and present meter readings.

#### 4. Water Use

- a. General User – details of water saving features and their use and benefits, e.g. aerating taps, low flush toilets, leak detection, metering etc.
- b. FM – As above, plus details of main components (including controls) and operation. Recommendations for system maintenance and its importance, e.g. risk of legionella.

#### 5. Transport Facilities

- a. General User – details of car-parking and cycling provision; local public transport information, maps and timetables; information on alternative methods of transport to the workplace, e.g. car sharing schemes; local 'green' transport facilities.
- b. FM - As above, plus information on conditions of access, maintenance and appropriate use of car parking and cycling facilities, e.g. number of spaces provided.

Retail projects: the above information in point 5 does not need to be included in the user's guide if there is a separate dedicated travel information space, accessible to the staff, and in compliance with BREEAM Issue Tra7. However, the guide must reference the travel information space, the information provided and its location.

#### 6. Materials & Waste Policy

- a. General User – Information on the location of recyclable materials storage areas and how to use them appropriately.
- b. FM – As above, plus information on recycling, including recyclable building/office/fit out components, waste storage and disposal criteria; examples of Waste Management Strategies and any cleaning/maintenance criteria for particular materials and finishes.

#### 7. Re-fit/Re-arrangement Considerations

- a. General User – an explanation of the impact of re-positioning of furniture, i.e. may cover grilles/outlets, implications of layout change, e.g. installation of screens, higher density occupation etc.
- b. FM - As above, plus environmental recommendations for consideration in any refit. Relevant issues covered in BREEAM should be highlighted, e.g. the use of natural ventilation, use of [Green Guide](#) 'A' rated materials, reuse of other materials etc., the potential impact of increasing occupancy and any provision made in the original design to accommodate future changes.

#### 8. Reporting Provision

- a. General User – Contact details of FM/manager, maintenance team, and/or help desk facility; and details of any building user group if relevant.
- b. FM – As above, plus contact details of suppliers/installers of equipment and services and their areas of responsibility for reporting any subsequent problems.

#### 9. Training

Details of the proposed content and suggested suppliers of any training and/or demonstrations in the use of the building's services, features and facilities that will be needed. This could include:

- a. General User - Training in the use of any innovative/energy saving features.
- b. FM – As above, plus training in emergency procedures and setting up, adjusting, and fine tuning, the systems in the building.

#### 10. Links & References

This should include links to other information including websites, publications and organisations. In particular, the Carbon Trust programme should be referenced and links provided to its website and good practice guidance.

#### 11. General

Where further technical detail may be required by the FM Team or manager there should be references to the appropriate sections in the Operation and Maintenance Manual.

BREEAM requires a 'Building User Guide' that contains the necessary details about the everyday operation of the development in a form that is easy for the intended users to understand.

Without the provision of adequate information and guidance it is likely that the building will be used inappropriately leading to the dissatisfaction of occupants and wasted resources. For example: Some ventilation and/or lighting systems can be impaired by inappropriate positioning of partitions, office furniture etc. so causing inefficiencies, a lack of comfort and poor performance.

The aim of the issue is to ensure that design features are used efficiently and that changes to office space are managed in the most appropriate manner. For example, the design team of a speculative, open plan office, are likely to have considered the need for meeting or cellular space, and may have provided additional riser or duct space to assist future use. The design of the building may require additional or expanded systems to be installed if occupant levels rise above those designed for. This information should be passed on to the personnel making management decisions, so that they are aware of the implications of such decisions on the management of the building.



No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
2	2	2	Man 12 - Life Cycle Cost Analysis	-	-	-	-	-

### Aim

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To recognise and encourage the development of a Life Cycle Cost (LCC) analysis model for the project to improve design, specification and through-life maintenance and operation.

### Assessment Criteria

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The following demonstrates compliance:

1. A Life Cycle Cost (LCC) analysis has been carried out based on the proposals developed during RIBA Work Stages C/D (concept design/design development), or equivalent.
2. The Life Cycle Costs analysis based on the concept design/design development proposals covers the following stages:
  - a. Construction
  - b. Operation - includes, as a minimum, utilities
  - c. Maintenance - includes, as a minimum, planned maintenance, replacements and repairs, cleaning, management costs
  - d. End of life.
3. The LCC analysis uses a study period of 25 or 30 (as applicable) **AND** 60 years, shown in real and discounted cash flow terms.
4. The analysis demonstrates that at least two of the following issues have been analysed at a strategic and system level (as per figure 6, Different levels of analysis at different stages of the life cycle, ISO 15686-5), comparing alternative options:
  - a. Structure
  - b. Envelope
  - c. Services
  - d. Finishes

The chosen solution is the one that best meets the performance requirements for the built asset.

5. The option(s) with the lowest discounted LCC over the period is preferred, assuming that their selection results in at least one of the following:
  - a. The lowest building energy consumption over the operational life span of the building (compared to other options/alternatives analysed)
  - b. A reduction in maintenance requirement/frequency
  - c. Prolonged replacement intervals of services infrastructure/systems or building fabric
  - d. Dismantling and recycling or reuse of building components.
6. The model was updated during Stages RIBA Work Stages D/E (design development/technical design) or equivalent.

### Second credit

1. The first credit is achieved.

2. The results of the feasibility study have been implemented in the specification, design and final construction of the assessed building.

<b>Compliance notes</b>	
<b>New Build</b>	There are no additional or different requirements to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different requirements to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	There are no additional or different requirements to those outlined above specific to the assessment of extensions to existing buildings.
<b>Shell Only</b>	There are no additional or different requirements to those outlined above specific to refurbishment projects.
<b>Fit Out Only</b>	Issue not applicable for fit-out-only assessments

### Schedule of Evidence Required

<b>Req.</b>	<b>Design Stage</b>	<b>Post Construction Stage</b>
<b>First Credit</b>		
1-4	A copy of the feasibility stage LCC analysis.  The details of the cost consultant who has completed the analysis.	No additional evidence required to that outlined for the design stage of assessment.
5	A formal letter from the design team or cost consultant confirming: <ul style="list-style-type: none"> <li>The preferred option.</li> </ul>	No additional evidence required to that outlined for the design stage of assessment.
6	An updated copy of the LCC analysis for the detailed and final design.  <b>OR</b>  A formal letter from the design team confirming: <ul style="list-style-type: none"> <li>The LCC analysis will be updated to reflect the detailed and final design proposals.</li> <li>Any proposed change(s) made to the specification will be on the basis that they will minimise life cycle costs and impacts.</li> </ul>	An updated copy of the LCC analysis for the final design.
<b>Second Credit</b>		
2	A formal letter from the design team confirming: <ul style="list-style-type: none"> <li>The option(s) with the lowest discounted life cycle costs have been, or will be, implemented in the design and specification.</li> </ul>	Assessor's building/site inspection confirming: <ul style="list-style-type: none"> <li>The completed building reflects the preferred option identified in the LCC analysis.</li> </ul>

## **Additional Information**

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### **Relevant definitions:**

**Life Cycle Cost analysis:** A procurement evaluation technique which determines the total cost of acquisition, operation, maintenance and disposal of the building.

The assessor should note that BREEAM places fixed requirements on the time at which the Life Cycle Cost feasibility study should be carried out in order that maximum benefit from undertaking this is achieved.

The *strategic level* analysis (looking at issues such as location and external environment, maintainability and internal environment, etc.) and *system level* analysis (looking at issues such as foundations, solid or framed wall and floors, types of energy, ventilation, water capacity, communications etc.) should be carried out early in the design process to influence the fundamental decisions taken regarding the building without having an adverse affect on either cost or design programme. It is however important that this is revisited as the design develops to ensure that an optimal solution is retained throughout the procurement process.

## 5.0 Health and Wellbeing

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	1	1	Hea 1 - Daylighting	-	-	-	-	-

### Aim

To give building users sufficient access to daylight.

### Assessment Criteria

The following demonstrates compliance:

1. The provision of daylight has been designed in compliance with national best practice daylighting guides.
2. For all developments, at least 80% of the net lettable office floor area is adequately daylighted as follows;
  - a. An average daylight illuminance of 200 lux for 2650 hours per year or an average daylight factor in accordance with table 7 below:

**Table 7 Average daylight factor according to latitude at the building location**

Latitude (°)	Average Daylight Factor		
	First credit - all buildings	Exemplary level	
		Single-storey buildings	Multi-storey buildings
≤40	1.5	3	2.25
40-45	1.7	3.4	2.55
45-50	1.8	3.6	2.7
50-55	2.0	4	3
55-60	2.1	4.2	3.15
≥60	2.2	4.4	3.3

### PLUS either (b) OR (c AND d) below

- b. A uniformity ratio of at least 0.4 (spaces with glazed roofs, such as atria, must achieve a uniformity ratio of at least 0.7) or a minimum point daylight factor in accordance with table 8 below:

**Table 8 Point daylight factor in office areas according to latitude at the building location**

Latitude (°)	Minimum point daylight factors					
	First credit		Exemplary level – single storey buildings		Exemplary level – multi storey buildings	
	All other spaces	Spaces with glazed roofs	All other spaces	Spaces with glazed roofs	All other spaces	Spaces with glazed roofs
≤40	0.6	1.05	1.2	2.1	0.9	1.575
40-45	0.68	1.19	1.36	2.38	1.02	1.785
45-50	0.72	1.26	1.44	2.52	1.08	1.89
50-55	0.8	1.4	1.6	2.8	1.2	2.1
55-60	0.84	1.47	1.68	2.94	1.26	2.205
≥60	0.88	1.54	1.76	3.08	1.32	2.31

**OR**

- c. A view of sky from desk height (0.7m) is achieved.

**AND**

- d. 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 10 (see additional information) gives maximum room depths in metres for different room widths and window head heights of sidelit rooms

3. For industrial developments, at least 80% of the operational area and all other *occupied spaces* are adequately daylighted as follows;
  - a. Average daylight illuminance of 200lux for 2650 hours per year or an average daylight factor in accordance with table 7 above.
  - b. **PLUS** either (b) **OR** (d) above.
4. For retail developments, at least 35% of the common areas (where applicable) have point daylight factors in accordance with table 9 below:

**Table 9 Point daylight factor in common and sales areas according to latitude at the building location**

Latitude (°)	Minimum point daylight factors
≤40	1.5
40-45	1.7
45-50	1.8
50-55	2.0
55-60	2.1
≥60	2.2

#### **Exemplary level criteria**

The following outlines the exemplary level criteria to achieve an *innovation credit* for this BREEAM issue.

1. At least 80% of the floor area (for the building spaces/room identified above in the standard criteria) has an average daylight factor in accordance with table 7 above or an average daylight illuminance of 300 lux for 2650 hours per year in multi-storey buildings and 400 lux in single-storey buildings.

2. The criteria outlined above concerning uniformity ratio, view of sky or room depth criterion are met. Where demonstrating compliance via uniformity ratio or point daylight factor the following minimum criteria apply:
  - a. A uniformity ratio of at least 0.4 (spaces with glazed roofs, such as atria, must achieve a uniformity ratio of at least 0.7) or a minimum point daylight factor as in table 8 below:
3. For retail developments, at least 50% by floor area of the common spaces and 35% by floor area of the sales spaces have point daylight factors in accordance with table 9 above or point daylight illuminance of 200lux for 2650 hours per year.

<b>Compliance Notes</b>	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	The criteria of this issue apply only to the scope of the assessed building. If this scope includes the existing building as well as the new building then the relevant areas within the existing building must be assessed against the criteria of this BREEAM issue. If the assessment covers only the new building, then the areas in the existing building do not need to be assessed.
<b>Shell Only</b>	There are no additional or different criteria to those outlined above specific to shell-only projects.
<b>Fit Out only</b>	There are no additional or different criteria to those outlined above specific to fit out-only projects.
<b>National daylighting best practice guides</b>	<p>Please refer to the country specific reference sheet to find the appropriate daylighting best practice guides in the country of assessment. Where daylighting best practice guides are not outlined in the country specific reference sheet or where the design team wishes to use an alternative reference document, please use Checklist A10 to determine its acceptability.</p> <p>Where no appropriate reference document exists for a country, the design team should demonstrate compliance using the UK alternative.</p>
<b>Percentage of assessed area</b>	Where the compliance requirement specifies that 80% of <i>office</i> or other <i>occupied space</i> floor area must be adequately daylighted, it refers to 80% of the total floor area of all the rooms that must be assessed i.e. the compliant area. If for example a development has 6 rooms that must be assessed, each 150m <sup>2</sup> (total area 900m <sup>2</sup> ) then 720m <sup>2</sup> must comply with the criteria; 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.
<b>View of sky requirement</b>	To comply with the <i>view of sky</i> criteria at least 80% of the room that complies with the average daylight factor requirement must meet the view out requirement; 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.
<b>Uniformity with rooflights</b>	The room depth criteria cannot be used where the lighting strategy relies on rooflights. In such areas either appropriate software should be used to calculate the uniformity ratio or, in the case of a regular array of rooflights across the whole of the space, the following figure can be used to determine the uniformity ratio.

	<p>Uniformity of illuminance decreases as the spacing between rooflights (extracted from the CIBSE Guiding Light LG10)</p>
<p><b>Two-side lit rooms</b></p>	<p>For rooms lit by windows on two opposite sides, the maximum room depth that can be satisfactorily daylight is twice the limiting room depth (d) (measured from window wall to window wall; CIBSE Lighting Guide LG10). The reflectance of the imaginary internal wall should be taken as 1.</p>
<p><b>Borrowed light</b></p>	<p>For areas where borrowed light is used, calculations or results from appropriate lighting design software must be provided to demonstrate that such areas meet the BREEAM requirements (if contributing to the percentage of compliant area). Examples of borrowed light include: light shelves, clerestory glazing, sun pipes or internal translucent/transparent partitions (such as those using frosted glass).</p>
<p><b>Options for demonstrating the daylighting criteria</b></p>	<p>Two options are available to demonstrate that the daylighting criteria have been met in order to accommodate for countries with different climate. The illuminance approach may be used where the overcast sky is deemed not appropriate to determine the daylight in the building, while the average daylight factor approach may be more appropriate in temperate climate. Both options are equivalent and will demonstrate one unique daylighting level, it is up to the design team to determine which option is the most appropriate to the location.</p> <p>Where the illuminance approach is chosen, a computer simulation must be carried out to demonstrate compliance.</p>

**Schedule of Evidence Required**

Req.	Design Stage	Post Construction Stage
Option 1		

All	<p>Design plans for each floor in the building with each room/area appropriately labelled for use.</p> <p><b>AND</b></p> <p>Daylight calculations confirming:</p> <ul style="list-style-type: none"> <li>• Building areas assessed</li> <li>• Latitude of the site</li> <li>• The daylighting variables/criterion measured</li> <li>• Average daylight factor for each area OR a copy of the results of the modelling demonstrating that the appropriate level of illuminance has been achieved for all relevant areas</li> <li>• Compliance with room depth criterion, uniformity ratio, view of sky (if required)</li> <li>• The daylight provision is in compliance with the relevant standards.</li> </ul> <p><b>Retail only</b></p> <ul style="list-style-type: none"> <li>• The percentage of area where point daylight factors are at least 2%</li> <li>• The position of the 2% daylight factors isolux contours in each of the rooms assessed</li> </ul>	<p>Daylight calculations for the building 'as built' confirming compliance with all criteria.</p> <p><b>OR</b></p> <p>Assessor's site inspection report or 'as-built' drawings confirming:</p> <ul style="list-style-type: none"> <li>• The window sizes and room layout and dimensions are as per design-stage daylighting compliant room</li> <li>• A letter from the design team or main contractor confirming that window specification, size and/or room layout have not changed since the design stage assessment.</li> </ul> <p>Where there have been changes, revised calculations/modelling are required to demonstrate compliance for the relevant areas/rooms.</p> <p><b>OR</b></p> <p>Results from on-site measurements* that have been carried out.</p> <p>*These must be in accordance with methodology detailed in BRE IP 23/93.</p>
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### Additional Information

#### Relevant definitions

**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.

**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'. Computer simulations are the most appropriate tools to allow for point daylight factors to be displayed. 2% daylight factors isolux contours (i.e. lines connecting all the points that have the same point daylight factor value) will need to be mapped on the room plan to check the area where point daylight factors are 2% or higher. Mapping should be done based on a minimum calculation grid of 50x50cm and 50cm from the wall.

**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.

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

**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 plan (or average daylight factor).



**View of sky / no-sky line:** 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. The no-sky line divides those areas of the working plane, which can receive direct skylight, from those that cannot.

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

**Computer simulation:** Software tools that can be used to model more complex room geometries for daylighting.

The table below gives maximum room depths in metres for different room widths and window head heights of sidelit rooms:

**Table 10 Reflectance for maximum room depths and window head heights**

Reflectance ( $R_B$ )	0.4		0.5		0.6	
Room Width (m)	3.0	10.0	3.0	10.0	3.0	10.0
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

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	1	1	Hea 2 - View Out	-	-	-	-	-

### Aim

To allow occupants to refocus their eyes from close work and enjoy an external view, thus reducing the risk of eyestrain and breaking the monotony of the indoor environment.

### Assessment Criteria

The following demonstrates compliance:

1. The *relevant building areas* are within 7m distance of a wall with a window or permanent opening providing an *adequate view out*, where the window/opening is  $\geq 20\%$  of the total inside wall area (refer to Compliance Notes for a definition of *relevant building areas* and *adequate view out*).

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	There are no additional or different criteria to those outlined above specific to the assessment of extensions to existing buildings.
<b>Shell Only</b>	Where the actual workstations/desk layout is unknown at the time of assessment, a notional workstations/desk layout may be used to demonstrate compliance.  Where it is not possible to confirm which areas of the building will contain workstations/benches or desks, due to the speculative nature of the building, then all areas of the building must comply (excluding ancillary areas).
<b>Fit Out</b>	The criteria at this stage of assessment are the same as those identified at the design stage.
<b>Buildings with office space &lt;500m<sup>2</sup> (Retail &amp; Industrial only)</b>	If the building being assessed contains office space that totals <500m <sup>2</sup> then this BREEAM issue does not need to be assessed as a standalone issue. The criteria for this issue form a part of BREEAM credit Hea 14 'Office Space'. The aim of Hea 14 is to recognise relevant Health & Wellbeing issues in buildings with a small amount of office space, ensuring the issues are weighted relative to the overall proportion of the building and users who utilise this type of space.
<b>Adequate view out</b>	The view out should ideally be through an external window providing a view of a landscape or buildings (rather than just the sky) at seated eye level (1.2 – 1.3m) in the <i>relevant building areas</i> . A view in to an internal courtyard or atrium will comply provided the distance from the opening to the back wall of the courtyard/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.
<b>High level windows</b>	Roof lights and high level windows that do not provide an <i>adequate view out</i> do not meet the criteria for this BREEAM issue.

<b>Relevant building areas</b>	Where the term ' <i>relevant building areas</i> ' is referenced in this BREEAM issue it refers to any areas of the building where there are, or will be, workstations/benches or desks for building users.
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### Schedule of Evidence Required

<b>Req.</b>	<b>Design Stage</b>	<b>Post Construction Stage</b>
All	Design plan and elevation showing: <ul style="list-style-type: none"> <li>• All <i>relevant building areas</i> and room depths</li> <li>• Actual or notional workstations/desk layout</li> <li>• Window/open areas</li> </ul> Site plan showing: <ul style="list-style-type: none"> <li>• Building location and proximity to external obstructions.</li> </ul>	Assessor's site inspection report and photographic evidence confirming: <ul style="list-style-type: none"> <li>• All <i>relevant building areas</i> comply.</li> </ul> <b>OR</b> As built drawings or a formal letter from the design team confirming: <ul style="list-style-type: none"> <li>• No changes have occurred since design stage, therefore design stage evidence demonstrates compliance post construction.</li> </ul>

### Additional Information

#### Relevant definitions

**Occupied space:** refer to BREEAM issue Hea 1.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	1	1	Hea 3 - Glare Control	-	-	-	-	-

### Aim

To reduce problems associated with glare in occupied areas through the provision of adequate controls.

### Assessment Criteria

The following demonstrates compliance:

1. An occupant-controlled shading system on all windows, glazed doors and rooflights in all *relevant building areas*.

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	Where the existing building falls within the scope of the assessment, then the criteria extend to the <i>relevant building areas</i> and <i>occupied spaces</i> of the existing building. If only the new extension is being assessed then the criteria apply to the relevant areas of the new building.
<b>Shell only</b>	<p>Compliance with this BREEAM issue can be demonstrated via one of the following means in shell only buildings/areas:</p> <ul style="list-style-type: none"> <li>• Option 1 – Use of a tenancy lease agreement between the developer and tenant/s (full value of available credits)</li> <li>• Option 2 – A Green Building Guide for tenant fit outs (half the value of the available credits)</li> <li>• Option 3 – Developer/Tenant collaboration (full value of available credits)</li> </ul> <p>Where compliance with the assessment criteria cannot be demonstrated the available credits must be withheld (option 4).</p> <p>Refer to the <i>Scope</i> section 2.2 <i>Types of project that can be assessed using BREEAM</i> (Shell and Core / Speculative Assessments) for further description of the above options.</p>
<b>Fit Out Only</b>	There are no additional or different criteria to those outlined above specific to fit out-only assessments.
<b>Buildings with office space &lt;500m<sup>2</sup> (Retail &amp; Industrial only)</b>	If the building being assessed contains office space that totals <500m <sup>2</sup> then this BREEAM issue does not need to be assessed as a standalone issue. The criteria for this issue form a part of BREEAM issue Hea 14 'Office Space'. The aim of Hea 14 is to recognise relevant Health & Wellbeing issues in buildings with a small amount of office space, ensuring the issues are weighted relative to the overall proportion of the building and users who utilise this type of space.

<b>Relevant building areas</b>	Where the term ' <i>relevant building areas</i> ' is referenced in this BREEAM issue it refers to any areas of the building where there are, or will be, workstations/benches, desks and/or close work will be undertaken or visual aids used.
<b>Workshops</b>	For workshops, to avoid unduly high maintenance due to dust/dirt, compliance can also be demonstrated in such areas by designing out glare through measures such as brise-soleil, low eaves, bioclimatic design or blinds integral to the window.

### Schedule of Evidence Required

<b>Req.</b>	<b>Design Stage</b>	<b>Post Construction Stage</b>
1	<p>Marked-up copy of the design plan(s) confirming:</p> <ol style="list-style-type: none"> <li>1. A description of the function of each of the building spaces.</li> </ol> <p>A copy of the relevant specification clause(s), window schedule or design plan confirming:</p> <ul style="list-style-type: none"> <li>• Type of shading system(s) and control to be installed.</li> </ul>	<p>Assessor's building/site inspection and photographic evidence confirming:</p> <ol style="list-style-type: none"> <li>2. Installation of compliant glare control system.</li> </ol>

### Additional Information

#### Relevant definitions

**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 and, with respect to this issue, where it would be desirable to limit the potential for glare or provided a system of glare control.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	1	1	Hea 4 - High frequency lighting	1	1	1	1	1

### Aim

To reduce the risk of health problems related to the flicker of fluorescent lighting.

### Assessment Criteria

The following demonstrates compliance:

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

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	Where the existing building falls within the scope of the assessment, then the criteria extend to the existing building. If only the new extension is being assessed then the criteria apply to the new building only.
<b>Shell Only</b>	<p>Compliance with this BREEAM issue can be demonstrated via one of the following means in shell only buildings/areas:</p> <ul style="list-style-type: none"> <li>• Option 1 – Use of a tenancy lease agreement between the developer and tenant/s (full value of available credits)</li> <li>• Option 2 – A Green Building Guide for tenant fit outs (half the value of the available credits)</li> <li>• Option 3 – Developer/Tenant collaboration (full value of available credits)</li> </ul> <p>Where compliance with the assessment criteria cannot be demonstrated the available credits must be withheld (option 4).</p> <p>Refer to the <i>Scope</i> section 2.2 <i>Types of project that can be assessed using BREEAM</i> (Shell and Core / Speculative Assessments) for further description of the above options.</p>
<b>Fit Out Only</b>	There are no additional or different criteria to those outlined above specific to fit out-only assessments.

### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
1	A copy of the specification clause or room data sheets confirming: <ul style="list-style-type: none"> <li>• A compliant lighting strategy.</li> </ul>	Assessor's building/site inspection and photographic evidence confirming: <ul style="list-style-type: none"> <li>• Installation of high frequency ballasts.</li> </ul> <p><b>OR</b></p> As-built drawings/specification confirming: <ul style="list-style-type: none"> <li>• No changes have occurred since design stage assessment.</li> <li>• Where changes have occurred, a compliant lighting strategy is installed.</li> </ul>

### Additional Information

#### Relevant definitions

**Occupied space:** refer to BREEAM issue Hea 1.

**High frequency ballast:** High frequency ballasts increase the frequency of the power coming from the grid (50Hz) to a frequency optimising the performance of fluorescent lamps, typically around 30kHz.

There are several advantages to running fluorescent lamps at higher frequencies. At 30kHz, the frequency of re-ignition of a fluorescent lamp is too quick to be detected by the human eye, therefore reducing visible flicker that some fluorescent lamps running on mains frequency fail to do. Additionally, 30kHz being above the audible range of the human ear, the buzzing noise coming out of low quality main frequency ballasts is avoided. Finally, the luminous efficacy of fluorescent lamps increases with frequency; it can be optimised by up to 10% when they are running at 30kHz compared to those operating at 50Hz.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	1	1	Hea 5 - Internal and external lighting levels	-	-	-	-	-

### Aim

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To ensure lighting has been designed in line with best practice for visual performance and comfort.

### Assessment Criteria

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The following demonstrates compliance:

1. Internal and external lighting illuminance (lux) levels are specified in accordance with national best practice lighting guides. Where the lighting strategy of the building design is based on a localised or local lighting system, the task illuminance should be compliant with those levels and the average 'ambient' level at least one-third of this value or at the requirement of the non-task areas (whichever is greater).
2. 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 national best practice lighting guides, in particular the UGR limits are met.
3. The uniformity of illuminance over any task area is equal to or greater than 0.7 and the uniformity of the surrounding area should be at least 0.5.

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	Where the existing building falls within the scope of the assessment, then the criteria extend to the existing building. If only the new extension is being assessed then the criteria apply to the areas of the new building only.



<b>Shell Only</b>	<p>The assessment criteria apply to shell only areas of the building. For the purposes of the BREEAM assessment it is permissible for the design team to substitute the default design fit-out performance specification (as defined in local building regulations) for the performance specifications confirmed within a <i>Green Lease Agreement</i>. This rule applies only to those areas of the building that the scope of the Green Lease covers. Tenanted areas not covered by the scope of the Green Lease must assume the default design fit-out performance specification as defined under local building regulations.</p> <p>The use of a <i>Green Building Guide</i> for tenants fit out (as defined in the Scope section 2.2) cannot be used to substitute the maximum design fit out specification, for the purpose of assessing BREEAM issue Hea 5 Internal and external lighting levels.</p> <p>Where compliance with the assessment criteria cannot be demonstrated the available credits must be withheld (option 4).</p> <p>Refer to the <i>Scope</i> section 2.2 <i>Types of project that can be assessed using BREEAM</i> (Shell and Core / Speculative Assessments) for further description of the above options.</p>
<b>Fit Out Only</b>	There are no additional or different criteria to those outlined above specific to fit out-only assessments.
<b>Surrounding area</b>	The illuminance of the immediate surrounding areas must be related to the illuminance of the task area, and should provide a well-balanced luminance distribution in the field of view. Large spatial variations in illuminance around the task area may lead to visual stress and discomfort. The immediate surrounding area is taken to be a band with a width of at least 0.5 m.
<b>No external areas</b>	Where no external light fittings are specified, 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.
<b>Local or national best practice lighting guides</b>	<p>Please refer to the country specific reference sheet to locate the appropriate best practice lighting guidance in the country of assessment. Alternatively, please demonstrate applicability as follows;</p> <ul style="list-style-type: none"> <li>• The minimum requirements as set out in Checklist A10 are covered by the proposed documents.</li> <li>• The illuminance levels and UGR limits are equal to or more onerous than those set in the European standard EN 12464-1 Light and lighting - Lighting of workspaces, 2002 and EN 12464-2 Lighting of work places - Part 2: Outdoor work places, 2007.</li> </ul> <p>Where appropriate lighting guides do not exist for a country, the design team should demonstrate compliance with the European standards mentioned above.</p>

### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
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All	<p>A copy of the specification or relevant room schedules confirming:</p> <ul style="list-style-type: none"> <li>• The internal/external illuminance levels</li> <li>• UGR limits</li> <li>• The uniformity of illuminance over task areas and surrounding area.</li> <li>• Where applicable, confirmation that the minimum requirements as set out in Checklist A10 are met and that illuminance levels are equal to or more onerous than those set in EN 12464.</li> </ul> <p><b>OR</b></p> <p>A formal written declaration of conformity from the relevant member of the design team confirming:</p> <ul style="list-style-type: none"> <li>• The maintained illuminance levels, UGR limits and uniformity for internal/external space are in compliance with the relevant Standard.</li> </ul>	<p>A formal written declaration from the design team or main contractor confirming:</p> <ul style="list-style-type: none"> <li>• Light fittings have been installed in compliance with the lighting specification.</li> <li>• No changes have occurred in the lighting specification used to demonstrate design stage compliance.</li> </ul> <p>Where changes have occurred, a further declaration is required confirming that the revised lighting specification is in compliance with the BREEAM criteria.</p>
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### Additional Information

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#### Relevant definitions

**Occupied space:** Refer to BREEAM issue Hea 1.

**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.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	1	1	Hea 6 - Lighting zones and controls	-	-	-	-	-

### Aim

To ensure occupants have easy and accessible control over lighting within each *relevant building area*.

### Assessment Criteria

The following demonstrates compliance:

1. Lighting is zoned to allow *separate occupant control* of the following areas (where applicable):
  - a. Office and circulation spaces
  - b. In office areas, zones of no more than four workplaces
  - c. Workstations adjacent to windows/atria and other building areas separately zoned and controlled.
  - d. Seminar and lecture rooms: zoned for presentation and audience areas
  - e. Library spaces: separate zoning of stacks, reading and counter areas.

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	There are no additional or different criteria to those outlined above specific to new building extensions to existing buildings.
<b>Shell Only</b>	In the case of speculative buildings, the control system must have the capacity to be zoned, as required, once the final tenant is known and occupancy patterns/layout are agreed.
<b>Fit Out Only</b>	There are no additional or different criteria to those outlined above specific to fit out-only projects.
<b>Buildings with office space &lt;500m<sup>2</sup> (Retail &amp; Industrial only)</b>	If the building being assessed contains office space that totals <500m <sup>2</sup> then this BREEAM issue does not need to be assessed as a standalone issue. The criteria for this issue form a part of BREEAM issue Hea 14 'Office Space'. The aim of Hea 14 is to recognise relevant Health & Wellbeing issues in buildings with a small amount of office space, ensuring the issues are weighted relative to the overall proportion of the building and users who utilise this type of space.
<b>Occupancy / workstation layout unknown</b>	Where occupancy/workstation layout is not known, lighting control can be zoned on the basis of 40m <sup>2</sup> grids i.e. an assumption of 1 person/workspace per 10m <sup>2</sup> .
<b>Small spaces</b>	Where the building consists entirely of small rooms/spaces (less than 40m <sup>2</sup> ) which do not require any subdivision of lighting zones/control or meet the criteria by default, then this credit may be awarded.

### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
All	Design plans for each floor of the building highlighting: <ul style="list-style-type: none"> <li>• Space arrangement and room type</li> </ul> <p><b>AND</b></p> Specification or design plans confirming: <ul style="list-style-type: none"> <li>• Lighting zones</li> <li>• Location and scope of user-controls.</li> </ul>	Assessor's site inspection report, or as-built drawings/specification confirming: <ul style="list-style-type: none"> <li>• No changes have occurred since design stage; therefore, design stage evidence can be used to demonstrate compliance at post construction stage.</li> <li>• Where changes have occurred since design stage, the amended features still comply with the design stage criteria.</li> </ul>

### Additional Information

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#### Relevant definitions

**Separate Occupant Control:** Light switches/controls for a particular area/zone of the building that can be accessed and operated by the individual(s) occupying that area/zone. Such controls will be located within, or within the vicinity of, the zone/area they control.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
			Hea 7 - Potential for Natural Ventilation					
1	1	1		-	-	-	-	-

### Aim

To recognise and encourage adequate cross flow of air in naturally ventilated buildings and flexibility in air-conditioned/mechanically ventilated buildings for future conversion to a natural ventilation strategy.

### Assessment Criteria

The following demonstrates compliance:

1. Office areas of the building are designed to be capable of providing fresh air entirely via a natural ventilation strategy, demonstrated via **EITHER** of the following:
  - a. The *openable window area* in each office space is equivalent to 5% of the gross internal floor area of that room/floor plate. For room/floor plates between 7m-15m depth, the *openable window area* is on opposite sides and evenly distributed across the area to promote adequate cross-ventilation. **OR**
  - b. The design demonstrates (by calculation, using ventilation design tool) that the natural ventilation strategy provides adequate cross flow of air to maintain required thermal comfort conditions and ventilation rates.

For a strategy which does not rely on *openable windows*, or which has office spaces with a plan depth greater than 15m, the design must demonstrate (by calculation in accordance with requirement 1b above) that the ventilation strategy can provide adequate cross flow of air to maintain the required thermal comfort conditions and ventilation rates.

2. The strategy is capable of providing at least two levels of user-control on the supply of fresh air to the office space with higher rates of ventilation achievable to remove short-term odours and/or prevent summertime overheating.

This would typically be demonstrated by providing a large enough area of manually opening windows or powered window actuators. Any opening mechanisms must be easily accessible and provide adequate user-control over air flow rates to avoid draughts.

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	Where the existing building falls within the scope of the assessment, then the criteria extend to the existing building. If only the new extension is being assessed then the criteria apply to the areas of the new building only.
<b>Shell Only</b>	There are no additional or different criteria to those outlined above specific to shell-only projects.
<b>Fit Out Only</b>	There are no additional or different criteria to those outlined above specific to fit out-only projects.

<b>Buildings with office space &lt;500m<sup>2</sup> (Retail &amp; Industrial only)</b>	If the building being assessed contains office space that totals <500m <sup>2</sup> then this BREEAM issue does not need to be assessed as a standalone issue. The criteria for this issue forms a part of BREEAM issue Hea 14 'Office Space'. The aim of Hea 14 is to recognise relevant Health & Wellbeing issues in buildings with a small amount of office space, ensuring the issues are weighted relative to the overall proportion of the building and users who utilise this type of space.
<b>Mechanically ventilated/cooled buildings</b>	The aim of this BREEAM issue is to ensure that a building is capable of providing fresh air using a natural ventilation strategy. As a result, buildings that employ a mechanically ventilated/cooled strategy may still be able to achieve the credit, provided they can demonstrate compliance with the above criteria (for future adaptability).
<b>Openable window area</b>	The <i>openable window area</i> 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 (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).

### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
1-2	<p>Design plans and elevations, specification or calculations confirming:</p> <ul style="list-style-type: none"> <li>• Ventilation strategy in each <i>occupied space</i></li> <li>• The depth of the room</li> <li>• Gross internal floor area of each <i>occupied space</i></li> <li>• The type of window/ventilator and total <i>openable area</i> *</li> <li>• The location of openings</li> <li>• The type and degree of user-control.</li> </ul> <p><b>AND</b> (where relevant)</p> <p>A copy of the results from the appropriate software modelling tool demonstrating compliance.</p> <p>*Manufacturers'/suppliers' literature may also be used as evidence.</p>	<p>Assessor's site inspection report and photographic evidence confirming:</p> <ul style="list-style-type: none"> <li>• The ventilation openings and controls are installed in accordance with compliant design stage evidence. *</li> </ul> <p>A formal letter from the design team or main contractor confirming:</p> <ul style="list-style-type: none"> <li>• No changes have occurred since design stage.</li> </ul> <p>Where changes have occurred since design stage, 'as-built' drawings, specification and calculations (as outlined under design stage evidence) that re-confirms compliance.</p> <p>* A random spot check of a selection of <i>occupied spaces</i> is sufficient. The assessor is not required to check each opening in all spaces/rooms.</p>

### Additional Information

#### Relevant definitions

**Ventilation design tools:** any of the following design tools can be used to demonstrate compliance, different tools being more suited to different stages in the development of the design:

- Envelope flow models
- Computational fluid dynamics (CFD)
- Combined thermal and ventilation models
- Physical scale models.

Envelope flow models are the simplest tool and are recommended for the initial sizing of openings at the chosen design conditions. The other tools provide more detailed information and are usually more suited to later stages in the design.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	1	1	Hea 8 - Indoor Air Quality	-	-	-	-	-

### Aim

To reduce the risk to health associated with poor indoor air quality.

### Assessment Criteria

The following demonstrates compliance:

- Air-conditioned and mixed-mode buildings:** Where the building's air intakes and exhausts are over 10m apart to minimise recirculation **AND** intakes are over 20m from *sources of external pollution*.
- Naturally-ventilated buildings:** Where openable windows/ventilators are over 10m from *sources of external pollution*.
- In addition to the specific BREEAM criteria above, the building has been designed to provide fresh air rates to dilute pollutants in accordance with national best practice guidelines
- Areas of the building subject to large and unpredictable or variable occupancy patterns such as shops and leisure buildings have CO<sub>2</sub> or air quality sensors specified and:
  - In mechanically ventilated spaces, the sensor(s) are linked to the mechanical ventilation system and provide demand-controlled ventilation to the space.
  - In naturally ventilated spaces, the sensors either have the ability to alert the building owner/manager when CO<sub>2</sub> 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/roof vents.

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	There are no additional or different criteria to those outlined above specific to the assessment of extensions to existing buildings.
<b>Shell Only</b>	There are no additional or different criteria to those outlined above specific to shell-only projects.
<b>Fit Out only</b>	There are no additional or different criteria to those outlined above specific to fit out-only projects.
<b>Scope of the assessment criteria – industrial buildings</b>	For industrial buildings the criteria apply only to the staff office areas and not the operational area. If the building does not contain any office areas, the BREEAM assessor's spreadsheet tool will filter this issue from the list of applicable credits.



<b>Buildings with office space &lt;500m<sup>2</sup> (industrial only)</b>	If the building being assessed contains office space that totals <500m <sup>2</sup> then this BREEAM issue does not need to be assessed as a standalone issue. The criteria for this issue form a part of BREEAM issue Hea 14 'Office Space'. The aim of Hea 14 is to recognise relevant Health & Wellbeing issues in buildings with a small amount of office space, ensuring the issues are weighted relative to the overall proportion of the building and users who utilise this type of space.
<b>Local or national best practice ventilation standards</b>	Please refer to the country specific reference sheet to locate the appropriate best practice ventilation guidance in the country of assessment. Alternatively, compliance can be demonstrated as follows; <ul style="list-style-type: none"> <li>The minimum requirements as set out in Checklist A10 are covered by the proposed documents.</li> <li>Fresh air is provided in office areas in accordance with the medium indoor air quality levels recommended in table A 11 of EN 13779 ie between 10 and 15 litres per second per person and at a rate of at least 8 litres per second per person in all other spaces.</li> </ul> <p>Where appropriate ventilation standards do not exist for a country, the design team should demonstrate compliance with the European Standard mentioned above.</p>
<b>Measuring the distance</b>	The distance requirement does not necessarily mean the plan distance, but the three dimensional distance around and over objects; e.g. on plan the air intakes may be less than 20m from a source of external pollution, but the intake may be on the roof of a 10 storey building and therefore over 20m from the source of pollution.
<b>Sources of external pollution</b>	This includes the following: <ul style="list-style-type: none"> <li>Highways and the main access roads on the assessed site.</li> <li>Car parks and delivery/vehicle waiting bays</li> <li>Other building exhausts, including from building services plant industrial/agricultural processes</li> </ul>
<b>Excluded sources</b>	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/drop-off or waiting bays.
<b>Filters</b>	It must be noted that filters fitted on the air supply are not considered by BREEAM to provide adequate protection from sources of external pollution. As such the distance criteria cannot be relaxed where filters are specified.
<b>Areas with a large and unpredictable occupancy</b>	The following are examples of these types of spaces: <ul style="list-style-type: none"> <li>Auditoria</li> <li>Gyms</li> <li>Retail stores/malls</li> <li>Cinemas</li> <li>Waiting rooms</li> </ul> <p>Where the assessed building does not have any areas deemed to be large with an unpredictable pattern of occupancy, the fourth BREEAM requirement does not apply.</p>

### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
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1&2	<p>A marked-up proposed site plan highlighting:</p> <ul style="list-style-type: none"> <li>• Locations of intakes, extracts, openable windows, ventilators</li> <li>• Any existing or proposed sources of external pollution.</li> </ul>	<p>Assessor's building/site inspection and as built drawings confirming:</p> <ul style="list-style-type: none"> <li>• Locations of intakes, extracts, openable windows, ventilators</li> <li>• Proximity of any sources of external pollution to the above.</li> </ul>
3	<p>Design team calculations and/or performance specification criteria confirming:</p> <ul style="list-style-type: none"> <li>• The fresh air rate set for each space</li> <li>• That the fresh air rate can be met using the chosen strategy</li> <li>• The relevant standard(s) to which the design is in accordance with.</li> </ul> <p>Where applicable, confirmation that the minimum requirements as set out in Checklist A10 have been met and that the fresh air rate is within the range specified in table 11 of EN 13779.</p>	<p>For a naturally ventilated building, a formal letter of declaration from the design team or main contractor confirming the building has been built in accordance with a design compliant with the BREEAM criteria.</p> <p>For a mechanically ventilated building, the commissioning manager's performance testing report confirming:</p> <ul style="list-style-type: none"> <li>• The required fresh air rates are achieved.</li> </ul>
4	<p>A copy of the design plans for the internal areas of the building.</p> <p>A copy of the relevant clause(s) of the specification confirming:</p> <ul style="list-style-type: none"> <li>• Air quality monitoring sensors</li> <li>• How these boost ventilation when set points are triggered.</li> </ul>	<p>Assessor's building/site inspection and as built drawings confirming:</p> <ul style="list-style-type: none"> <li>• Installation of air quality sensors.</li> <li>• The sensors boost ventilation when set points are triggered</li> </ul>

### Additional Information

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#### Relevant definitions

**Occupied space:** Refer to BREEAM issue Hea 1.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	1	1	Hea 9 - Volatile Organic Compounds	-	-	-	-	-

### Aim

To recognise and encourage a healthy internal environment through the specification of internal finishes and fittings with low emissions of volatile organic compounds (VOCs).

### Assessment Criteria

The following demonstrates compliance:

- All decorative paints and varnishes have been tested against EN ISO 11890-2:2006 Paints and varnishes. *Determination of volatile organic compound (VOC) content. Gas-chromatographic method* and meet the phase II maximum VOC content limit values set in Annex II of Decorative Paint Directive 2004/42/CE. All decorative paints and varnishes must also be fungal and algal resistant.
- At least five out of the seven product categories listed in table 11 below (where specified) have been tested against and meet the *relevant standards* outlined in the table below for Volatile Organic Compound (VOC) emissions.

### Exemplary level criteria

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

- Credit HEA 9 is awarded
- All product categories listed below (where specified) have been tested against and meet the relevant standards outlined in the table below for Volatile Organic Compound (VOC) emissions.

**Table 11 VOC criteria by product type**

Product	European Standard	Emission level required
<b>Wood Panels</b> <ul style="list-style-type: none"> <li>Particleboard,</li> <li>Fibreboard including MDF,</li> <li>OSB,</li> <li>Cement-bonded particleboard</li> <li>Plywood</li> <li>Solid wood panel and acoustic board</li> </ul>	EN 13986:2002	Formaldehyde E1 (Testing req 1 – see below) Verify that regulated wood preservatives are absent and of the minimum content.
<b>Timber Structures</b> <ul style="list-style-type: none"> <li>Glued laminated timber</li> </ul>	EN 14080:2005	Formaldehyde E1 (Testing req 1)
<b>Wood flooring</b> <ul style="list-style-type: none"> <li>e.g. parquet flooring</li> </ul>	EN 14342:2005	Formaldehyde E1 (Testing req 1) Verify that regulated wood preservatives are absent and of the minimum content.
<b>Resilient, textile and laminated Floor coverings</b>	EN 14041:2004	Formaldehyde E1 (Testing req 1) Verify that regulated

<ul style="list-style-type: none"> <li>• Vinyl/linoleum</li> <li>• Cork and rubber</li> <li>• Carpet</li> <li>• Laminated wood flooring</li> </ul>		preservatives are absent and of the minimum content.
<b>Suspended ceiling tiles</b>	EN 13964:2004	Formaldehyde E1 (Testing req 1) No asbestos.
<b>Flooring adhesives</b>	EN 13999-1:2007	Verify that carcinogenic or sensitising volatile substances are absent (Testing req. 2-4).
<b>Wall-coverings</b> <ul style="list-style-type: none"> <li>• Finished wallpapers</li> <li>• Wall vinyl's and plastic wall-coverings</li> <li>• Wallpapers for subsequent decoration.</li> <li>• Heavy duty wall-coverings</li> <li>• Textile wall-coverings</li> </ul>	EN 233:1999 EN 234:1989 EN 259:2001 EN 266:1992	Formaldehyde (testing req. 5) and Vinyl chloride monomer (VCM) (testing req. 5) release should be low and within the EN standard for the material. Verify that the migration of heavy metals(5) and other toxic substances are within the EN standard for the material.
<b>Testing requirement:</b> <ol style="list-style-type: none"> <li>1. EN 717-1:2004</li> <li>2. EN 13999-2:2007 - Volatile Organic Compounds (VOCs)</li> <li>3. EN 13999-3:2007 - Volatile aldehydes</li> <li>4. EN 13999-4:2007 - Volatile diisocyanates</li> <li>5. EN 12149:1997</li> </ol>		

<b>Compliance Notes</b>	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	There are no additional or different criteria to those outlined above specific to the assessment of extensions to existing buildings.
<b>Shell Only</b>	<p>Compliance with this BREEAM issue can be demonstrated via one of the following means in shell only buildings/areas:</p> <ul style="list-style-type: none"> <li>• Option 1 – Use of a tenancy lease agreement between the developer and tenant/s (full value of available credits)</li> <li>• Option 2 – A Green Building Guide for tenant fit outs (half the value of the available credits)</li> <li>• Option 3 – Developer/Tenant collaboration (full value of available credits)</li> </ul> <p>Where compliance with the assessment criteria cannot be demonstrated the available credits must be withheld (option 4).</p> <p>Refer to the <i>Scope</i> section 2.2 <i>Types of project that can be assessed using BREEAM</i> (Shell and Core / Speculative Assessments) for further description of the above options.</p>
<b>Fit Out only</b>	There are no additional or different criteria to those outlined above specific to shell-only assessments.
<b>Furnishings</b>	The scope of this BREEAM issue does not extend to furnishings e.g. desks/shelving, it focuses on the key internal finishes and fittings integral to the building.

<b>Relevant standards</b>	All standards outlined in the table above are standards recognised across Europe for VOCs content. These are the only standards that will be accepted by BREEAM Europe for the purposes of assessing this issue – these cannot be substituted by local standards.
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### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
1 & 2	<p>A copy of the relevant specification clause confirming:</p> <ul style="list-style-type: none"> <li>The VOC content of the relevant specified product types will comply with the standards specified above.</li> </ul>	<p>For each relevant product, a formal letter from or copies of the manufacturer's literature confirming:</p> <ul style="list-style-type: none"> <li>The standard(s) against which the product is tested</li> <li>The VOC emissions achieved</li> <li>The VOC emissions meet the required level.</li> </ul>

### Additional Information

#### Relevant definitions

None.

#### Volatile Organic Compounds

VOCs are emitted by a wide array of products numbering in the thousands. Examples include: paints and lacquers, paint strippers, cleaning supplies, pesticides, building materials and furnishings, glues and adhesives, Urea-formaldehyde foam insulation (UFFI), pressed wood products (hardwood plywood wall panelling, particleboard, fibreboard) and furniture made with these pressed wood products.

'No' or 'low' VOC paints are available from most standard mainstream paint manufacturers. There 'eco-friendly' paints are made from organic plant sources and also powdered milk-based products. The emissions of VOCs from paints and varnishes are regulated by the Directive 2004/42/CE, implemented in the UK by the Volatile Organic Compounds in Paints, Varnishes and Vehicle Refinishing Products Regulation 2005. Products containing high organic solvent content should also be avoided (EU VOC Solvent Directive 1999/13/EC).

Wood products that contain phenol-formaldehyde (PF) generally emit formaldehyde at considerably lower rates than those containing urea-formaldehyde (UF). Although formaldehyde is present in both types of resins, pressed woods that contain PF would be preferable to those containing UF resin.

Exposure risk assessment of any possible release of chemicals from manufactured products and their possible impact on health and the environment generally, is an important requirement of European regulations. The possible impact of a building product on indoor air quality is included in the European Construction Products Directive, 89/106/EEC. The amended Directive, 93/68/EEC provided the criteria for CE Marking of products.

Products to be fitted in buildings should not contain any substances regulated by the Dangerous Substances Directive 2004/42/CE, which could cause harm to people by inhalation or contact. Materials containing heavy metals (e.g. antimony, barium, cadmium, lead and mercury) and other toxic elements (e.g. arsenic, chromium and selenium) or regulated biocides (e.g. pentachlorophenol) should be avoided.

Various labelling schemes identify products that have been tested and shown to be low emitting and these have been summarised in BRE Digest 464<sup>2</sup>.

Dangerous substances are defined in the Dangerous Substances Directive (67/548/EEC)

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
			Hea 10 - Thermal Comfort					
2	2	2		-	-	-	-	-

### Aim

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To ensure, with the use of design tools, that appropriate thermal comfort levels are achieved.

### Assessment Criteria

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The following demonstrates compliance:

#### One credit

1. An analytical measurement and evaluation of the thermal comfort levels of the building has been carried out using the PMV (predicted mean vote) and PPD (predicted percentage of dissatisfied) indices in accordance with EN ISO 7730:2005 *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*.
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 EN 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 Annex A of EN ISO 7730.

#### Two credits

1. Thermal modelling has been carried out aimed at optimising thermal comfort.
2. The modelling is used to guide the following design decisions (that influence thermal comfort levels);
  - a. Basic building form and orientation
  - b. Internal layout
  - c. Exploiting the effect of trees and building overshadowing on solar heat gain and shielding effects on transmission losses
  - d. Balancing the maximisation of daylight for reduced lighting energy use against increased cooling loads and thermal comfort levels
  - e. Checking for overheating risk.
3. Thermal comfort levels in *occupied spaces* meet the requirements local thermal comfort criteria; in particular internal winter and summer temperature ranges will be in line with the recommended comfort criteria.
4. The software used to carry out the simulation at the detailed design stage must provide *full dynamic thermal analysis*. For smaller and more basic building designs an alternative less complex means of analysis may be appropriate (further guidance can be found in CIBSE AM11 “Building energy and environmental modelling”<sup>[3]</sup>).

Note: those two credits are independent from the first one being achieved.

<b>Compliance Notes</b>	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	Where the existing building falls within the scope of the assessment, then the criteria extend to all <i>occupied spaces</i> of the new and existing building. If only the new extension is being assessed then the criteria apply to the occupied areas of the new building.
<b>Shell Only</b>	<p>Thermal modelling completed on the basis of a notional layout will be acceptable. Alternatively, compliance with this BREEAM issue can be demonstrated via one of the following means in shell only buildings/areas:</p> <ul style="list-style-type: none"> <li>• Option 1 – Use of a tenancy lease agreement between the developer and tenant/s (full value of available credits)</li> <li>• Option 2 – A Green Building Guide for tenant fit outs (half the value of the available credits)</li> <li>• Option 3 – Developer/Tenant collaboration (full value of available credits)</li> </ul> <p>Where compliance with the assessment criteria cannot be demonstrated the available credits must be withheld (option 4).</p> <p>Refer to the <i>Scope</i> section 2.2 <i>Types of project that can be assessed using BREEAM</i> (Shell and Core / Speculative Assessments) for further description of the above options.</p>
<b>Fit Out Only</b>	There are no additional or different criteria to those outlined above specific to the assessment of fit out-only projects.
<b>Local or national thermal comfort criteria</b>	<p>Please refer to the country specific reference sheet to locate the appropriate best practice thermal comfort guidance in the country of assessment.</p> <p>Where appropriate thermal comfort criteria do not exist for a country, the design team should demonstrate compliance with Annex A of EN 15251:2007.</p>
<b>Buildings with office space &lt;500m<sup>2</sup> (industrial only)</b>	If the building being assessed contains office space that totals <500m <sup>2</sup> then this BREEAM issue does not need to be assessed as a standalone issue. The criteria for this issue form a part of BREEAM issue Hea 14 'Office Space'. The aim of Hea 14 is to recognise relevant Health & Wellbeing issues in buildings with a small amount of office space, ensuring the issues are weighted relative to the overall proportion of the building and users who utilise this type of space.
<b>Allocation of credits</b>	The maximum number of credits can only be awarded where a detailed thermal analysis is carried out at early design stage in order to take the thermal comfort issue into account within the design. This is the second option set out above. Where the first option has been followed to check that adequate thermal comfort levels have been designed for the building it is only possible to award one credit.
<b>Buildings with airconditioning</b>	For the second credit to be awarded, modelling is required in any case even for new air-conditioned buildings which are likely to be designed to achieve thermal comfort levels. This is to ensure that the building has been designed to minimise the demands on the system before the cooling system is specified.

### **Schedule of Evidence Required**

Req.	Design Stage	Post Construction Stage
<b>One credit</b>		
All	<p>A copy of the report confirming:</p> <ul style="list-style-type: none"> <li>A thermal comfort analysis has been undertaken in accordance with EN ISO 7730:2005</li> <li>Thermal comfort criteria used to carry out the assessment</li> </ul> <p><b>OR</b></p> <p>A copy of the relevant specification clause confirming:</p> <ul style="list-style-type: none"> <li>A thermal comfort assessment will be undertaken.</li> <li>The requirements for thermal comfort analysis.</li> </ul> <p>A copy of the results from the modelling demonstrating thermal comfort levels in compliance with Annex A of EN ISO 7730:2005.</p>	<p>Formal written confirmation from the design team confirming:</p> <ul style="list-style-type: none"> <li>No changes have occurred since design stage thermal comfort assessment was carried out, therefore design stage evidence demonstrates compliance at the post construction stage.</li> </ul> <p>Where changes have occurred, an updated copy of the results from the modelling demonstrating the internal temperatures in compliance with the relevant standards.</p>
<b>Two credits</b>		
All	<p>A copy of the report confirming:</p> <ul style="list-style-type: none"> <li>A thermal comfort modelling has been undertaken</li> <li>Indicative examples of how the modelling has been used in the design</li> <li>The name of the thermal comfort modelling software used</li> </ul> <p><b>OR</b></p> <p>A copy of the relevant specification clause confirming:</p> <ul style="list-style-type: none"> <li>A thermal comfort modelling will be undertaken and influence the design.</li> <li>The requirements for thermal comfort analysis.</li> </ul> <p>A copy of the results from the modelling demonstrating thermal comfort levels in compliance with Annex A of EN 15251:2007</p>	<p>Formal written confirmation from the design team confirming:</p> <p>No changes have occurred since design stage thermal comfort assessment was carried out, therefore design stage evidence demonstrates compliance at the post construction stage.</p> <p>Where changes have occurred, an updated copy of the results from the modelling demonstrating the internal temperatures in compliance with the relevant standards.</p>

### Additional Information

#### Relevant definitions

**Occupied space:** For the purpose of this BREEAM issue an occupied space is a room or space within the assessed building that is likely to be occupied for 30 minutes or more by a building user. The definition excludes the following:

- Atria/concourses
- Entrance halls/reception areas
- Ancillary space e.g. circulation areas, storerooms and plantrooms



**Predicted Mean Vote:** the PMV is an index that predicts the mean value of the votes of a large group of persons on the 7-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.

**Table 12 Seven-point thermal sensation scale**

+ 3	Hot
+2	Warm
+1	Slightly warm
0	Neutral
-1	Slightly cool
-2	Cool
-3	Cold

**Predicted Percentage Dissatisfied:** 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 EN ISO 7730, thermally dissatisfied people are those who will vote *hot*, *warm*, *cool* or *cold*.

**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/cooling loads, overheating risks and control strategies to be assessed.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	1	1	Hea 11 - Thermal Zoning	-	-	-	-	-

### Aim

To recognise and encourage the provision of user controls which allow independent adjustment of heating/cooling systems within the building.

### Assessment Criteria

The following demonstrates compliance:

1. The heating/cooling system is designed to allow *occupant control* of zoned areas within all *occupied spaces* in the building.
2. The 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).

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	Where the existing building falls within the scope of the assessment, then the criteria extend to the <i>occupied spaces</i> of the existing building. If only the new extension is being assessed then the criteria apply to the relevant spaces of the new building.
<b>Shell Only</b>	<p>Compliance with this BREEAM issue can be demonstrated via one of the following means in shell only buildings/areas:</p> <ul style="list-style-type: none"> <li>• Option 1 – Use of a tenancy lease agreement between the developer and tenant/s (full value of available credits)</li> <li>• Option 2 – A Green Building Guide for tenant fit outs (half the value of the available credits)</li> <li>• Option 3 – Developer/Tenant collaboration (full value of available credits)</li> </ul> <p>Where compliance with the assessment criteria cannot be demonstrated the available credits must be withheld (option 4).</p> <p>Refer to the <i>Scope</i> section 2.2 <i>Types of project that can be assessed using BREEAM</i> (Shell and Core / Speculative Assessments) for further description of the above options.</p>
<b>Fit Out only</b>	There are no additional or different criteria to those outlined above specific to fit out-only projects.

<b>Buildings with office space &lt;500m<sup>2</sup> (Retail &amp; Industrial only)</b>	Where the building being assessed contains office space that totals <500m <sup>2</sup> then this BREEAM issue does not need to be assessed as a standalone credit. The requirements form a part of BREEAM issue Hea 14 'Office Space'. The aim of Hea 14 is to recognise relevant Health & Wellbeing issues in buildings with a small amount of office space, ensuring the issues are weighted relative to the overall proportion of the building and users who utilise this type of space.
<b>Long lag systems</b>	Where <i>long-lag systems</i> are specified, the criteria can be met where they are designed to service the base load only and a responsive secondary heating system and controls are provided, zoned in compliance with the above criteria.
<b>Distance requirement</b>	The distance requirement is approximate; however, the assessor must use sound judgement considering fully the aims of this issue, before accepting solutions that do not strictly meet the above criteria.
<b>Controls for wet heating systems</b>	Adequate TRVs (thermostatic radiator valves) placed in zones around the building perimeter, and the provision of local occupant controls to internal areas, such as fan coil units, would satisfy the criteria for this BREEAM issue.
<b>No office space (retail and industrial only)</b>	Where the assessed building contains no office space and only an operational area, this BREEAM issue will be filtered from the list of applicable BREEAM issues by the BREEAM assessor's spreadsheet tool.

### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
1&2	<p>A copy of the relevant clauses of specification and/or marked-up M&amp;E drawings confirming:</p> <ul style="list-style-type: none"> <li>• Scope of the heating/cooling system</li> <li>• The type of user controls for the above systems</li> <li>• The scope of the controls i.e. control zone.</li> </ul>	<p>Assessor's building/site inspection and photographic evidence confirming:</p> <ul style="list-style-type: none"> <li>• Installation of user controls in each <i>occupied space</i>.*</li> </ul> <p>*For large buildings it would not be expected that the assessor check every individual <i>occupied space</i>, but a random selection of spaces that confirm compliance.</p>

### Additional Information

#### Relevant definitions

**Long-lag systems:** These low temperature systems use the thermal mass of the building to provide a consistent supply of heat to the space during the occupied period. As the mass of the building is used to regulate and supply the heat, the temperature in the space lags behind any change required by the occupants via the systems controls. An example of a long-lag system is under-floor heating.

**Separate Occupant Control:** Heating/cooling controls for a particular area/zone of the building that can be accessed and operated by the individual(s) occupying that area/zone. Such controls will be located within, or within the vicinity of, the zone/area they control.

**Occupied space:** For the purpose of this BREEAM issue an occupied space is a room or space within the assessed building that is likely to be occupied for 30 minutes or more by a building user. The definition excludes areas where building users would not expect, or be expected, to control temperature in the space, including the following:

- Atria/association space
- Entrance halls/reception areas
- Circulation areas
- Storerooms

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
			Hea 12 - Microbial Contamination					
1	1	1		-	-	-	-	-

### Aim

To ensure the building services are designed to reduce the risk of legionellosis in operation.

### Assessment Criteria

The following demonstrates compliance:

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
2. Where no humidification is specified or only steam humidification is provided.

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	If the extended and existing building share the same water systems, then these 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 extended building will use water systems in the existing building, then it must be confirmed that the existing systems comply with the criteria.
<b>Shell Only</b>	<p>Compliance with this BREEAM issue can be demonstrated via one of the following means in shell only buildings/areas:</p> <ul style="list-style-type: none"> <li>• Option 1 – Use of a tenancy lease agreement between the developer and tenant/s (full value of available credits)</li> <li>• Option 2 – A Green Building Guide for tenant fit outs (half the value of the available credits)</li> <li>• Option 3 – Developer/Tenant collaboration (full value of available credits)</li> </ul> <p>Where compliance with the assessment criteria cannot be demonstrated the available credits must be withheld (option 4).</p> <p>Refer to the <i>Scope</i> section 2.2 <i>Types of project that can be assessed using BREEAM</i> (Shell and Core / Speculative Assessments) for further description of the above options.</p>
<b>Fit Out Only</b>	Any and all existing and new water systems in the fitted-out building/unit must comply with the BREEAM criteria. In some instances responsibility for water systems may lie with a landlord and not the tenant; in such cases confirmation will be required from the landlord, or their representative, confirming that the water system comply with ACoP.
<b>Assessor's responsibility</b>	The BREEAM assessor <b>is not</b> required to confirm that the design is compliant with the relevant standard; 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 compliance.
<b>National health and safety best practice guides</b>	<p>Please refer to the country specific reference sheet to find the appropriate health and safety best practice guides in the country of assessment.</p> <p>Where health and safety best practice guides are not outlined in the country specific reference sheet or where the design team wishes to use an alternative reference document, please use Checklist A10 to determine its acceptability.</p> <p>Where no appropriate reference document exists for a country, the design team should demonstrate compliance using the UK alternative.</p>

### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
1&2	<p>A copy of the relevant specification clause(s) confirming:</p> <ul style="list-style-type: none"> <li>All types of water system in the building and on the assessed site.</li> <li>The standards to which all water systems in the building will be designed.</li> </ul> <p>Where applicable, a copy of Checklist A10.</p> <p>Where design responsibility is to be passed on to the contractor/installer, a copy of the relevant specification clause(s) stating:</p> <ul style="list-style-type: none"> <li>The requirements on the contractor/installer with regards to minimising the risk of Legionnaires disease from the specified water systems.</li> </ul>	<p>For all water systems in the building, a formal letter of declaration from the design team, main contractor or installer of the relevant systems confirming:</p> <ul style="list-style-type: none"> <li>The design and installed systems comply with the relevant standard.</li> <li>If relevant, any existing water systems comply with the relevant standard.</li> </ul>

### Additional Information

#### Relevant definitions

**Water systems:** For the purpose of this issue, this refers to:

- Cooling towers
- Evaporative condenser
- Domestic hot and cold water systems
- 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:
  - humidifiers and air washers
  - spa baths and pools
  - car/bus washes
  - wet scrubbers
  - Indoor fountains and water features.

**Legionnaires disease:** The HSE describes Legionnaires disease as a type of pneumonia caused by the bacterium *Legionella pneumophila*. People catch Legionnaires' disease by inhaling small droplets of water suspended in the air, which contain the bacteria.

**Humidification Units**

Humidification options fall into two broad groups; the first group relies on a heated air stream evaporating water vapour either from a pond or stream of water. This includes so-called 'trickle-down' systems. These are dependent on sterilisation technologies such as UV, ultrasonic etc, to ensure that the water vapour is not contaminated. Whilst these systems are effective when working properly, any partial failure will allow untreated water into a warmed air stream. Where this occurs, the health-related consequences are likely to be significant.

The second group relies on failsafe systems that minimise risk if the plant fails. The only option in this group is steam humidification. This process sterilises the water vapour and ensures that untreated water cannot enter the air stream when no steam is being produced.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
			Hea 13 - Acoustic Performance					
1	1	1		-	-	-	-	-

### Aim

To ensure the acoustic performance of the building meets the appropriate standards for its purpose.

### Assessment Criteria

The following demonstrates compliance:

1. Indoor ambient noise levels in *unoccupied* staff/office areas comply with the following:
  - a.  $\leq 40\text{dB } L_{Aeq,T}$  in single occupancy offices
  - b.  $40\text{-}50\text{dB } L_{Aeq,T}$  in multiple occupancy offices
  - c.  $\leq 40\text{ dB } L_{Aeq,T}$  general spaces (staffrooms, restrooms)
  - d.  $\leq 35\text{ dB } L_{Aeq,T}$  in spaces designed for speech e.g. seminar/lecture rooms
  - e.  $\leq 50\text{ dB } L_{Aeq,T}$  in informal café/canteen areas
2. **Fully fitted buildings only:** The sound insulation between *acoustically sensitive rooms* and other *occupied spaces* complies with section 7.6.3.1 of BS8233<sup>3</sup>, as follows:
  - a.  $D_w + L_{Aeq,T} > 75$ 
    - $D_w$  is the weighted sound level difference between the two spaces
    - $L_{Aeq,T}$  is the design (or measured) indoor ambient noise level in the space adjacent to the *acoustically sensitive room*.

The source and receive room sound pressure levels from which  $D_w$  is derived must be measured in accordance with EN ISO 140-4:1998. Measurements must be based on finished rooms, accounting for any carpets and acoustically absorbent ceilings specified. The measurements can be conducted in either furnished or unfurnished rooms.

3. Pre-completion acoustic testing is carried out by a *suitably qualified acoustician* to ensure that all relevant spaces (as built) achieve the performance standards required, and any required remedial works in spaces that do not meet the standards are completed prior to handover and occupation.

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	There are no additional or different criteria to those outlined above specific to assessments of extensions to existing buildings.
<b>Shell Only</b>	Where it is not possible to define the type of office space due to the speculative nature of the development, it must be assumed that it will be open plan with an occupancy rate of 1 person per 10m <sup>2</sup> .  For assessments of buildings that are not fully fitted, compliance with this BREEAM issue within shell-only areas may be demonstrated via one of the following means:

	<ul style="list-style-type: none"> <li>• Option 1 – Use of a tenancy lease agreement between the developer and tenant/s requiring compliance with the criteria (full value of available credits)</li> <li>• Option 2 – A Green Building Guide for tenant fit outs demonstrating how to achieve the standards and the benefits of doing so (half the value of the available credits)</li> <li>• Option 3 – Developer/Tenant collaboration to ensure compliance with the criteria (full value of available credits)</li> </ul> <p>Where compliance with the assessment criteria cannot be demonstrated within shell-only areas, the credit must be withheld regardless of compliance in fitted out areas (option 4).</p> <p>Refer to the <i>Scope</i> section 2.2 <i>Types of project that can be assessed using BREEAM</i> (Shell and Core / Speculative Assessments) for detailed description of the above options.</p>
<b>Fit Out Only</b>	Fit out-only assessments of buildings with <i>acoustically sensitive spaces</i> must be assessed against the sound insulation criteria for this BREEAM issue.
<b>Buildings with office space &lt;500m<sup>2</sup> (Retail &amp; Industrial only)</b>	If the building being assessed contains office space that totals <500m <sup>2</sup> then this BREEAM issue does not need to be assessed as a standalone credit. The requirements form a part of BREEAM issue Hea 14 'Office Space'. The aim of Hea 14 is to recognise relevant Health & Wellbeing issues in buildings with a small amount of office space, ensuring the issues are weighted relative to the overall proportion of the building and users who utilise this type of space.
<b>Acoustically sensitive areas</b>	Where the term ' <i>acoustically sensitive rooms</i> ' is referenced in this BREEAM issue, it refers to the following types of space/rooms (where specified) where privacy, and therefore appropriate sound insulation levels, are deemed important: <ul style="list-style-type: none"> <li>• Cellular offices and meeting rooms</li> <li>• Any other room/space the design team or client deems to be acoustically sensitive.</li> </ul>
<b>Unoccupied spaces</b>	Where the term ' <i>unoccupied space</i> ' 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 when the space is unoccupied and therefore devoid of sources of noise. Care should be taken to avoid confusing this term with the definition " <i>occupied space</i> " (see relevant definitions) as they have two different meanings within the context of this BREEAM issue.
<b>Measurement procedures</b>	The Additional Information section outlines the criteria 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/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.
<b>Factory noise</b>	Where there is a known source of noise within the operational area of the building e.g. installed machinery/plant, such noises must be factored in to any calculations or measurements of indoor ambient noise levels.
<b>Privacy</b>	Where ranges of noise levels are specified where 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 levels to be lower or equal to the upper limit of the range.



### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
1-2	<p>A copy of the design plan for each level of the building with each room/area clearly labelled.</p> <p>A copy of the specification clause or acousticians calculations confirming:</p> <ul style="list-style-type: none"> <li>Indoor ambient noise levels in each relevant room/area.</li> <li>If relevant, sound insulation levels between each <i>acoustically sensitive room</i> and adjacent <i>occupied areas</i>.</li> <li>The standards to which calculations/measurements have complied, or are required to comply with.</li> </ul>	<p>Copies of acoustic field test report/results confirming:</p> <ul style="list-style-type: none"> <li>The required performance levels have been achieved for each room/area of the completed building.</li> <li>Where relevant, any remedial work/actions required to meet the performance standards.</li> </ul> <p>Evidence, such as a formal letter from the acoustician or their test report confirming that they meet BREEAM's definition of a <i>suitably qualified acoustician</i>.</p> <p>A letter from the design team or main contractor confirming:</p>
3	<p>A copy of the specification clause or a formal letter from the project team confirming:</p> <ul style="list-style-type: none"> <li>A programme of pre-completion acoustic testing by a <i>suitably qualified acoustician</i> will be commissioned.</li> <li>Where rooms/areas do not comply with the required levels, appropriate remedial works will be actioned and completed.</li> </ul>	<p>Any and all required remedial works have been carried out in accordance with the acoustician's recommendations.</p>

### Additional Information

#### Relevant definitions

**Suitably qualified acoustician:** an individual achieving all the following items can be considered to be "suitably qualified" for the purposes of a BREEAM assessment:

- Holds a degree, PhD or equivalent qualification in acoustics/sound testing.
- Has a minimum of three years relevant experience (within the last five years). Such experience must clearly demonstrate a practical understanding of factors affecting acoustics in relation to construction and the built environment; including, acting in an advisory capacity to provide recommendations for suitable acoustic performance levels and mitigation measures.

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

- represent sound industry practice
- be appropriate given the building assessed and scope of works proposed
- avoid invalid, biased and exaggerated recommendations.

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

**Single occupancy offices:** cellular office space designed to accommodate one or two desk spaces/workstations (typically no greater than 10m<sup>2</sup>).

**Multiple occupancy offices:** Office space that is not cellular in nature i.e. it is open-planned, and designed to accommodate more than two desk spaces/workstations.

**Occupied space:** For the purpose of this BREEAM issue an occupied space is a room or space within the assessed building that is likely to be occupied for 30 minutes or more by a building user (see also description of 'unoccupied space' in the Compliance Notes table above).

#### Measurement/calculation procedures

The following procedures must be followed by the acoustician when measuring or calculating the levels required to demonstrate compliance with this BREEAM issue (see also compliance note above on measurement procedures):

- Noise from both internal sources (e.g. mechanical ventilation systems, plant noise) 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.
- Noise from occupants and office equipment (e.g. computers) should not be included in the measurements.
- 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.
- 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.
- $T$  in  $L_{Aeq,T}$  is taken as the duration of the normal working day (typically 8 hours between 09.00 and 17.00).
- 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.
- Measurement periods shorter than 5 minutes should not be used.
- Measurements should be taken in a minimum of 3 locations in rooms at a height of 1.2 m above the floor level and at least 1 m away from any surface.

For music rooms it may be possible to aid compliance with the above requirements by positioning and orientating such rooms away from more noise-sensitive areas such as libraries and classrooms.

#### 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.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
			Hea 14 - Office Space					
2	-	2		-	-	-	-	-

### Aim

To recognise steps taken to provide a good working environment in smaller office areas within the development.

### Assessment Criteria

The following demonstrates compliance:

#### First credit

1. For retail developments, three of the following measures must be achieved for at least 80% of the development's office space floor area:
  - a. View out: in accordance with the requirements of BREEAM issue Hea 2
  - b. Glare control: in accordance with the requirements of BREEAM issue Hea 3
  - c. Lighting controls & zones: in accordance with the requirements of BREEAM issue Hea 6
  - d. Potential for natural ventilation: in accordance with the requirements of BREEAM issue Hea 7
  - e. Thermal zoning: in accordance with the requirements of BREEAM issue Hea 11
  - f. Acoustic Performance: in accordance with the requirements of BREEAM issue Hea 13.
2. For industrial developments, three of the following measures must be achieved for at least 80% of the development's office space floor area:
  - a. View out: in accordance with the requirements for office space in BREEAM issue Hea 2
  - b. Glare control: in accordance with the requirements of BREEAM issue Hea 3
  - c. Lighting controls & zones: in accordance with the requirements of BREEAM issue Hea 6
  - d. Potential for natural ventilation: in accordance with the requirements of BREEAM issue Hea 7
  - e. Indoor air quality: in accordance with the requirements of BREEAM issue Hea 8
  - f. Thermal comfort: in accordance with the requirements of BREEAM issue Hea 10
  - g. Thermal zoning: in accordance with the requirements of BREEAM issue Hea 11
  - h. Acoustic Performance: in accordance with the requirements of BREEAM issue Hea 13.

#### Second credit

1. For retail developments, four of the six measures listed above must be achieved for at least 80% of the development's office space floor area.
2. For industrial developments, six of the eight measures listed above must be achieved for at least 80% of the development's office space floor area.

#### Exemplary level criteria

The following outlines the exemplary level criteria to achieve an *innovation credit* for this BREEAM issue.

1. An exemplary credit can be awarded where all the measures detailed above have been achieved for at least 80% of the development's office space floor area.

Compliance notes	
<b>New Build</b>	For guidance please refer to the compliance notes in each BREEAM issue for each individual Health & Wellbeing issue listed above.
<b>Refurbishment</b>	For guidance please refer to the compliance notes in each BREEAM issue for each individual Health & Wellbeing issue listed above.
<b>Extensions to existing buildings</b>	For guidance please refer to the compliance notes in each BREEAM issue for each individual Health & Wellbeing issue listed above.
<b>Shell Only</b>	For guidance please refer to the compliance notes in each BREEAM issue for each individual Health & Wellbeing issue listed above.
<b>Fit Out Only</b>	For guidance please refer to the compliance notes in each BREEAM issue for each individual Health & Wellbeing issue listed above.
<b>Buildings with office space &gt;500m<sup>2</sup></b>	<p>If the building being assessed contains office space that totals &gt;500m<sup>2</sup>, then this BREEAM issue does not need to be assessed. In such cases the relevant Health &amp; Wellbeing issues (listed above) must be assessed separately.</p> <p>The aim of Hea 14 is to recognise relevant Health &amp; Wellbeing issues in buildings with a small amount of office space, ensuring the issues are weighted relative to the overall proportion of the building and users who utilise this type of space.</p>
<b>No office space</b>	If the building does not contain any office areas this issue will not need to be assessed and the BREEAM assessor's spreadsheet tool will filter it from the list of applicable issues.
<b>80% requirements</b>	The 80% rule is set to provide some flexibility in collectively assessing each of the individual issues. In applying the 80% rule it must be the same 80% (or greater) of floor area that complies with each issue; it is not acceptable to 'pick and mix' the 80% of office area that complies with each issue in order to justify awarding a credit.

### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
All	For each individual measure, the evidence described in the 'Schedule of evidence required' section of the individual BREEAM issue relating to that measure must be provided.	For each individual measure, the evidence described in the 'Schedule of evidence required' section of the individual BREEAM issue relating to that measure must be provided.

### Additional Information

#### Relevant definitions

Refer to the definitions section of each relevant BREEAM issue.

## 6.0 Energy

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
15	15	15	Ene 1 - Energy Efficiency	-	-	-	6	10

### Aim

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To recognise and encourage buildings that are designed to minimise their operational energy consumption.

### Assessment Criteria

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The following demonstrates compliance:

#### **OPTION 1 – Determination of the energy performance of the building using the National Calculation Methodology**

1. Where there is a National Calculation Methodology in place in the country of assessment, the number of credits achieved is based on the percentage improvement in the assessed designs' predicted Building Energy Performance Index (BEPI) over the Current Standards Building Energy Performance Index (CSBEPI), as defined for the local Energy Performance Certificate.
2. The building has been modelled using a software compliant with the National Calculation Methodology (NCM) and an energy rating and certificate produced by a *suitably qualified energy modelling engineer and/or accredited expert*.
3. The percentage improvement is used to allocate the number of credits, as illustrated in the table below;

**Table 13 Percentage improvement over the requirements of local Building Regulations**

BREEAM Credits	New buildings	Refurbishments
1	1%	-50%
2	3%	-32%
3	5%	-20%
4	7%	-9%
5	11%	0%
6	15%	8%
7	19%	15%
8	25%	21%
9	31%	28%
10	37%	36%
11	45%	45%
12	55%	55%
13	70%	70%
14	85%	85%
15	100%	100%
Exemplar credit 1	<i>Carbon neutral building</i>	
Exemplar credit 2	<i>True zero carbon building</i>	

For buildings that are part new-build part refurbishment refer to Compliance Notes.

Example:

Calculate the percentage improvement of the actual Building Energy Performance Index (BEPI) over the Current Standards Building Energy Performance Index (CSBEPI):

Current Standards Building Energy Performance Index (CSBEPI) = 66 kWh/m<sup>2</sup>

Actual Building Energy Performance Index (BEPI) = 53 kWh/m<sup>2</sup>

**Improvement as percentage**

$$\frac{CSBEPI - BEPI}{CSBEPI} \times 100 = \text{improvement \%}$$

$$= \frac{66 - 53}{66} \times 100 = 19.7 \%$$

**Therefore 19.7 % improvement = 7 Credits**

#### **OPTION 2 – Determination of the energy performance of the building using a Dynamic Simulation Modelling tool**

1. Where there is no operational National Calculation Methodology in the country of assessment, the predicted energy performance can be calculated from the design information using a *recognised energy Dynamic Simulation Modelling (DSM) software*. Please refer to the compliance notes table for a definition and examples of compliant tools.
2. The number of credits achieved is based on the predicted energy performance from the assessed building (BEPI) compared to the Current Standards Building Energy Performance Index. The Current Standards Building will be generated using local building regulations, or where these are not defined using Appendix G of ASHRAE Energy Standard 90.1-2007<sup>[2]</sup>.

3. The individual carrying out the modelling is a suitably *qualified energy modelling engineer* and is responsible for making sure that the data entered in the energy modelling is appropriate.
4. The same rating scale and percentage improvement as outlined in Option 1 must be used to award the credits.

### OPTION 3 – Energy Design Features

1. Where there is no operational National Energy Calculation Methodology in the country of assessment, the assessor can use Checklist A7 to determine the number of credits available.

#### Historic Buildings only

In addition to the above an additional 2 credits may be awarded (up to a maximum of 15 for options 1 and 2 and a maximum of 10 for option 3) for carrying out the following:

1. A specialist study has been undertaken by a heritage conservation specialist to investigate the implications of improving building fabric performance whilst minimising the potential negative impacts on both the historic character of the building and the condition of the building fabric.
2. The report makes recommendations for potential improvements to the building fabric and, as a minimum, covers the following issues:
  - a. Each element of the following building elements (as a minimum) must be considered and recommendations for improvements made:
    - i. Roof
    - ii. External/Sheltered walls
    - iii. Ground floor
    - iv. Upper floors
    - v. Windows and external doors
    - vi. Junctions between building elements such as between roof and walls.
    - vii. Junctions between different parts of the building such as between different ages or methods of construction.

Where significant improvement cannot be made to an element then the report should state the reason, setting out in detail the conservation and/or building performance issues that have resulted in this recommendation.

- b. The potential for improvements in ventilation, air tightness and moisture control within the building, ensuring that these are considered in balance with that of the welfare of the historic building fabric. In general, tighter building fabric can be balanced with controlled ventilation improvements (passive and mechanical) and the benefits and disadvantages must be set out together with the recommendations.
3. The study must have been carried out at or prior to concept design stage (equivalent to RIBA stage C or earlier).
4. The building design has implemented and accounted for the study's recommended improvements and, in particular, demonstrates:
  - The design strategy chosen is that which has the greatest impact in terms of potential improvements in energy use, whilst minimising the detrimental impacts on the historic building fabric.
  - That any improvements made to the thermal insulation of the building have been specified in accordance with the recommendations of '*Thermal Insulation: avoiding risks*'.

**Exemplary level criteria**

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

1. Fifteen credits have been achieved under option 1 or option 2.
2. One additional innovation credit can be awarded where evidence provided demonstrates the building is designed to be a *carbon neutral* building (i.e. in terms of building services energy demand).
3. Two additional innovation credits can be awarded where evidence provided demonstrates the building is designed to be a *True zero carbon building* (in terms of building services and operational energy demand).
4. The building has been modelled using a DSM software. Where the software recommended by the National Calculation Methodology (NCM) does not comply with the DSM requirements as set out in Checklist A10, a different software must be used to demonstrate compliance.

<b>Compliance Notes</b>	
<b>New Build</b>	New buildings should compare their Energy Rating to the New Build benchmark scale.
<b>Refurbishment</b>	<p>Existing buildings that have undergone or are undergoing major refurbishment should compare their percentage improvement to the refurbishment benchmark scale. This separate scale aims to better recognise and encourage the energy-efficient refurbishment of existing buildings which results in a significant reduction in the energy demand for that building.</p> <p>However, where the NCM defines a different reference building for refurbishment projects and therefore already accounts for the difference between new build and refurbishment projects, the new build scale should be used to demonstrate compliance.</p>
<b>Extensions to existing buildings</b>	<p>Where an existing building is being extended (and only the new extension is being assessed) and that extension uses existing building services plant, the energy modelling and % improvement must be based on the building fabric of the new extension and any existing, common, building services plant and new building services plant installed that will service the new extension.</p> <p>The energy modelling does not have to consider the existing building fabric where this will not form part of the scope of the BREEAM assessment. Nor does it have to consider existing building services where they are not supplying services (heating, cooling and/or ventilation) to the new extension being BREEAM assessed.</p>



<b>Part new-build extension part refurbishment</b>	<p>For assessments of buildings that are a mixture of new build and existing building refurbishment a weighted benchmark scale is used.</p> <p>The weighted benchmark scale is determined using the area (m<sup>2</sup>) for new build and area (m<sup>2</sup>) for refurbishment and the two benchmark scales in BREEAM C. If there is a higher proportion of new build to refurbishment then the weighted scale will be biased towards the benchmark scale for new buildings and vice-versa if there is a higher proportion of refurbished element. As the benchmarks are influenced by the split in areas between the new build element and major refurbished element of the assessed building, the benchmarks will change if the new build/refurbishment area totals change.</p> <p>To determine the weighted benchmark scale and number of credits achieved, the assessor must enter the area (m<sup>2</sup>) for new build and area (m<sup>2</sup>) for refurbishment in to the relevant box of the <i>Ene 1 Energy efficiency</i> calculator.</p>
<b>Shell Only</b>	<p>For the purposes of the BREEAM assessment it is permissible, when conducting the energy modelling and calculating the % improvement, for the design team to substitute the maximum design fit-out performance specification (as defined in local building regulations when generating % improvements for buildings with tenanted areas) for the performance specifications confirmed within a <i>Green Lease Agreement</i>. This rule applies only to those areas of the building that the scope of the Green Lease covers. Tenanted areas not covered by the scope of the Green Lease must assume the maximum design fit-out specification as defined under local building regulations.</p> <p>The use of a <i>Green Building Guide</i> for tenants fit out (as defined in the Scope section 2.2) cannot be used to substitute the maximum design fit out specification, for the purpose of assessing BREEAM issue Ene 1 Energy Efficiency.</p> <p>Refer to the <i>Scope</i> section 2.2 <i>Types of project that can be assessed using BREEAM</i> (Shell and Core / Speculative Assessments) for further description of the options available for assessing shell only buildings.</p>
<b>Refit</b>	<p>If the Fit Out-only assessment is a refit of an existing building then the refurbishment benchmark scale must be used to determine the number of credits awarded.</p>
<b>Suitably qualified energy modelling engineer and/or accredited expert</b>	<p>If there is a NCM in place in the country of assessment, and the NCM requires Accredited experts to undertake the energy performance calculations, then an Accredited expert as per defined in the country NCM is required.</p> <p>If the NCM does not require accredited experts, then a suitably qualified energy modelling engineer as defined in the Additional Information section must carry out the modelling.</p>
<b>Option 2</b>	<p>Option 2 is available for design teams where there is no operational National Calculation Methodology in place OR where the National Calculation Methodology does not require a dynamic simulation model but the design team wants to undertake a more in-depth analysis of the building as part of the design and for the purposes of assessing this BREEAM issue (e.g. where the NCM does not take issues such as lighting or renewable energy generation into account, the design team may want to undertake a more thorough analysis of the performance of the building).</p> <p>A maximum of 15 credits will be available under this option and the rating scale is the same as option 1.</p>

<b>Recognised energy Dynamic Simulation Modelling (DSM) software</b>	<p>Where the design team wishes to use a modelling software package for the purposes of assessing this BREEAM issue, please use Checklist A10 to determine whether the modelling software package meets the minimum requirements in terms of:</p> <ul style="list-style-type: none"> <li>• Minimum capabilities</li> <li>• Design features</li> <li>• Testing</li> </ul> <p>Where those minimum requirements are met, final approval from BRE Global will be required before the package can be used for the purposes of demonstrating compliance with Ene1.</p> <p>Recognised energy DSM software packages include ASHRAE Energy Standard 90.1-2007, TAS or IES.</p>
<b>Option 3</b>	<p>Option 3 is available for design teams who cannot carry out an energy modelling of their building and where there is no operational National Calculation Methodology in place. However, because energy modelling is the only acceptable way to demonstrate that a building is a truly energy efficient building, a maximum of 10 credits will be available under option 3.</p>
<b>Rating scale</b>	<p>The rating scale works on a basis of a percentage improvement over the base requirement to achieve national Building Regulation compliance. These are set as an additional percentage as there are different base requirements depending on building services strategies.</p> <p>The building energy model output may equally be in kWh or CO2 emissions as the resulting percentage improvement considered for the purposes of awarding BREEAM credits for this issue will be the same.</p>
<b>Renewable and low carbon Installations</b>	<p>Where included as part of the project and therefore assessed under this BREEAM issue, the installation of low or zero carbon technologies can be used to improve the assessed building's energy performance. The LZC technology can be installed <i>on-site</i>, <i>near-site</i> where a <i>private wire arrangement</i> is in place (see relevant definitions) or <i>off-site</i> via <i>accredited external renewables</i> (see compliance note below).</p>
<b>Accredited external renewables</b>	<p>For the purpose of this BREEAM issue <i>accredited external renewables</i> are renewable energy schemes located off-site, but within the country in which the building is being assessed, which:</p> <ul style="list-style-type: none"> <li>• Create new installed generation capacity, designed to meet the loads of the building (i.e. not just units of carbon)</li> <li>• Are additional to capacity already required under pre-existing commitments</li> </ul> <p>At the time of writing, BRE Global are not aware of a mechanism for accrediting off-site renewables and therefore any renewable energy schemes that meet the above definition; though some ESCOs may achieve these criteria.</p>
<b>Energy exported to the grid</b>	<p>Any electricity from an <i>onsite</i> LZC energy source that is exported to the grid may be included in the calculations as if it were used within the building.</p>

<p><b>EPC certificates, BREEAM &amp; building use/tenancy arrangement</b></p>	<p>The legislative criteria for an Energy Performance Certificate may vary according to building size, use, services and tenancy arrangement. In some instances an EPC may be required for the whole building, in others an EPC may be required 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 a number of units to be sub let. Where an EPC is required for each unit, for the purposes of determining the number of BREEAM credits, the energy performance index is the total of the area-weighted average of the energy performance index of each individual unit. Where the development contains conditioned common and/or landlord spaces, the area of these spaces, unless otherwise accounted for, should be divided and attributed amongst the separate units. The proportion of common area attributed to each unit must be equivalent to the ratio of each unit's area as a proportion of the total area of all units.</p> <p>All units, heating systems and common areas within the assessed building must be accounted for in the assessment of Ene 1.</p>
<p><b>Checklist A7</b></p>	<p>Southern and Mediterranean countries are defined as countries with mild winters, high radiation, long days and hot summers. For the purposes of assessing the issue using Checklist A7, they should be assumed to be as follows;</p> <ol style="list-style-type: none"> <li>a. Albania</li> <li>b. Bosnia Herzegovina (coasts)</li> <li>c. Croatia (coasts)</li> <li>d. Cyprus</li> <li>e. France (southeast coast, and the island of Corsica)</li> <li>f. Gibraltar</li> <li>g. Greece</li> <li>h. Italy (except the Po River plain and Alps region)</li> <li>i. Malta</li> <li>j. Monaco</li> <li>k. Montenegro</li> <li>l. Portugal (northeast and southern two-thirds)</li> <li>m. Spain (southern half and eastern coast)</li> </ol>

**Schedule of Evidence Required**

Req.	Design Stage	Post Construction Stage
<p><b>Options 1 &amp; 2</b></p>		
<p>All</p>	<p>A copy of the report produced by the approved calculation tool for the assessed building at the design stage illustrating:</p> <ul style="list-style-type: none"> <li>• The predicted actual Building Energy Performance Index (BEPI) and the Current Standards Building Energy Performance Index (CSBEPI)</li> <li>• Name of the approved software used to carry out the modelling for calculating the energy performance.</li> <li>• Confirmation of the expertise and experience of the individual carrying out the modelling in compliance with the requirements of the local Building Regulations.</li> </ul> <p><b>AND</b></p>	<p>Third party documentation, as follows:</p> <ul style="list-style-type: none"> <li>• BEPI from the standard output of accredited software, required as part of demonstrating the 'as built' building complies with local Building Regulations.</li> <li>• 'As built' drawings to demonstrate that the specification used and modelled at the design stage matches the specification of the completed building.</li> </ul> <p>*The final rating must account for any changes to the specification during construction; and the measured air leakage rate, ductwork leakage and fan performances (as required by local Building Regulations).</p>

	Where appropriate, a letter from the person carrying out the modelling confirming:  Data used to model the Current Standards Building is taken from national Building Regulations or Appendix G of ASHRAE Energy Standard 90.1-2007.	
<b>Option 3</b>		
1	Copy of Checklist A7 completed  Relevant specification clauses confirming: <ul style="list-style-type: none"> <li>• Details of compliance with each requirement.</li> </ul>	As built' drawings and specification demonstrating: <ul style="list-style-type: none"> <li>• Implementation of the study's recommendations.</li> </ul>
<b>Historic buildings only</b>		
1-3	A copy of the heritage conservation specialist's report.  A letter from the specialist confirming the qualifications, experience and IHBC status.	The evidence required at this stage of assessment does not differ from that outlined at the design stage of assessment.
4	Marked-up drawings or a specification document demonstrating: <ul style="list-style-type: none"> <li>• Implementation of the study's recommendations</li> <li>• Compliance with 'Thermal Insulation: avoiding risks' <sup>[2]</sup>.</li> </ul> <p><b>OR</b></p> Where a formal letter from the design team confirming the above will be implemented.	'As built' drawings and specification demonstrating: <ul style="list-style-type: none"> <li>• Implementation of the study's recommendations</li> <li>• Compliance with '<i>Thermal Insulation: avoiding risks</i>'.</li> </ul> Assessor's building/site inspection and photographic evidence demonstrating: <ul style="list-style-type: none"> <li>• Examples of the recommendations of the study having been manifested in the actual complete building (as highlighted by the design team during the building inspection).</li> </ul>

### Additional Information

#### Relevant definitions

**Suitably qualified energy modelling engineer:** is a person with at least 3 years relevant experience in energy modelling within the last 5 years and a recognised qualification such as a building services engineer or building energy modelling engineer. Their expertise should be broad enough to cover all required technical aspects guaranteeing that the data entered in the energy model is appropriate and that the results reflect the actual performance of the building. It can be someone operating as sole traders or employed by public or private enterprise bodies.

**Building Energy Performance Index (BEPI) -** The BEPI represents a generic measure of energy performance, depending on the country of assessment it may be in CO<sub>2</sub> emissions, kWh, etc. Therefore Current Standards Building Energy Performance Index (CSBEPI) will have to be expressed in the same units as the BEPI.

**Carbon neutral building:** Where net carbon dioxide emissions resulting from energy consumed in the operation of the space heating/cooling, hot-water systems, ventilation and internal lighting is zero or better.

The calculation of CO<sub>2</sub> emissions can take account of contributions from *on-site*, *near-site* and *accredited external* renewable/low carbon installations. Off-site renewables that are not accredited cannot be used to meet this definition.

**Historic buildings** - For the purpose of assessing this BREEAM issue, historic buildings are defined as:

- a. Listed buildings
- b. Existing buildings situated in conservation areas (where the existing building itself has conservation status and contributes to the status of the conservation area)
- c. Existing buildings which are of architectural and historical interest and which are referred to as a material consideration in a local authority's development plan
- d. Existing buildings of architectural and historic interest within national parks, areas of outstanding natural beauty, and world heritage sites.

**Near-site LZC:** renewable energy generated near to the site that is provided for all or part of the community, including the assessed building, e.g. decentralised energy generation linked to a community heat network or renewable connected via private wire.

**On-site LZC:** renewable energy generated on the site of the assessed development.

**Private wire arrangement:** Where used in the context of BREEAM for low or zero carbon technology installations, a private wire arrangement is where any electricity generated on or in the vicinity of the site is fed directly to the building being assessed, by dedicated power supplies. 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.

**True zero carbon building:** Where net carbon dioxide emissions resulting from energy consumed in the operation of the space heating/cooling, hot-water systems, ventilation, internal lighting AND process related energy consumption is zero or better.

The calculation of CO<sub>2</sub> emissions can take account of contributions from *on-site*, *near-site* and *accredited external* renewable/low carbon installations. Off-site renewables that are not accredited cannot be used to meet this definition.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	1	1	Ene 2 - Sub-metering of Substantial Energy Uses	-	-	1	1	1

### Aim

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To recognise and encourage the installation of energy sub-metering that facilitates the monitoring of in-use energy consumption.

### Assessment Criteria

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The following demonstrates compliance:

1. Separate *accessible energy sub-meters*, labelled with the end use of the consumed energy that is being sub-metered, are provided for the following systems (where present):
  - a. Space Heating
  - b. Domestic Hot Water
  - c. Humidification
  - d. Cooling
  - e. Fans (major)
  - f. Lighting
  - g. Small Power (lighting and small power can be on the same sub-meter where supplies are taken at each floor/department).
  - h. Other major energy-consuming items where appropriate (see Compliance Notes).

### OR

2. Where a BMS (Building Management System) has been installed, with individual monitoring and outputs for the systems listed under point 1 above.

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	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 for energy metering cover the entire building.
<b>Shell Only</b>	<p>Where present core building services should be assessed in accordance with the assessment criteria. In shell only areas/building, where final decisions concerning the specification of particular building services and systems will be made by a new owner/tenant, compliance with this BREEAM issue can be demonstrated via one of the following means:</p> <ul style="list-style-type: none"> <li>• Option 1 – Use of a tenancy lease agreement between the developer and tenant/s (full value of available credits)</li> <li>• Option 2 – A Green Building Guide for tenant fit outs (half the value of the available credits)</li> <li>• Option 3 – Developer/Tenant collaboration (full value of available credits)</li> </ul> <p>Where compliance with the assessment criteria cannot be demonstrated the available credits must be withheld (option 4).</p> <p>Refer to the <i>Scope</i> section 2.2 <i>Types of project that can be assessed using BREEAM</i> (Shell and Core / Speculative Assessments) for further description of the above options.</p>
<b>Fit Out Only</b>	Where the assessment stakeholder is a tenant within a landlord-owned/operated development with central plant provision, then the central plant must be assessed against the criteria of this issue. This is in addition to the provision of sub-metering of any other substantial uses within the tenant's space that are independent of other tenant units and common areas.
<b>Lighting &amp; small power</b>	Due to traditional distribution methods, it can be difficult to cost-effectively separate lighting and small power. It is acceptable for lighting and small power to be combined for metering purposes, provided that sub-metering is provided for each floor plate or per tenant as applicable.
<b>Other major energy-consuming items</b>	Other major energy-consuming items, depending on the building type, might include, for example, plant used for swimming or hydrotherapy pools, kitchen plant, cold storage plant, laboratory plant, sterile services equipment, transportation systems (e.g. lifts & escalators) drama studios and theatres with large lighting rigs.
<b>Modular boiler systems</b>	Where the building uses a modular system and the rated input power of the lead boiler is less than the figure in <b>Error! Reference source not found.</b> , but greater than 10kW (see Additional Information), sub-metering of the lead boiler is still required to comply with the criteria of this issue.
<b>Accessible meters</b>	The energy meters must be located in an area of the building that allows for easy access to facilitate regular monitoring and readings by the buildings staff and facilities manager. Typically this will be the plant room, main distribution room or control room (where BMS is installed).
<b>Centralised production of space and water heating and/or cooling</b>	In a building with a number of units, where the production of heat and/or cooling is centralised for the building and tenants are connected to the central production system, typically in a shopping centre, only the central production system needs to be submetered along with any other energy-consuming uses as listed in the assessment criteria.

### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
All	Specification document or technical drawings confirming: <ul style="list-style-type: none"> <li>• Energy-consuming systems and their rated outputs</li> <li>• Metering arrangements for each system, type and location of meter specified.</li> <li>• If applicable, scope of BMS and its energy-monitoring capability.</li> </ul>	Assessor's building/site inspection and photographic evidence confirming: <ul style="list-style-type: none"> <li>• Location and labelling/function of the individual sub-meters or BMS.</li> </ul>

### Additional Information

#### Relevant definitions

**BMS:** Building (energy) Management System is a central computer controlling, monitoring and optimising building services and systems such as heating, air-conditioning, lighting and security.

**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, external areas e.g. parking, stairwells and main entrance foyers/reception.

**Table 14 Size of plant for which separate metering would be required**

Plant Item	Rated input power (kW)
Boiler installation comprising one or more boilers or CHP plant feeding a common distribution circuit	50
Chiller installations comprising one or more chiller units feeding a common distribution circuit	20
Electric humidifiers	10
Motor control centres providing power to fans and pumps	10
Final electrical distribution boards	50

Detailed guidance on how to develop an appropriate metering strategy for the energy criteria of a new building is available in General Information Leaflet 65: Metering energy use in new non-domestic buildings.



No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	1	1	Ene 3 - Sub-metering of High Energy Load and Tenancy Areas	-	-	-	-	-

### Aim

To recognise and encourage the installation of energy sub-metering that facilitates the monitoring of in-use energy consumption by tenant or end user.

### Assessment Criteria

The following demonstrates compliance:

1. Provision of *accessible* sub-meters covering the *energy supply* to each tenanted, or in the case of single occupancy buildings, *relevant function areas or departments* within the building/unit.
2. The meters are labelled with the end energy consuming use.

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	There are no additional or different criteria to those outlined above specific to the assessment of extensions to existing buildings.
<b>Shell Only</b>	For speculative buildings, meters must be installed on the energy supply to each separate tenanted unit or floor plate within the assessed development.
<b>Fit Out Only</b>	There are no additional or different criteria to those outlined above specific to Fit Out-Only assessments.
<b>Relevant function areas / departments – offices projects</b>	This list is not exclusive and where other areas/departments exist these should also be metered: <ul style="list-style-type: none"> <li>• Office areas (Metering by floor plate)</li> <li>• Catering</li> </ul>
<b>Relevant function areas / departments – retail projects</b>	This list is not exclusive and where other areas/departments exist these should also be metered: <ul style="list-style-type: none"> <li>• Sales area</li> <li>• Storage and warehouse</li> <li>• Cold storage</li> <li>• Offices</li> <li>• Catering</li> <li>• Tenant units</li> </ul>
<b>Relevant function areas / departments – industrial projects</b>	<ul style="list-style-type: none"> <li>• Office areas</li> <li>• Operational area</li> <li>• Ancillary areas (e.g. canteen etc)</li> </ul>

<b>Small Units</b>	For a development consisting of a number of small units a single meter per unit is sufficient to achieve this credit. Individual areas within each unit do not need to be sub-metered. For the purpose of this BREEAM issue, a small unit is defined as <math><500\text{m}^2</math>. (Please note that other BREEAM issues may define 'small' using a different size band. This is the case only where necessary due to the assessment criteria and the scope of the BREEAM issue.)
<b>Large units</b>	A development consisting of one or more larger units (i.e. >500m <sup>2</sup> ), sufficient sub metering to allow for monitoring of the <i>relevant function areas/departments</i> within the unit must be specified, in addition to metering of the unit as a whole.
<b>Accessible meters</b>	Refer to the Compliance Notes in BREEAM issue Ene 2 for a description.

### Schedule of Evidence Required

<b>Req.</b>	<b>Design Stage</b>	<b>Post Construction Stage</b>
1&2	<p>Marked-up drawings and site plan detailing:</p> <ul style="list-style-type: none"> <li>• Building areas by department/function and/or tenancy</li> <li>• Location of meters.</li> </ul> <p>Specification document or technical drawings confirming:</p> <ul style="list-style-type: none"> <li>• Metering arrangements for each department/function and/or tenancy area</li> <li>• Type of meter specified.</li> </ul>	<p>Assessor's building/site inspection and photographic evidence confirming:</p> <ul style="list-style-type: none"> <li>• Location and function of the individual sub-meters or BMS.</li> </ul>

### Additional Information

#### Relevant definitions

**BMS:** Refer to definitions in BREEAM issue Ene 2.

**Energy supply:** This includes any incoming energy types such as electricity, gas, oil, LPG, etc.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	1	1	Ene 4 - External Lighting	-	-	-	-	-

### Aim

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

### Assessment Criteria

The following demonstrates compliance (where provided):

1. All external light fittings for the building, access ways and pathways have a luminous efficacy of at least 50 lamp lumens/circuit Watt when the lamp has a colour rendering index (Ra) greater than or equal to 60. **OR** 60 lamp Lumens / circuit Watt when the lamp has a colour rendering index (Ra) less than 60.
2. All external light fittings to car parking areas, associated roads and floodlighting has a luminous efficacy of at least 70 lamp lumens/circuit Watt when the lamp has a colour rendering index (Ra) greater than or equal to 60. **OR** 80 lamp Lumens / circuit Watts when the lamp has a colour rendering index (Ra) less than 60.
3. All external light fittings for signs and uplighting have a luminous efficacy of at least 60 lamp lumens/circuit Watt when the lamp wattage is greater than or equal to 25W. **OR** 50 lamp lumens/circuit Watt when the lamp wattage is less than 25W.
4. External light fittings are controlled through a time switch, or daylight sensor, to prevent operation during daylight hours. Daylight sensor override on a manually switched lighting circuit is acceptable.

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	Refer to the guidance below for single building assessments on large existing developments/campuses.
<b>Single building assessments on larger developments/campuses</b>	Where the building being assessed forms part of larger development (or is an extension to an existing building) containing common areas and other buildings, the scope of the external lighting criteria apply only to external new and existing lighting within the <i>construction zone</i> of the assessed building.
<b>Shell Only</b>	There are no additional or different criteria to those outlined above specific to shell-only assessments.
<b>Fit Out Only</b>	There are no additional or different criteria to those outlined above specific to fit out-only assessments.

<b>No external lighting specified</b>	Where the building is designed to operate without external lighting, including external lighting on the building, signs and at entrances, the credit can be awarded.
<b>Low energy innovative light fittings</b>	Any fitting that consumes less than 5W complies with the criteria provided each individual fitting is a direct replacement for an alternative, individual BREEAM-compliant fitting and provides an equivalent amount of light for the necessary task. The assessor must ensure that several low watt fittings are not being specified in place of one higher watt but overall more energy-efficient fitting. This compliance note is to allow for the specification of innovative low energy light sources, such as LEDs.
<b>Decorative and floodlighting</b>	Decorative lighting and floodlighting must not be exempt from the assessment criteria although temporary lighting such as theatrical, stage or local display installations, where specified, may be excluded.

### Schedule of Evidence Required

<b>Req.</b>	<b>Design Stage</b>	<b>Post Construction Stage</b>
1-4	<p>Marked-up site plan and building elevations showing:</p> <ul style="list-style-type: none"> <li>Location and purpose of all external lighting fittings.</li> </ul> <p>Lighting specification or lighting designer's calculations confirming:</p> <ul style="list-style-type: none"> <li>Lamp lumens/circuit watt for each type of fitting as well as the colour rendering index Ra (where appropriate)</li> <li>External lighting control strategy..</li> </ul>	<p>As design stage, but 'as built' documentation.</p> <p><b>AND</b></p> <p>Assessor's building/site inspection and photographic evidence confirming:</p> <ul style="list-style-type: none"> <li>External lighting controls.</li> </ul> <p>Manufacturers' literature confirming:</p> <ul style="list-style-type: none"> <li>Technical spec for the installed external light fittings.</li> </ul>

### Additional Information

#### Relevant definitions

**Colour rendering index (Ra):** A measure, between 0 and 100, of the ability of a lamp to reproduce the colour of objects in comparison to their aspect under a natural or reference source of light. An incandescent source has a Ra of 100 and a low pressure sodium source a Ra of 0 (see below for further information on colour rendering).

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

**Luminous efficacy in lamp Lumens per circuit Watt:** The ratio between the luminous flux produced by a lamp (in Lumens) and the total power consumed by both the lamp and its associated control gear (in Watts).

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

#### Colour Rendering

At night time, the sensitivity of the eye is shifted towards the blue region of the visual spectrum. As a result, lamps with poor colour rendering index, such as some sodium lamps that emit light between the yellow and red region of the visual spectrum, require more luminous output to light an object with the same level of brightness than a source with better colour rendering index. Sources with a poor colour rendering index also make the differentiation of coloured objects more difficult for individuals.

The colour rendering index requirement means compliance with this issue using sources of light with a poor colour rendering index is harder to achieve than those with an index greater than or equal to 60. Other benefits of using sources with an index greater than 60 include an increased feeling of safety for individuals, making recognition of spaces and other individuals easier. In areas where CCTV is used, the colour rendering index of lighting sources is critical; an Ra value of at least 80 is recommended (but not required by BREEAM).

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
3	3	3	Ene 5 - Low or Zero Carbon Technologies	-	-	-	1	1

### Aim

To reduce carbon emissions and atmospheric pollution by encouraging local energy generation from renewable sources to supply a significant proportion of the energy demand.

### Assessment Criteria

The following demonstrates compliance:

#### First credit

1. A feasibility study has been carried out by an *energy specialist* (see Compliance Notes) to establish the most appropriate local (on-site or near-site) LZC energy source for the building/development. This study covers as a minimum:
  - a. Energy generated from LZC energy source per year
  - b. Payback
  - c. Land use
  - d. Local planning criteria
  - e. Noise
  - f. Feasibility of exporting heat/electricity from the system
  - g. Life cycle cost/lifecycle impact of the potential specification in terms of carbon emissions
  - h. Any available grants
  - i. All technologies appropriate to the site and energy demand of the development.
  - j. Reasons for excluding other technologies.
2. A local LZC energy technology has been specified for the building/development in line with the recommendations of the above feasibility study.
3. The feasibility study has been carried out at RIBA stage C (concept design) or equivalent procurement stage.

#### OR

4. The organisation that occupies the building has in place a contract with an energy supplier to provide electricity for the assessed building/development from a 100% renewable energy source. This supply must be delivered by an *accredited external renewable* source. The contract must be valid for a minimum of 3 years from the date the assessed building becomes occupied.

#### Second credit

1. The first credit for a feasibility study must be achieved.
2. A local LZC energy technology has been installed in line with the recommendations of the above feasibility study and this method of supply results in a 10% reduction in the building's CO<sub>2</sub> emissions.
3. Figures used for calculations of the percentage carbon reduction provided by LZC technology are based on the output from a recognised *energy modelling software*.

**Third credit**

1. The first credit for a feasibility study must be achieved.
2. A local LZC energy technology has been installed in line with the recommendations of the above feasibility study and this method of supply results in a 15% reduction in the building's CO<sub>2</sub> emissions.
3. Figures used for calculations of the percentage carbon reduction provided by LZC technology are based on the output from a recognised *energy modelling software*.

**Exemplary level criteria**

The following outlines the exemplary level criteria to achieve an *innovation credit* for this BREEAM issue.

1. The first credit for a feasibility study must be achieved.
2. A local LZC energy technology has been installed in line with the recommendations of the above feasibility study and this method of supply results in a 20% reduction in the building's CO<sub>2</sub> emissions.
3. Figures used for calculations of the percentage carbon production provided by LZC technology are based on the output from a recognised *energy modelling software*.

Buildings complying with the exemplary level criteria would therefore achieve four credits for this issue.

<b>Compliance Notes</b>	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	There are no additional or different criteria to those outlined above specific to the assessment of extensions to existing buildings.
<b>Shell Only</b>	There are no additional or different criteria to those outlined above specific to shell-only assessments.
<b>Fit Out Only</b>	Existing installed LZC technologies can be used to assess compliance with this BREEAM issue. In circumstances where the percentage total building energy demand requirement is met by such existing systems, the credit(s) can be awarded without the need for a feasibility study.
<b>Feasibility study</b>	<p>When undertaking a feasibility study at a later stage than <i>outline proposals</i>, an additional element will need to be included in the report to highlight the local LZC energy sources which have been discounted due to the constraints placed on the project by the late consideration, and the reason for their omission. If the feasibility study discounts 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.</p> <p>If the feasibility was commissioned at the <i>outline proposals</i> stage or earlier and in the unlikely event the study concludes that the specification of any local LZC technology is unfeasible, the first credit can still be awarded. Subsequent credits for installing LZC technology that meets a percentage of building energy demand will not be achievable.</p>

<p><b>List of recognised LZC technologies</b></p>	<p>The following technologies will be deemed acceptable by BREEAM as LZC technologies provided that the relevant percentage outputs are achieved:</p> <p><b>Solar</b></p> <ul style="list-style-type: none"> <li>• Solar hot water</li> <li>• Photovoltaics</li> </ul> <p><b>Water</b></p> <ul style="list-style-type: none"> <li>• Small scale hydro power</li> <li>• Tidal power</li> <li>• Wave power</li> </ul> <p><b>Wind</b></p> <ul style="list-style-type: none"> <li>• Wind turbines</li> </ul> <p><b>Biomass</b></p> <ul style="list-style-type: none"> <li>• Biomass single room heaters/stoves</li> <li>• Biomass boilers</li> <li>• Biomass community heating schemes</li> </ul> <p><b>Combined Heat and Power (CHP) for use with the following fuels:</b></p> <ul style="list-style-type: none"> <li>• Biomass</li> <li>• Natural gas</li> <li>• Sewerage gas and other biogases</li> </ul> <p>High efficiency cogeneration technologies should meet minimum standards defined in the EU CHP directive or according to national standards associated with implementing this directive.</p> <p><b>Community heating</b>, including utilising waste heat from processes such as large scale power generation where the majority of heating comes from waste heat (see also Compliance Notes below).</p> <p><b>Heat Pumps</b></p> <ul style="list-style-type: none"> <li>• Ground source heat pumps</li> <li>• Water source heat pumps</li> <li>• Geothermal heating systems</li> <li>• Air source heat pumps</li> </ul> <p>For heat pumps to comply, the heat source (ground or water) must be from a renewable source, for example soil, outside air, ground water, or a river.</p> <p><b>Other</b></p> <ul style="list-style-type: none"> <li>• Fuel cells using hydrogen generated from any of the above 'renewable' sources</li> </ul> <p>The list above is not a definitive list of technologies compliant with BREEAM, but a list of those technologies that may be considered to comply. If the assessor has a justified reason to doubt the low or zero carbon credentials/feasibility of the above technologies, where specified for a development they are assessing, they can justifiably withhold the available BREEAM credits.</p>
<p><b>LZC technology not listed</b></p>	<p>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 if in doubt.</p>



<b>Waste heat from a building related operational process</b>	Waste heat from a process that takes place within the assessed building (or on the assessed site), for the purpose of this BREEAM issue, can be considered as 'Low carbon'. This is on the condition that the generation of the heat from the process is integral to the assessed building.
<b>Waste incineration</b>	Waste heat from an incineration plant can only be considered as a low carbon for the purpose of this BREEAM issue under the following circumstances: <ol style="list-style-type: none"> <li>1. All other LZC technologies have been considered and discounted in the feasibility study. <b>And either</b></li> <li>2. The Local Authority or region in which the incineration plant is located is demonstrably meeting its annual waste reuse/recycling targets and waste management policies. <b>Or</b></li> <li>3. A near- or onsite facility connected to the building, via a <i>private wire arrangement</i>, which demonstrably removes re-usable and recyclable waste material prior to incineration.</li> </ol>
<b>Biofuels</b>	Given the current uncertainty over their impact on biodiversity, global food production and green house gas savings, plus the ease of inter-changeability between fossil fuels, BREEAM does not recognise or reward building systems fuelled by <i>first generation biofuels</i> manufactured from feedstock's e.g. biofuels manufactured from sugars, seeds, grain, animal fats etc. BREEAM will recognise systems using <i>second generation biofuels</i> (see relevant definitions) or biofuels manufactured from biodegradable waste materials e.g. biogas, or locally and sustainably sourced solid biofuels e.g. woodchip, wood pellets.
<b>Community and off-site schemes</b>	'Local' does not have to mean <i>on-site</i> and community schemes (near site) can be used as means of demonstrating compliance. As this BREEAM issue seeks to encourage the installation of <i>on-site</i> and <i>near-site</i> LZC technologies, <i>accredited external renewables</i> (accept where stated to achieve one credit) cannot be used to demonstrate compliance with the criteria of this BREEAM issue.
<b>Export to the grid</b>	Any electricity from an <i>onsite</i> LZC energy source that is exported to the grid may be included in the calculations as if it were used within the building.
<b>More than one technology</b>	The percentage can be made up from more than one of the above technologies.
<b>Building assessed part of a larger development</b>	Where the building under assessment forms part of a larger development and either a new or existing LZC installation is provided for the whole site, then the amount of LZC energy generation counted for in this issue, and subsequent CO <sub>2</sub> emissions saved, should be proportional to the building's energy demand compared to the total energy demand for the site (see also note below on existing LZC technology).
<b>LZC technology already available on site</b>	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/development. The study should seek to identify any other options to supply a higher proportion of the building's energy demand in addition to that supplied by the existing source.
<b>Countries with national energy strategy heavily based on renewables</b>	For buildings located in countries where the energy supply from the mains grid is highly de carbonized due to the energetic supply being from renewable sources AND where a feasibility study clearly confirms that the introduction of local LZC technologies on site would have an adverse effect on the overall related CO <sub>2</sub> emissions, then all three credits can be awarded by default
<b>Calculation of the CO<sub>2</sub> emissions saved</b>	When calculating the energy contribution and CO <sub>2</sub> emissions saved from the LZC installation the following rules should be applied: <ul style="list-style-type: none"> <li>• The net yield of the LZC installation(s) must be used (i.e. subtract any CO<sub>2</sub> related to the energy used by the LZC technology itself such as pumps, inverters, controllers, etc).</li> </ul>

	<ul style="list-style-type: none"> <li>The percentage CO<sub>2</sub> savings should be calculated using the following assumptions: <ul style="list-style-type: none"> <li>Renewable heat energy is displacing gas where the location for the building would practically have access to a gas connection. Where there is no access to a gas connection assume oil is being displaced.*</li> <li>Renewable electrical energy is displacing grid electricity at the national CO<sub>2</sub> conversion rate.</li> </ul> </li> </ul> <p>* The design team is required to provide the assessor with sufficient justification that gas is not available.</p>
<b>Process-related energy</b>	For the purpose of assessing this BREEAM issue, energy and subsequent CO <sub>2</sub> emissions from process-related activities can be excluded from the total when calculating the percentage reduction in CO <sub>2</sub> emissions. For example energy required for cold storage, catering facilities and laundry equipment can be excluded. Display lighting energy demand, where specified, must not be excluded.

### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
<b>First Credit</b>		
1&3	<p>A copy of the feasibility study report.</p> <p>Letter from the energy specialist confirming:</p> <ul style="list-style-type: none"> <li>Compliance with the definition of an energy specialist</li> <li>The timing of the feasibility report within the plan of works.</li> </ul>	<p>Assessor's building/site inspection (or "as built" drawings) and photographic evidence confirming:</p> <ul style="list-style-type: none"> <li>Installation of LZC technology.</li> </ul>
2	<p>Marked-up design plan or specification confirming:</p> <p>Reduction in the building's CO<sub>2</sub> emissions as a result of the installed LZC technology</p> <p>Manufacturer's technical data and details or calculations stating the carbon savings as a result of the installed LZC technology.</p>	
4	<p>Where an offsite supply is being used as a method of compliance, supplier's documentation confirming:</p> <ul style="list-style-type: none"> <li>Name and details of supplier</li> <li>Details of the source of supply.</li> </ul> <p>A copy of the contract or other formal documentation confirming the length of contract to supply 100% renewable energy.</p>	As design stage evidence.
<b>Second, Third &amp; Exemplary Level Credit</b>		
1	Evidence (as outlined above) confirming compliance with the first credit.	Evidence (as outlined above) confirming compliance with the first credit.
2&3	<p>A copy of the report produced by the <i>recognised energy modelling software</i> illustrating;</p> <ul style="list-style-type: none"> <li>The name of the approved software used to carry out the modelling</li> <li>Confirmation of the expertise and</li> </ul>	Where there have been changes to the proposed design or LZC technology specification, a copy of the 'as built' report produced by the <i>recognised energy modelling software</i> confirming the same data as outlined at the design stage.

	<p>experience of the individual carrying out the modelling</p> <ul style="list-style-type: none"> <li>• Total CO<sub>2</sub> emissions for the assessed building (without LZC energy technology).</li> </ul> <p><b>AND</b></p> <p>Calculations/outputs from the manufacturer, supplier, engineer or <i>recognised energy modelling software</i> confirming:</p> <ul style="list-style-type: none"> <li>• Total carbon savings as a result of the installed LZC technology.</li> </ul>	
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### Additional Information

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#### Relevant definitions

**Accredited External Renewables:** Please refer to the Compliance Notes in BREEAM issue Ene 1.

**Energy Specialist:** An individual who has acquired substantial expertise or a recognised qualification for undertaking assessments, designs and installations of low or zero carbon solutions in the commercial buildings sector; and is not professionally connected to a single low or zero carbon technology or manufacturer.

**First and second generation biofuels:** first generation biofuels are biofuels made from sugar, starch, vegetable oil, or animal fats using conventional technology. Second generation biofuels are biofuels from lignocellulosic biomass feedstock using advanced technical processes. Common first generation biofuels include vegetable oil, biodiesel and bioalcohols.

**Feasibility credit objective:** The objective of the feasibility study is to make sure that LZC energy technologies installed on a particular site are the most appropriate for this site and ensure maximum reduction of pollutants to the atmosphere. Therefore, no credit can be awarded if a feasibility study has not been undertaken.

**Life Cycle Costs:** the total cost of a building or its parts throughout its life, including the costs of planning, design, acquisition, operations, maintenance and disposal, less any residual value, in terms of carbon emissions.

**Life cycle impact:** this is the requirement to look at the carbon balance of each technology over its whole life. Encouraging people to not just the savings or emissions over its operational life but also the savings or emissions over the whole life of the technology (from 'cradle to grave'), therefore reflecting the fact that different technologies have different life spans.

**Near-site LZC:** Please refer to the relevant definitions in BREEAM issue Ene 1.

**On-site renewable:** Please refer to the relevant definitions in BREEAM issue Ene 1.

**Private wire arrangement:** Please refer to the relevant definitions in BREEAM issue Ene 1.

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

**Recognised Energy Modelling Software:** for the purposes of assessing this BREEAM issue, the approved energy modelling software is the one that is compliant with requirements set in Ene 1. It can be the software approved for the country NCM or a recognised energy Dynamic Simulation Modelling software approved by BRE.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	-	1	Ene 6 - Building fabric performance and avoidance of air infiltration	-	-	-	-	-

### Aim

To recognise and encourage measures taken to minimise heat loss and air infiltration through the building fabric.

### Assessment Criteria

The following demonstrates compliance:

#### Design measures

At least 5 of the following design measures have been specified/installed to minimise heat loss and air infiltration through the building fabric from treated/conditioned spaces:

1. Installation of personnel door(s) between internal and external areas within proximity of any adjacent openings for goods delivery access; **AND** a draught lobby between office areas (where present) and the external building access.
2. Delivery loading/unloading areas and operational and/or storage areas are partitioned (see also compliance note on relevancy of design measures).
3. Where present all goods/personnel access, vents in the roof and backdraught dampers on extract fans are draught sealed.
4. Loading/unloading bay doors insulated to 0.6 W/m<sup>2</sup>K.
5. Plastic strip curtains are specified between internal delivery areas and other internal warehouse storage or operational areas (where there is no other draught sealing or doors). The strip curtains should have a partial overlap.
6. Either of the following are specified on the external goods doors/vehicle delivery bays:
  - a. Plastic strip curtains (with a partial overlap)
  - b. Air curtains (not door heaters) covering the entire width of the opening
  - c. Pneumatic dock seals mounted on all vehicle delivery bays.
7. Rapid rise loading/unloading bay doors with at least 1.0 m/sec closing speed or less than 5 secs closing time between fully opened and fully closed are specified/installed.

#### As built performance measures

8. In addition to the above, a comprehensive thermographic inspection of the building fabric (once construction is complete) has been or will be undertaken to confirm the following:
  - a. Continuity of insulation in accordance with the construction drawings
  - b. Avoidance of excessive thermal bridging
  - c. No air leakage paths through the fabric (except through intentional openings)
9. The inspection has been, or will be, carried out in accordance with an appropriate national thermographic best practice standard.

10. Any defects identified via the inspection are rectified and the building re-inspected to confirm it complies with the criteria of point 1.
11. Plus, where integral cold storage facilities are present, these have been tested and commissioned in accordance with the cold storage criteria of BREEAM issue Man 1 (this does not necessarily require BREEAM issue Man 1 to have been awarded).

<b>Compliance Notes</b>	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	There are no additional or different criteria to those outlined above specific to the assessment of extensions to existing buildings.
<b>Shell Only</b>	There are no additional or different criteria to those outlined above specific to shell-only assessments.
<b>Fit Out Only</b>	There are no additional or different criteria to those outlined above specific to fit out-only assessments.
<b>Scope of the thermographic survey</b>	The thermographic survey must ensure that all exterior walls to treated areas and all walls separating treated and untreated spaces will be tested.
<b>National thermographic best practice standard</b>	<p>Please refer to the country specific reference sheet to find the appropriate best practice standard regarding thermographic surveys in the country of assessment. Alternatively, please demonstrate applicability as follows;</p> <ul style="list-style-type: none"> <li>The minimum requirements as set out in Checklist A10 are covered by the proposed documents.</li> </ul> <p>Where appropriate standards do not exist for a country, the design team should demonstrate compliance with EN 13187 <i>Qualitative detection of thermal irregularities in building envelopes. Infrared method</i>.</p>
<b>Where some design measures are not relevant</b>	If some of the design measures are not relevant, e.g. partitioning between delivery and storage areas may not be practical because of operational reasons or the building/unit is too small; the assessor may omit them from the assessment. In such instances the design team must provide the assessor with an adequate statement of justification as to why this is the case. The assessor must use their discretion in determining the validity of the case and reference any justification and design team statement in the formal BREEAM report.
<b>No heated or air conditioned areas – industrial projects</b>	Where the scope of the building specification covers fitted-out elements and the building is designed to be untreated then the requirement to comply with the 'as built' performance measures can be omitted. The design measures are still applicable for future-proofing i.e. in the event that the building at some point has heating and/or air conditioning plant installed.
<b>Scope of the issue</b>	This issue is applicable only for assessments of buildings that have a warehouse storage/operational area and/or dedicated vehicle delivery bays/access. Where this is not the case the issue will be filtered from the list of applicable issues by the BREEAM assessor's spreadsheet tool. Where the issue is applicable, the 'as built' performance measures i.e. the requirement for a thermographic survey applies to the whole building, not just the warehouse/delivery area (to ensure completeness of the measures).

<b>Synergy with Ene1</b>	It should be recognised that whilst there is only one credit available for this BREEAM issue, the benefit of installing the above measures will also be recognised in BREEAM issue Ene 1, Energy Efficiency. This BREEAM issue is provided in addition to Ene 1 to recognise and encourage specific measures taken to reduce air infiltration to and heat loss from the internal storage, warehousing and delivery areas of the building.
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### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
1-7	A copy of the relevant clauses of the specification or proposed design plan confirming: <ul style="list-style-type: none"> <li>Each of the relevant measures incorporated into the design.</li> </ul>	Assessor's building/site inspection and photographic evidence confirming compliance.
8-10	A copy of the specification clause(s) confirming: <ul style="list-style-type: none"> <li>A requirement to commission a thermographic study</li> <li>The standards/method to which the survey will be carried out</li> <li>A requirement to rectify any defects and re-inspect to confirm performance.</li> </ul> Where applicable, confirmation that the minimum requirements as set out in Checklist A10 are met.	A copy of the survey report or certificate confirming either: <ul style="list-style-type: none"> <li>No consequential defects in construction details or continuity of insulation. <b>OR</b></li> <li>All consequential defects remedied following re-inspection.</li> </ul>
11	Evidence as outlined under BREEAM issue Man 1 for the relevant requirement.	Evidence as outlined under BREEAM issue Man1 for the relevant requirement.

### Additional Information

#### Relevant definitions

**Thermographic inspection:** A method of producing images of a building using thermal radiation. The images help to identify areas of the building fabric with a higher (or lower in the case of internal fabric) than expected surface temperatures, thus indicating heat loss from, or air infiltration to, the building and therefore highlighting construction defects.

**Air curtain:** A fan heater that directs a curtain of warm air downwards over an opening which prevents the transfer of heat through the opening. Air curtains help to manage and minimise heat loss from the building when it is necessary to open external doors or access a cold storage enclosure.

**Air permeability:** physical property used to measure air tightness of the building fabric

**Pneumatic dock seals:** Also referred to as inflatable shelters, are structures that surround the top and sides of a vehicle loading dock forming a seal between the building and delivery vehicle and therefore minimising heat loss from the building.

**Treated:** A term to describe an area of the building that is heated and/or mechanically cooled by plant integral to the building.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	-	1	Ene 7 - Cold Storage	-	-	-	-	-

### Aim

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To recognise and encourage the installation of energy efficient cold storage systems, therefore reducing operational CO<sub>2</sub> emissions.

### Assessment Criteria

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The following demonstrates compliance:

#### First credit

1. The following components, where specified as part of the cold storage refrigeration plant/strategy, are recognised as meeting published energy-efficiency criteria, e.g.the ECA Energy Technology Product List or equivalent:
  - Air cooled condensing units
  - Automatic air purgers
  - Cellar cooling equipment
  - Commercial service cabinets (cold food storage)
  - Curtains, Blinds, Sliding Doors and Covers for Refrigerated Display Cabinets
  - Evaporative condensers
  - Forced air pre-coolers
  - Liquid pressure amplification
  - Refrigerated display cabinets
  - Refrigeration compressors
  - Refrigeration system controls

#### Second credit

2. Where the cold storage refrigeration plant complies with the following minimum criteria:
  - a. Variable speed drives are fitted to the compressors, pumps and fans
  - b. Strip curtains are installed on the cold storage opening(s)
  - c. Low powered/heat lighting is fitted e.g. fibre optics, LEDs
  - d. *Defrost on demand* controls for evaporators are installed
  - e. The installed refrigeration plant has a computerised monitoring system with either automated and/or programmable control to monitor the following operational variables:
    - Compressor suction temperature
    - Compressor discharge temperature
    - Compressor current draw
    - Secondary refrigeration temperature
    - Ambient temperature
    - Electricity consumption
    - Evaporator air on/liquid inlet
    - Evaporator air on/liquid outlet.
  - f. The plant has been commissioned in compliance with the criteria for cold food storage commissioning outlined in BREEAM Issue Man 1 Commissioning (this does not necessarily require BREEAM Issue M1 to have been awarded).

Note: this credit is not dependent on the previous one.

### Third credit

3. Where the plant is capable of **EITHER** of the following free cooling/heating strategies:
- Thermal storage during periods of low load to provide additional cooling during periods of peak cooling load **OR**
  - Heat recovery of the waste heat to meet in part or full space heating and/or hot water criteria for the assessed building or other local demand e.g. air curtain above the cold storage enclosure entrance.

Note: this credit is not dependent on the previous ones.

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	The criteria apply to any new or existing refrigeration plant. If the existing building contains refrigeration plant that will remain, then this plant must meet the criteria in order to achieve the credit.
<b>Extensions to existing buildings</b>	If the assessment comprises of a part new build-extension and part refurbishment and there is existing cold storage plant in the existing building that also serves the new extension, then the compliance note above for refurbishment applies.
<b>Shell Only</b>	There are no additional or different criteria to those outlined above specific to shell-only assessments.
<b>Fit Out Only</b>	There are no additional or different criteria to those outlined above specific to fit out-only assessments.
<b>Awarding the credits</b>	Each of the three credits can be awarded independently of each other i.e. it is not a requirement of the second credit that the first credit is achieved, likewise for the third credit.
<b>Heat recovery or thermal storage unfeasible</b>	Where the specification of thermal storage or heat recovery is unfeasible because there will be no low load periods and/or there is no demand for recovered heat, then the third credit can be awarded provided all the criteria of the second credit are met. The design team must justify why there are no feasible opportunities for heat recovery, free cooling or thermal storage.
<b>Local alternative available for the ECA Energy Technology Product List</b>	Where the design team wishes to use a local alternative to the ECA Energy Technology Product List, please refer to the country specific reference sheet to check acceptability.  Alternatively, please demonstrate applicability as follows; <ul style="list-style-type: none"> <li>• The minimum requirements as set out in Checklist A10 are covered by the proposed document.</li> <li>• The eligibility criteria are equal to or more onerous than those in the ECA Energy Technology Product List .</li> </ul>

### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
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1	<p>A copy of the relevant clause of the specification requiring the specific undertaking.</p> <p><b>OR</b></p> <p>A letter from the manufacturer/supplier or copies of their technical literature confirming the specific components meet published energy-efficiency criteria.</p> <p><b>OR</b></p> <p>A print out of the energy-efficient products list (e.g. ETPL) confirming the specific products meet the criteria.</p> <p><b>AND</b></p> <p>Where applicable a copy of Checklist A10.</p>	The evidence required at this stage is the same as that outlined at the design stage.
2a-e & 3	<p>A copy of the relevant clause of the specification confirming:</p> <ul style="list-style-type: none"> <li>• Cold storage plant and enclosure criteria.</li> </ul> <p><b>AND/OR</b></p> <p>A letter from the manufacturer/supplier or copies of their technical literature confirming compliance.</p>	The evidence required at this stage is the same as that outlined at the design stage.
2f	Evidence as outlined under BREEAM issue Man 1 for the relevant requirement.	Evidence as outlined under BREEAM issue Man 1 for the relevant requirement.

### Additional Information

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#### Relevant definitions

**Defrost on demand controls for evaporators:** A control system that automatically initiates a defrost sequence when an appropriate amount control of ice has built up on the evaporator surface.

**ECA Energy Technology Product List (ETPL):** The EPTL list is part of the Governments Enhanced Capital Allowance Scheme, a key part of the Government's programme to manage climate change. The Scheme provides a tax incentive to encourage investment in low carbon energy-saving equipment that meets published energy-efficiency criteria. The Energy Technology List (ETL) details the criteria for each type of technology, and lists those products in each category that meet them: [www.eca.gov.uk](http://www.eca.gov.uk).

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
2	2	2	Ene 8 - Lifts	-	-	-	-	-

### Aim

To recognise and encourage the specification of energy-efficient transportation systems.

### Assessment Criteria

The following demonstrates compliance:

#### First credit

1. An analysis of transport demand and patterns for the building has been carried out by the design team to determine the optimum number and size of lifts and *counterbalancing ratio* on the basis of anticipated passenger demand.
2. The energy consumption for at least two types of lift or lift strategy 'fit for purpose' has been estimated and the system with the lowest energy consumption specified.

#### Second credit

3. The first credit is achieved.
4. Of the following energy-efficient features, the three that offer the greatest potential energy saving are specified:
  - a. The lifts operate in a stand-by mode during off-peak and idle periods. For example the power side of the lift controller and other auxiliary equipment such as lift car lighting and ventilation fan switch off when the lift is not in motion.
  - b. Where lift motors use a drive controller capable of variable-speed, variable-voltage, variable-frequency control of the drive motor.
  - c. The lift has a regenerative unit so that energy generated by the lift (due to running up empty and down full) is returned back to the grid or used elsewhere on site.
  - d. The lift car uses energy-efficient lighting and display lighting (>60 Lumens/watt or fittings that consume less than 5W e.g. LEDS).

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	There are no additional or different criteria to those outlined above specific to the assessment of extensions to existing buildings.
<b>Shell Only</b>	There are no additional or different criteria to those outlined above specific to shell-only assessments.
<b>Fit Out Only</b>	There are no additional or different criteria to those outlined above specific to fit out-only assessments.

<b>Building has no lifts</b>	Please note that this issue will not be assessed where a building contains no lifts. In such instances the BREEAM assessor's spreadsheet tool will filter this issue from the list of applicable issues.
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### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
1-2	A copy of the relevant report or documentation detailing the analysis undertaken and findings/recommendations.  A copy of the lift specification.	The evidence required at this stage is the same as that outlined at the design stage.
3-4	A copy of the lift specification.  <b>OR</b>  Formal letter from the lift manufacturer/supplier confirming that the lift to be installed on the project meets the relevant criteria for the number of credits sought.	The evidence required at this stage is the same as that outlined at the design stage.

### Additional Information

#### Relevant definitions

**Counterbalancing ratio:** Lifts use a counterweight to balance the weight of the car plus a proportion of the maximum weight of the passengers; this reduces the size of the drive motor required for the lift. Lowering the counterbalancing ratio means a smaller motor and controlling drive unit are required, thus saving energy.

#### **ISO Draft standard CD25745-1 Energy performance of lifts, escalators and moving walks – Part 1 Energy and conformance**

It has been estimated that between 5-15% of a building's total energy consumption can be attributed to the operation of lifts and 58% of the energy consumption of lifts is attributable to stand-by mode.

A Working Group of an International Standards Organisation's Technical Committee is developing a draft standard for the Energy performance of lifts, escalators and moving walkways. This standard draft standard outlines proposed procedures to be used when making energy measurements of lifts, escalator and moving walkways.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	1	-	Ene 9 - Escalators and travelling walkways	-	-	-	-	-

### Aim

To recognise and encourage the specification of energy-efficient transportation systems.

### Assessment Criteria

The following demonstrates compliance:

1. Where each escalator and/or horizontal travelling walkway complies with **EITHER** of the following:
  - a. Is fitted with a load sensing device that synchronises motor output to passenger demand through a variable speed drive. **OR**
  - b. Is fitted with a passenger sensing device for automated operation, so the escalator operates in stand-by mode when there is no passenger demand.

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	There are no additional or different criteria to those outlined above specific to the assessment of extensions to existing buildings.
<b>Shell Only</b>	There are no additional or different criteria to those outlined above specific to shell-only assessments.
<b>Fit Out Only</b>	There are no additional or different criteria to those outlined above specific to fit out-only assessments.
<b>Building has no escalators or travelling walkways</b>	Please note that this issue will not be assessed where a building contains no escalators or travelling walkways. In such instances the BREEAM assessor's spreadsheet tool will filter this issue from the list of applicable issues.

### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
1	<p>A copy of the specification and manufacturer's technical literature confirming:</p> <ul style="list-style-type: none"> <li>• No. and type of escalators specified</li> <li>• Escalator control strategy.</li> </ul>	<p>Escalator manufacturer's/supplier's technical literature.</p> <p>Assessor's building/site inspection and photographic evidence confirming:</p> <ul style="list-style-type: none"> <li>• Installation of compliant escalators.</li> </ul>

## **Additional Information**

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### **Relevant definitions**

None.

## 7.0 Transport

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
4	2	2	Tra 1 - Provision of Public Transport	-	-	-	-	-

### Aim

To recognise and encourage developments in proximity to good public transport networks, thereby helping to reduce transport-related emissions and traffic congestion.

### Assessment Criteria

The following demonstrates compliance:

#### OFFICES ONLY

##### First credit;

1. The distance from the building entrance to the public transport node (i.e. bus stop, station etc.) is less than 500m.
2. The transport node has a service at least once every 15 minutes at peak times (i.e. 8.00am-10.00am and 5.00pm to 7.00pm) on working days to a local urban centre.

##### Second credit;

1. The distance from the building entrance to the public transport node (i.e. bus stop, station etc.) is less than 500m.
2. The transport node has a service at least once every 30 minutes through the working day (i.e. 8.00am - 7.00pm) to a major transport node serving local and regional infrastructure systems.

#### RETAIL ONLY

1. There is a public transport service from a nearby public transport node, going to and/or from a local urban centre
2. The table below, illustrating frequency of the public transport and proximity to the building being assessed, is used to determine the number of credits achieved.

**Table 15 Frequency and distance to public transport requirements for retail developments**

Frequency	Same as or less than 5 mins	Less than 10 mins	Less than 15 mins	Less than 20 mins	Less than 25 mins
	Credits available				
Proximity					
100m	4	4	3	2	1
200m	4	3	2	1	0
300m	4	3	2	1	0
400m	4	3	2	1	0
500m	3	2	1	0	0

**INDUSTRIAL ONLY**

1. There is a public transport service from a nearby public transport node, going to and/or from a local urban centre
2. The table below, illustrating frequency of the public transport and proximity to the building being assessed, is used to determine the number of credits achieved.

**Table 16 Frequency and distance to public transport requirements for industrial developments**

Proximity	Frequency/Number of Credits	
	≤15mins	≤30mins
≤500m	2	1
≤800m	1	0

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	There are no additional or different criteria to those outlined above specific to the assessment of extensions to existing buildings.
<b>Shell Only</b>	There are no additional or different criteria to those outlined above specific to shell-only assessments.
<b>Fit Out Only</b>	There are no additional or different criteria to those outlined above specific to fit out-only assessments.

<b>Operating hours</b>	<p>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; however, some buildings will operate for 24 hours a day and on a shift work basis. As a result, during what typically would be deemed unsociable hours and therefore periods where a) there is little if any public transport operating and b) the number of total building users travelling to the building during this time is a minority; such periods are not required to be accounted for in the assessment of this issue.</p> <p>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 table 17 of default operating hours, which can be found in the Additional Information section of this issue.</p>
<b>Compliant public transport node</b>	<p>A compliant node includes any bus stop, railway, tram or underground station, measured from the building entrance via a safe pedestrian route (not '<i>as the crow flies</i>'). The service stopping at each node must provide transport from, or onward travel to, either a local urban centre, major transport node or a community focal point e.g. doctor's surgery, library, school or village centre.</p>
<b>Multiple services</b>	<p>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, however, should be considered as separate entities.</p>
<b>Bi-directional routes</b>	<p>Routes will be bi-directional; however for the purpose of assessing the issue, consider only the direction with the highest frequency.</p>
<b>Rural areas</b>	<p>The criteria remain the same where the project assessed is located in a rural location. This BREEAM issue aims at mitigating the CO2 emissions associated with the transport of staff and visitors to and from that building. Developers are therefore encouraged to consider this issue at a very early stage before the site of the project is determined.</p> <p>Where the location of the site is already determined, the developer may work with the local authority to develop the public transport infrastructure in the area or consider providing dedicated transport services</p>
<b>Phased developments</b>	<p>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:</p> <ul style="list-style-type: none"> <li>• A commitment to provide transport facilities has been made in the General Contract Specification. <b>And the shortest of the following periods - Either</b></li> <li>• The transport facilities will be available for use by the time 25% of all phases have been completed and are ready for occupation. <b>Or</b></li> <li>• 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.</li> </ul> <p>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 requirements.</p>
<b>Dedicated transport services</b>	<p>Where a dedicated company bus service is provided for staff during, or before or after, <i>operating hours</i> (as defined below), the building entrance can be substituted for the drop-off/pick-up destination point of this service and therefore public transport accessibility measured from that point. The dedicated service may pick up and drop off staff within 500m of their homes, or at a public transport node.</p>



<b>More than one Transport Node in the same proximity</b>	Where there is more than one transport node in the same proximity of the building for example one node at 100m and another at 200m (i.e. both within 250m) then the average service frequency between these nodes may be taken.
<b>More than one Transport Node in different proximities</b>	Where there is more than one transport node but they are in different proximities of the building for example one node at 100m and another at 400m (i.e. one within 250m and another within 500m) then each node should be assessed separately and the credit awarded on the basis of the better performing node.
<b>Transport Nodes served by more than one service</b>	Where a transport node is served by more than one service that goes to a local urban centre, the frequency of time between one service and the next can be used as the frequency for assessment. For example, where there are three services, each with a 20 minute frequency but each follows on 10 minutes after the other, then the frequency used for assessment purposes would be 10 minutes.
<b>Measuring the frequency of services</b>	The frequency is measured as the average frequency between one service and the next, for at least 75% of the assessed development's opening hours for a typical day's operation. This is subject to there being at least one service every 45 minutes during opening hours. This requirement is to ensure that credits are not awarded in instances where there is a good average frequency but a poor spread of service frequency throughout the day.
<b>Average service frequency</b>	The typical day is that which represents the period when travel to and from the building by staff and visitors will be at its highest. For most buildings this should be taken as a mid-week day. In choosing a typical day the assessor should check that the timetabled information for that day is, within reason, representative of the public transport provision for the entire operating week (excluding Sundays). Where the opening hours are not known and the default hours (in the Additional Information section) are used, it must be assumed that the retail development will be open six days a week.

**Schedule of Evidence Required**

<b>Req.</b>	<b>Design Stage</b>	<b>Post Construction Stage</b>
1	Scale map highlighting the location of the building and all public transport nodes in proximity of the building.	The evidence required at this stage is the same as that outlined at the design stage.
2	Timetables for each service at each public transport node considered.	Where changes have occurred since the design stage which could affect the compliance, full details of the changes will be required to demonstrate compliance.

**Additional Information**

**Relevant definitions**

**Local Urban Centre:** This is any community focal point, as these will be served by public transport networks, This includes local shops and/or community facilities such as doctor's surgery/dentist/library/school, a major transport node such as a railway/bus station/transport node, or another type of significant non-leisure related meeting place.

**Main building entrance:** The main building entrance is the entrance to the assessed building accessed by the majority of the building's staff and visitors, not the site entrance (unless the site entrance is also the building entrance e.g. building with a boundary on a public highway).

**Major Transport Node:** This is any node on a regional/national transport infrastructure system.

**Table 17 Default hours of operation for a typical day**

<b>Building type</b>	<b>AM</b>	<b>PM</b>
<b>Office</b>	8.00am - 7.00pm	
<b>Industrial</b>	8.00am - 7.00pm	
<b>Shopping centre</b>	9.00am - 7.00pm	
<b>Supermarket</b>	8.00am - 10.00pm	
<b>Bank/Service provider</b>	9.00am - 5.00pm	
<b>Convenience store</b>	7.00am - 10.00pm	
<b>DIY/retail park</b>	8.00am - 8.00pm	
<b>High street store</b>	9.00am – 7.00pm	
<b>Car showroom</b>	8.00am - 7.00pm	
<b>24 hour use building</b>	7am - 8pm	

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	1	1	Tra 2 - Proximity to amenities	-	-	-	-	-

### Aim

To encourage and reward a building that is located in proximity to local amenities, thereby reducing the need for extended travel or multiple trips.

### Assessment Criteria

The following demonstrates compliance:

1. For developments in *rural locations*, the building is within 500m of the following amenities:
  - a. Grocery shop and/or food outlet
  - b. Postal facilities
2. For all other developments, the building is **also** within 1000m of at least **two** of the following:
  - a. Bank/Cash machine
  - b. Creche/school
  - c. Hairdresser
  - d. Doctors surgery/medical centre
  - e. Pharmacy
  - f. Dry cleaners

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	There are no additional or different criteria to those outlined above specific to the assessment of extensions to existing buildings.
<b>Shell Only</b>	There are no additional or different criteria to those outlined above specific to shell-only assessments.
<b>Fit Out Only</b>	There are no additional or different criteria to those outlined above specific to fit out-only assessments.
<b>Food Outlet</b>	This includes the following: <ul style="list-style-type: none"> <li>• Grocery shop</li> <li>• Supermarket</li> <li>• Sandwich shop</li> <li>• On- or off-site cafeteria or staff canteen</li> </ul>
<b>Collective amenities</b>	One type of amenity may also exist within or a part of other types of amenities e.g. grocery store in a petrol station, cash point or pharmacy in a supermarket etc. It is not a requirement of the assessing this issue that each amenity is 'stand alone'.

<b>Accessible local amenities</b>	The distance must be measured via safe pedestrian routes e.g. pavements and safe crossing points or, where provided, dedicated pedestrian crossing points. The distance should not be measured in a straight line, ' <i>as the crow flies</i> '.
<b>Amenities within building</b>	Amenities within the building or on the site (provided within 500m of assessed building) meet the assessment criteria.  For example, where there is no postal box within 500m of the building, the building occupier can provide an alternative facility, such as a contract with the postal office or alternative mail/courier service. Alternatively the building occupier can provide a facility to collect the mail within the building on a daily basis and arrange to have them delivered to the nearest postal facility. Daily collection of the mail will need to be guaranteed for the facility to be deemed compliant.
<b>Phased developments</b>	The guidance provided in BREEAM issue Tra 1, concerning phased developments, also applies to this issue.

### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
1	Marked-up site plan or map highlighting: <ul style="list-style-type: none"> <li>• Location of assessed building</li> <li>• Location and type of amenities</li> <li>• The route to the amenities</li> <li>• Plan/map scale</li> </ul>	Assessor's building/site inspection and photographic evidence confirming: <ul style="list-style-type: none"> <li>• The existence of the local amenities</li> <li>• The route and distance to the amenities.</li> </ul>
	Where the amenities do not currently exist, but are due to be developed, a letter from the client/developer confirming: <ul style="list-style-type: none"> <li>• The location and type of amenities to be provided</li> <li>• The timescale for development of the amenities.</li> </ul>	Evidence as outlined at the design stage of assessment.  <b>OR</b>  As above where amenities developed, or under development at the time of post construction review/assessment.

### Additional Information

#### Relevant definitions

**Rural location:** for the purposes of BREEAM, a rural location should be defined according to national regulations, or where no national definition exists, as one with a population cluster of less than 1000 inhabitants and a density below 150 inhabitants per km<sup>2</sup>.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
2	2	2	Tra 3 - Alternative modes of transport	-	-	-	-	-

### Aim

To recognise the provision of adequate facilities on site allowing building users to use alternative modes of transport to go to and from the building.

### Assessment Criteria

Two credits can be awarded where one of the following measures has been implemented to encourage the use of alternatives to the private car for commuting:

#### Option 1

##### First credit - Compliant cycle storage spaces

1. Offices and Industrial projects: the number of *compliant cycle storage spaces* provided is as follows:
  - a. 10% of the number of *building users* up to 500 **PLUS**
  - b. 7% for the number of *building users* in the range of 501 – 1000 **PLUS**
  - c. 5% for the number of *building users* over 1000

This is subject to providing a minimum of 2 cycle storage spaces.

2. Retail developments: the number of *compliant cycle storage spaces* provided is as follows:
  - a. 10% of the number of *full-time equivalent* staff that will commute to the development **PLUS**
  - b. 5% of the total number of customer car parking spaces (excluding disabled spaces and mother-and-baby spaces where provided). This is subject to providing a minimum of 10 cycle racks. Any development that provides at least 50 customer cycle storage spaces will comply regardless of the number of parking spaces

The staff spaces must be provided in addition to customer spaces and whilst they do not need to be separate from customer spaces, this is encouraged.

##### Second credit - Compliant facilities

1. The first credit has been achieved.
2. At least two of the following *compliant facilities* must be provided for the *building users*:
  - a. Compliant showers
  - b. Compliant changing facilities and lockers for clothes
  - c. Compliant drying space for wet clothes

#### Option 2

1. During the preparation of the brief (equivalent to stage B) 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.

**Option 3**

1. Negotiations with local bus companies have resulted in an increase of the local service provision in the development's local area.

**Option 4**

1. For office and industrial developments, electric recharging stations have been provided for at least 3% of the total carparking capacity for the building.
2. For retail developments, electric recharging stations have been provided for at least the following number of vehicles;
  - a. 3% of the carparking capacity up to 300 **PLUS**
  - b. 2% of the carparking capacity in the range of 301 – 1000 **PLUS**
  - c. 1% of the carparking capacity over 1000.
3. Electricity must be provided from a 100% renewable energy contract as per BREEAM issue Ene5 criteria.

**Option 5**

1. A car sharing platform has been set up to facilitate and encourage building users to sign up to a carsharing scheme.
2. Marketing material has been developed to help raise awareness of the system and will be communicated to the tenants where applicable.
3. Priority spaces for car sharers are provided for at least 5% of the total carparking capacity for the building.
4. Priority spaces are located in the nearest available spaces in the nearest available parking area to the main building entrance on site.

**Exemplary level criteria**

The following outlines the exemplary level criteria to achieve an *innovation credit* for this BREEAM issue.

1. Two of the options above have been implemented.

<b>Compliance Notes</b>	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	Refer to the compliance note below on existing compliant facilities.
<b>Shell Only - Offices</b>	If it is not possible to confirm the number of <i>staff</i> due to the speculative nature of the building then a default occupancy rate of 1 person per 10m <sup>2</sup> of net lettable area should be used.

<b>Shell Only - Retail</b>	<p>If it is not possible to confirm the number of <i>full time equivalent staff</i> commuting to the development due to the speculative nature of the building then a default occupancy rate of 1 person per 10m<sup>2</sup> of nett lettable area should be used. Alternatively, the number of <i>full time equivalent staff</i> in an existing retail development of similar type and size can be used (the assessor needs to justify/validate the number used in their certification report).</p> <p>Where tenants will be installing cyclist facilities as part of their fit-out specifications, these might be taken into account in order to demonstrate compliance with the criteria, provided that a tenancy lease agreement between the developer and the tenant/s confirm that all the BREEAM requirements will be met.</p>
<b>Shell Only - Industrial</b>	<p>If it is not possible to confirm the number of <i>building users</i> due to the speculative nature of the building then a default occupancy rate of 1 person per 10m<sup>2</sup> of nett lettable office area and 1 person per 20m<sup>2</sup> of operational floor space should be used. Operational floor space does not include warehouse storage space. Alternatively, the number of <i>staff</i> in an existing industrial unit of similar type/operation and size can be used (the assessor needs to justify/validate the number used in their certification report).</p> <p>Where tenants will be installing cyclist facilities as part of their fit-out specifications, these might be taken into account in order to demonstrate compliance with the criteria, provided that a tenancy lease agreement between the developer and the tenant/s confirm that all the BREEAM requirements will be met.</p>
<b>Fit Out Only</b>	There are no additional or different criteria to those outlined above specific to fit out-only assessments.
<b>Option 1 only</b>	
<b>Building users</b>	Where the term <i>building users</i> is referenced this refers to the staff, therefore the number of staff that will work within the building must be used to determine the number of <i>compliant facilities</i> that must be provided to achieve the credit. Whilst staff numbers are the means by which compliance with the assessment criteria is determined, the percentage requirements account for visitors that will travel to and use or work within the building. As such the compliant cycle facilities must be accessible to all these types of building users.
<b>Compliant cycle storage space</b>	<p>Cycle storage facilities should be designed to ensure maximum health and safety of building users and should therefore meet the following wherever possible:</p> <ul style="list-style-type: none"> <li>• The space is covered overhead and protected from the rain</li> <li>• The covered area and the cycle racks are set in or fixed to a permanent structure (building or hardstanding) and allow both the wheel and frame to be locked securely (e.g. Sheffield type). <b>OR</b> racks are located in a locked structure with CCTV surveillance and access from staff only. Fixtures to lock bikes are not required in the second instance.</li> <li>• There must be sufficient space for all bikes to be stored without having to move others or rely on integral stands.</li> <li>• Adequate lighting is provided in accordance with national best practice lighting guide as defined in issue Hea 5.</li> <li>• The facilities are in a prominent site location that is viewable from the building.</li> <li>• The majority of the cycle racks are within 100m of a building entrance (ideally within 50m).</li> </ul> <p>Where any of those requirements are not deemed suitable in relation to the health and safety of the users, they may be excluded provided that adequate justification has been provided and approved by BRE.</p>

<b>Vertical bike racks</b>	Vertical racks, which allow direct access (without the need to get alongside the locked bike) and permit one bike per vertical stack can comply with the criteria (provided all other criteria are met).
<b>Non compliant cycle racks</b>	These types of cycle storage devices do not comply with BREEAM: <ul style="list-style-type: none"> <li>• Hooks and wall attachments</li> <li>• Single wheel (butterfly) bike rack holders (these racks provide less security and can cause damage to bike wheels).</li> </ul>
<b>Public bicycle sharing systems</b>	<p>Bicycle sharing systems are increasingly popular and diverse systems have appeared over the past few years in major cities in Europe whereby a number of bicycles are made available for shared use amongst 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.</p> <p>Up to 50% of the BREEAM cycle racks requirement may be provided by a public bicycle sharing system where it complies with the following:</p> <ul style="list-style-type: none"> <li>• The program is implemented by the municipality or through a public-private partnership.</li> <li>• The system must be open to casual users who wish to use them for one-way rides to work, education or shopping centres.</li> <li>• Bicycles are available at unattended urban locations; and they operate in a manner that could be seen as "bicycle transit"</li> <li>• Service terminals must be available throughout the city</li> <li>• The average distance between service terminals is 500 m maximum in inner city areas.</li> <li>• A service terminal is available within 500m of the main building entrance.</li> <li>• The station terminals do not need to comply with the design requirements listed above.</li> </ul> <p>The number of compliant facilities is calculated based on the total number of cycle racks required. For retail projects, public bicycle racks can also count towards the number of customer cycle racks required.</p>
<b>City centre locations – Offices and Industrial</b>	In city centre locations the criteria for <i>compliant cycle spaces</i> can be reduced by 50% where at least <b>two</b> of the available BREEAM credits for provision of public transport (Tra 1) have been awarded.
<b>City centre locations – Retail</b>	Sites in city centre locations can reduce by 50% the criteria for <i>compliant cycle spaces</i> where at least <b>three</b> of the available BREEAM credits for provision of public transport (Tra 1) have been awarded.
<b>Individual buildings/units that form part of a larger development or business district</b>	<p>For the assessment of individual buildings/units that form part of a larger development or business district (eg retail parks, shopping centres), and do not have the scope to provide their own dedicated cyclist facilities (i.e. no external publicly accessible areas), awarding the credit does not require that individual facilities are provided for each individual retail unit. The credit can be awarded where:</p> <ul style="list-style-type: none"> <li>• The development has compliant centralised facilities, provided their number caters for and can be accessed by all staff that work at the development.</li> <li>• At least 10 publicly accessible <i>compliant cycle storage spaces</i> are within proximity of the main shop entrance i.e. 100m.</li> </ul> <p>Those facilities should comply with all the BREEAM design requirements as listed above in order for the credit to be awarded.</p> <p>50% of those may be provided by a public bicycle sharing system.</p>



<b>Rural locations</b>	Sites can reduce by 50% the criteria for <i>compliant cycle spaces</i> where the building is located in a rural location as defined under Tra2 AND the average building user commuting distances are likely to be greater than 10 miles.
<b>Sites in mountainous locations</b>	Sites in mountainous/hilly areas where the average slope is more than 8% around the site and is likely to prohibit commuting by bicycle can reduce by 50% the criteria for <i>compliant cycle spaces</i> . Typical examples include buildings in cities such as Lisbon or Istanbul which are located on one of the hills.  Buildings located in a plain but at the top of a hill do not comply with this definition.
<b>Compliant showers</b>	One shower must be provided for every 10 cycle storage spaces and both male and female users catered for i.e. either separate showers within shared gender-specific facilities or single shower cubicles and changing space for mixed use. The showers can be available for others to use in addition to cyclists.
<b>Compliant changing facilities &amp; lockers</b>	Changing facilities and locker criteria; <ul style="list-style-type: none"> <li>• The assessor can use their judgement to determine whether the changing area is appropriate given the number of cycle storage spaces/showers provided. As guidance to aid the assessor, where a shower/changing cubicle is provided there should be a minimum of one square metre of changing space adjacent to the shower(s) with a bench seat and hooks for hanging clothes. Where there is more than one shower provided there should be a minimum of one square metre of changing space per shower, subject to a minimum changing area of four square metres. Where there are no showers specified, but there is a changing facility, there is a minimum of one square metre of changing space for every 10 cycle storage spaces, subject to a minimum of four square metres of changing area with a bench seat and hooks for hanging clothes.</li> <li>• The number of lockers is at least equal to the number of cycle spaces provided.</li> <li>• Lockers are either in or adjacent to compliant changing rooms. Where the changing space is a cubicle the locker(s) must not be located within the cubicle.</li> <li>• Each locker is at least 900mm high by 300mm wide by 450mm deep, or a locker with dimensions that provide an equivalent volume of storage space.</li> <li>• Both male and female users are catered for i.e. either gender specific, shared facilities or single changing cubicles in mixed use areas.</li> <li>• Toilet cubicles do not count as changing facilities.</li> </ul>
<b>Compliant drying space</b>	The drying space (for wet clothes) must be a specially designed and designated space with adequate heating/ventilation. A plant room is not a compliant drying space.
<b>Existing compliant facilities</b>	For assessments of new <i>infill</i> buildings on an existing site, where there are existing compliant facilities, such facilities can be assessed against the criteria 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.
<b>Minimum number of facilities</b>	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/lockers/changing facilities.
<b>Option 2 only</b>	
<b>Contribution to the local cycling network</b>	Where the local infrastructure around the site doesn't cater adequately for cyclists, building users will not be encouraged to cycle to the building. Therefore, in order to increase the usage of the cycle racks, and promote cycling in a cyclist-unfriendly environment, developers should consult with the

	<p>local authority to identify options to influence and contribute to the development of suitable cyclist infrastructure in the area.</p> <p>Examples of cyclist infrastructures include the development of cycle lanes in the surrounding area, the creation of a public cycle racks or bicycle pools, the installation of a cyclist lift in hilly parts of the city etc.</p> <p>Contributions will need to have a significant impact on the development of those infrastructures to be recognised under this BREEAM issue and this should be justified accordingly in the assessment report.</p>
<b>Option 5 only</b>	
<b>No parking on site</b>	The option 5 remains applicable where there is no carparking on site provided that the first and second requirements are met.

### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
<b>Option 1</b>		
<b>First Credit</b>		
1&2	<p>Site plan, design drawings and/or a copy of the specification confirming:</p> <ul style="list-style-type: none"> <li>The location of the building and its surroundings</li> <li>The location of the cycle storage facilities</li> <li>The number of cycle spaces provided</li> <li>The type, dimensions and layout of cycle racks</li> <li>The materials and construction specified for the facility.</li> <li>The lighting for the facility is in accordance with the appropriate standard.</li> <li>Building occupancy or, where relevant, net lettable/floor area.</li> </ul> <p>Where the building is in a city centre location, and the benchmarks reduced, evidence as outlined under BREEAM credit Tra 1 demonstrating the relevant number of credits achieved.</p>	Assessor's building/site inspection and photographic evidence confirming the installation of the compliant facilities.
<b>Second credit</b>		
1	Evidence (as outlined above) confirming compliance with the first credit.	Evidence (as outlined above) confirming compliance with the first credit.
2	<p>Design drawings or a copy of the specification confirming:</p> <ul style="list-style-type: none"> <li>Number of showers</li> <li>Changing room</li> <li>Secure locker locations, dimensions and numbers</li> <li>Drying space</li> </ul>	Assessor's building/site inspection and photographic evidence confirming the installation of the compliant facilities.

<b>Option 2 &amp; 3</b>		
All	<p>Minutes of discussions and negotiations with the relevant stakeholders demonstrating:</p> <ul style="list-style-type: none"> <li>• A list of the stakeholders present</li> <li>• The process and scope of the consultation</li> <li>• The stage in plan of works that consultation occurred.</li> <li>• The different options to contribute to the local network</li> </ul> <p>A copy of the contract outlining:</p> <ul style="list-style-type: none"> <li>• How the developer will contribute to the development of the local cycling infrastructure <b>OR</b></li> <li>• The number of bus services provided before and after the development</li> </ul>	<p>Assessor's building/site inspection and photographic evidence confirming the cycling infrastructure is in place.</p> <p><b>OR</b></p> <p>Timetables for each service at each public transport node considered.</p> <p>Where changes have occurred since the design stage which could affect the compliance, full details of the changes will be required to demonstrate compliance.</p>
<b>Option 4</b>		
All	<p>A marked-up copy of the site plan confirming:</p> <ul style="list-style-type: none"> <li>• Location and number of electric recharging stations</li> </ul> <p>Electricity supplier's documentation confirming:</p> <ul style="list-style-type: none"> <li>• Name and details of supplier</li> <li>• Details of the source of supply.</li> </ul> <p>A copy of the contract or other formal documentation confirming the length of contract to supply 100% renewable energy</p>	<p>Assessor's building/site inspection and photographic evidence confirming the electric recharging stations are in place</p> <p>Where changes have occurred since the design stage which could affect the compliance, full details of the changes will be required to demonstrate compliance.</p>
<b>Option 5</b>		
All	<p>A copy of the contract with a relevant carsharing platform.</p> <p>A copy of the relevant clause or specification confirming:</p> <ul style="list-style-type: none"> <li>• Marketing material will be developed to raise awareness of car sharing</li> <li>• Material will be communicated to all tenants.</li> </ul> <p>A marked-up copy of the site plan confirming:</p> <ul style="list-style-type: none"> <li>• Location and number of priority spaces for car sharers</li> </ul>	<p>As design stage evidence</p>

### Additional Information

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### Relevant definitions

**Carsharing scheme:** a carsharing scheme is aimed at providing the facility and incentives for people to share lifts to go to work. The benefits of car sharing include reduced travel costs for staff and customers and reduced local congestion and pollution. Different types of carsharing scheme exist. Ready-to-use web-platforms may be created or purchased for the benefit of the building users and/or close neighborhood where the building is located in a business park. However, in any case, a commitment from the developer will be required under the form of management policies/procedures to run and manage the scheme efficiently. This includes marketing and monitoring the system, providing incentives to encourage people to join the system (such as financial incentives or specific parking spaces in busy areas) or providing marketing material to help raise awareness of the system.

**Nett lettable area (NLA) – also called usable floor area:** this is the gross internal floor area excluding all internal structural and party walls (but not partitioning or other non load-bearing walls within the tenancy area which are included in the area), ancillary areas for services, ancillary areas to main function areas and circulation areas. Please refer to the relevant country appendix sheet to find national equivalent where relevant.

**Full Time Equivalent (FTE) staff:** FTE is a unit of measure which is equal to one filled, full-time position.

**Rural location:** please see definition in Tra2.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
2	1	1	Tra 4 - Pedestrian and Cyclist Safety	-	-	-	-	-

### Aim

To recognise and encourage the provision of safe and secure pedestrian and cycle access routes on the development.

### Assessment Criteria

The following demonstrates compliance:

- Where external site areas form part of the assessed site and these areas contain vehicle access roads, parking and/or pedestrian access to the building, adequate cycle lanes and pedestrian pathways must be provided. If the building does not have any external areas and internal access is directly from the public highway/footpath, then the credit(s) can be awarded on a default basis.

#### Cycle access criteria

- The cycle lanes meet the following minimum width dimensions:
  - Where pedestrian and cycle routes are shared the minimum total width of the combined path is 3.0m
  - Where the cycle lane is segregated from both the pedestrian route and carriageway the minimum width of the cycle path is 2.0m
  - Where the cycle route forms a part of the carriageway, the minimum width of the lane is 1.5m
- Cycle lanes provide direct access to any cycle storage facilities provided on the site, without the need to deviate from the cycle path and, if relevant, connect to offsite cycle paths where these run adjacent to the development's boundary.
- Delivery areas do not cross or share cyclist routes.
- Lighting design of cycle paths on site are in compliance with national best practice road lighting guide.

#### Pedestrian access criteria

- The pedestrian paths meet the following minimum width dimensions:
  - Where pedestrian and cycle routes are shared the minimum total width of the combined path is 3.0m
  - Where the pedestrian route is segregated from both the cycle lane and carriageway the minimum width of the pedestrian path is 1.5m
- Delivery areas are not accessed through parking areas and do not cross or share and other outside amenity areas accessible to building users and general public.
- Lighting design of pedestrian pathways on site is in compliance with national best practice road lighting guide.
- Onsite footpaths connect to public footpaths off site, providing access to local transport nodes and other offsite amenities (where present).

10. Where provided, drop-off areas are designed off the access road and provide direct access to pedestrian pathways/areas, therefore avoiding the need for the pedestrian to cross vehicle access routes.
11. Where dedicated pedestrian crossing of a vehicle access route is provided, the road is raised to the pavement level (i.e. the pavement is not lowered to road level).
12. For larger developments with a high number of public users/visitors, pedestrian pathways must be signposted to other local amenities off site, including public transport nodes.

**Note:** For office and industrial buildings, all criteria need to be met in order for the credit to be awarded.

**Note:** For retail buildings, one credit can be achieved where the cycle access criteria are complied with, and a second credit where the pedestrian access criteria are complied with. The credits can be awarded independently of each other i.e. one credit can still be awarded for compliant pedestrian routes where cycle routes do not comply and vice versa.

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	There are no additional or different criteria to those outlined above specific to the assessment of extensions to existing buildings.
<b>Shell Only</b>	There are no additional or different criteria to those outlined above specific to shell only assessments.
<b>Fit Out Only</b>	There are no additional or different criteria to those outlined above specific to fit out-only assessments.
<b>National best practice road lighting guide</b>	<p>Please refer to the country specific reference sheet to locate the appropriate best practice road lighting guides in the country of assessment. Alternatively, please demonstrate applicability as follows;</p> <ul style="list-style-type: none"> <li>• The minimum requirements as set out in Checklist A10 are covered by the proposed documents.</li> <li>• The illuminance levels are equal to or more onerous than those set in European standard EN 12464-2.</li> </ul> <p>Where appropriate lighting guides do not exist for a country, the design team should demonstrate compliance with EN 12464-2.</p>
<b>Covered parking area</b>	Where the assessed building has no external areas but does have a covered parking facility and cyclists and/or pedestrians access the assessed building via this area, then the criteria apply and this area must be assessed against them.
<b>Operational safety measures</b>	Operational safety measures such as speed reduction are often recognised as an efficient measure to reduce risks to cyclists and pedestrians. However, these being dependent on the way they will be enforced, they cannot be recognised under BREEAM and only safety design measures will be assessed under this BREEAM issue.

#### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
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1-4 & 6-7 & 9-12	A scaled proposed site plan, specification and/or design details highlighting all necessary features and dimensions.	Assessor's building/site inspection and photographic evidence confirming compliance.  <b>AND/OR</b>  'As built' site plan and design details.
5&8	A copy of the specification, site plan and/or manufacturer's technical details. confirming: <ul style="list-style-type: none"> <li>• External lighting design strategy in compliance with relevant standard.</li> </ul> <p>Where applicable, confirmation that the minimum requirements as set out in Checklist A10 are met and that illuminance levels are equal to or more onerous than those set in EN 12464-2.</p>	Assessor's building/site inspection and photographic evidence confirming compliant installation.  The assessor is not expected to check every detail but that the lighting strategy is broadly compliant with the relevant guidance, demonstrated by checking compliance at their discretion with select key issues.

### Additional Information

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#### Relevant definitions

None.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	1	1	Tra 5 - Travel Plan	-	-	-	-	-

### Aim

To recognise the consideration given to accommodating a range of travel options for building users, thereby encouraging the reduction of user reliance on forms of travel that have the highest environmental impact.

### Assessment Criteria

The following demonstrates compliance:

1. A travel plan has been developed as part of the feasibility and design stages which considers all types of travel relevant to the building type and *users*.
2. The travel plan is structured to meet the needs of the particular site and takes into consideration the findings of a site-specific transport survey and assessment that covers the following (as a minimum):
  - 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
  - b. Travel patterns and transport impact of future *building users*
  - c. Current local environment for walkers and cyclists (accounting for visitors who may be accompanied by young children)
  - d. Disabled access (accounting for varying levels of disability and visual impairment)
  - e. Public transport links serving the site
  - f. Current facilities for cyclists
3. The travel plan includes a package of measures that have been used to steer the design of the development in order to meet the travel plan objectives and minimise car-based travel patterns. This is demonstrated via specific examples such as:
  - a. Providing parking priority spaces for car sharers
  - b. Providing dedicated and convenient cycle storage and changing facilities
  - c. Lighting, landscaping and shelter to make pedestrian and public transport waiting areas pleasant
  - d. Negotiating improved bus services, i.e. altering bus routes or offering discounts
  - e. Restricting and/or charging for car parking
  - f. Criteria for lobby areas where information about public transport or car sharing can be made available
  - g. Pedestrian and cycle friendly (for all types of user regardless of the level of mobility or visual impairment) via 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 offsite pedestrian and cycle routes.
4. The travel plan includes measures tailored to minimise the impacts of operational-related transport e.g. deliveries to and from the site.

### Compliance Notes

<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
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<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	There are no additional or different criteria to those outlined above specific to the assessment of extensions to existing buildings.
<b>Shell Only</b>	Where the occupier is not known a travel plan is still required, albeit that it may only be an interim travel plan or one that broadly addresses all the above issues.
<b>Fit Out Only</b>	There are no additional or different criteria to those outlined above specific to fit out-only assessments.
<b>Building users – Offices and Industrial</b>	Where the term <i>building users</i> is referenced, this refers to staff (commuter journeys and business travel), visitors and personnel who make deliveries/collections to and from the development.
<b>Building users – Retail</b>	Where the term <i>building users</i> is referenced in this BREEAM issue it refers to staff, customers and personnel who make deliveries/collections to and from the development.
<b>Existing Travel Plan</b>	The first credit can be awarded if the building being assessed is a refurbishment or infill new build on an existing site that has an existing up-to-date travel plan that is compliant with BREEAM and applicable to all building users (in the existing and assessed buildings).

### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
<b>First credit</b>		
1-3	A copy of the Travel Plan.  A copy of the site-specific transport survey/assessment.	The evidence required at this stage is the same as that outlined at the design stage.
3	A marked-up copy of the site plan demonstrating examples of design measures, implemented in support the travel plan's findings.  <b>OR</b>  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 the travel plan's findings.	Assessor's building/site inspection and photographic evidence confirming: <ul style="list-style-type: none"> <li>The installation of measures that support the travel plan.</li> </ul>
4	A section within the Travel Plan or written confirmation that the plan will address operational related transport impacts.	The evidence required at this stage is the same as that outlined at the design stage.

### Additional Information

#### Relevant definitions

**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.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
-	2	2	Tra 6 - Maximum Car Parking Capacity	-	-	-	-	-

### Aim

To encourage the use of alternative means of transport to the building other than the private car, thereby helping to reduce transport related emissions and traffic congestion.

### Assessment Criteria

The following demonstrates compliance:

#### First credit

1. No more than one parking space is provided for every three *building users*.

#### Second credit

1. No more than one parking space is provided for every four *building users*.

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	There are no additional or different criteria to those outlined above specific to the assessment of extensions to existing buildings.
<b>Shell Only - Offices</b>	If it is not possible to confirm the number of building users due to the speculative nature of the building then a default occupancy rate of 1 person per 10m <sup>2</sup> of nett lettable area of the building can be used.
<b>Shell Only – Industrial</b>	If it is not possible to confirm the number of building users due to the speculative nature of the building then a default occupancy rate of 1 person per 10m <sup>2</sup> of nett lettable office area and 1 person per 20m <sup>2</sup> of operational floor space. Alternatively, the number of <i>staff</i> in an existing industrial unit of similar type/operation and size can be used (the assessor needs to justify/validate the number used in their certification report).
<b>Fit Out Only</b>	There are no additional or different criteria to those outlined above specific to fit out-only assessments.
<b>Building users</b>	Where the term <i>building users</i> is referenced in this BREEAM issue it refers to the staff who will work within the building.
<b>Determining number of building users</b>	If known actual building occupancy rate figures should be used. If this figure cannot be confirmed use the default occupancy rate detailed above under the <i>Shell Only</i> compliance note.
<b>Variable occupancy</b>	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.

<b>Disabled, mother &amp; baby &amp; motorbike spaces</b>	Parking spaces for these building users can be excluded from the assessment of this issue provided these spaces are dedicated for this use and they are sized accordingly with the appropriate signage/markings.
<b>Car share spaces</b>	Car share spaces can be excluded from the assessment provided these spaces are dedicated for this use with the appropriate signage and the future building occupier confirms they have an enforceable car share policy. The assessor must obtain a copy of the policy and related documentation. Where there is no policy these spaces must be included within the calculation.
<b>Local authority car parking requirements</b>	As a general rule, where the local authority sets car parking requirements that are different from the BREEAM criteria, the most onerous of the requirements will need to be complied with: <ul style="list-style-type: none"> <li>• Where the local authority requires a minimum car parking capacity that is higher than the maximum limit set by BREEAM, the BREEAM criteria will need to be met for the credit to be awarded.</li> <li>• Where the local authority requires a maximum car parking capacity that is lower than the one set by BREEAM, then the local authority criteria should be met for the credit to be awarded.</li> </ul>
<b>Parking shared with other buildings</b>	Where the building being assessed forms part of a wider site development and parking is not designated to specific buildings, then this credit must be assessed on the provision of parking spaces for the whole development, accounting for all existing and new users and parking spaces.  Where the numbers of users for the whole site cannot be confirmed, then the parking spaces can be attributed to the assessed development on the basis of the ratio of assessed building floor area to total building floor area of the whole site. E.g. if the assessed building is 20% of the total building area for the site then attribute 20% of the parking spaces to the building for the purpose of the assessment.

### Schedule of Evidence Required

<b>Req.</b>	<b>Design Stage</b>	<b>Post Construction Stage</b>
1	<p>A site plan or copy of the specification confirming:</p> <ul style="list-style-type: none"> <li>• Number and type of parking spaces provided for the building.</li> </ul> <p>Relevant documentation or correspondence from the design team or client confirming the number of building users.</p>	<p>Assessor's building/site inspection and photographic evidence confirming:</p> <ul style="list-style-type: none"> <li>• Number and type of parking spaces provided for the building.</li> </ul> <p>Evidence as outlined at the design stage.</p> <p><b>OR</b></p> <p>A physical check by the assessor of the relevant number of building users (if practical).</p>

### Additional Information

#### Relevant definitions

**Nett lettable area (NLA):** Refer to BREEAM issue Tra 3.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	-	-	Tra 7 - Travel Information Point	-	-	-	-	-

### Aim

To ensure the building has the capacity to provide users with up-to-date information on local public transport routes and timetables.

### Assessment Criteria

The following demonstrates compliance:

1. A real-time public transport information system, where *building users* can access up-to-date public transport information and plan their journey, is provided.
2. The system must be in a publicly accessible area with adequate signage at its point of use and throughout appropriate areas of the development indicating its purpose and location/existence.

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	There are no additional or different criteria to those outlined above specific to the assessment of extensions to existing buildings.
<b>Shell Only</b>	There are no additional or different criteria to those outlined above specific to shell-only assessments.
<b>Fit Out Only</b>	There are no additional or different criteria to those outlined above specific to fit out-only assessments.
<b>Building users</b>	Where the term <i>building users</i> is referenced this refers to staff and customers.
<b>Scope of BREEAM issue</b>	This BREEAM issue applies only to retail buildings >500m <sup>2</sup> .
<b>Location of 'Travel Information Point'</b>	The information point does not necessarily have to be situated internally. If sited externally however, it must be covered, in an area that is readily accessible to building users and within close proximity of the main entrance or pedestrian routes to and from local public transport nodes, parking areas and the main building entrance.
<b>Existing travel information facilities</b>	The credit can be awarded where there is an existing maintained real-time information point within 250m of the assessed development's main entrance via a safe pedestrian route (not ' <i>as the crow flies</i> ').
<b>Buildings with very high levels of public transport</b>	Where the assessed building has achieved all credits available under the BREEAM issue Tra1, ie has very high levels of public transport in close proximity, the travel information point does not need to provide real time information. The second BREEAM requirement will however need to be met for the credit to be achieved.

### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
1&2	Design plan and/or a copy of the relevant specification clause(s) confirming: <ul style="list-style-type: none"> <li>• Location and scope of the travel information point/facility</li> </ul>	Assessor's building/site inspection and photographic evidence confirming compliant installation of the travel information point(s).

### Additional Information

#### Relevant definitions

**Real time passenger information system:** An electronic system that provides up-to-date, i.e. real time, information on local public transport service(s). Primarily how close the service is running to time and when it is due at a node/interchange and, potentially, incidents that affect service operations, platform changes etc.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	-	1	Tra 8 – Deliveries & Manoeuvring	-	-	-	-	-

### Aim

To ensure that safety is maintained and disruption due to delivery vehicles minimised through well-planned layout and access to the site.

### Assessment Criteria

The following demonstrates compliance:

1. 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.
2. There is a separate parking area for waiting goods vehicles, away from the manoeuvring area and staff/visitor car parking.
3. Delivery areas are not accessed through parking areas and do not cross or share pedestrian and cyclist routes and other outside amenity areas accessible to building users and general public.
4. There is a dedicated space for the storage of refuse skips and pallets away from the delivery vehicle manoeuvring area and staff/visitor car parking.

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	There are no additional or different criteria to those outlined above specific to the assessment of extensions to existing buildings.
<b>Shell Only</b>	Where the building occupier is known then the design team must be able to demonstrate that the layout of the manoeuvring area is suitable for the specified types and number of delivery vehicles typically used by the occupier. For speculative developments it must be demonstrated that the manoeuvring area can accommodate a range of goods vehicle types.
<b>Fit Out Only</b>	There are no additional or different criteria to those outlined above specific to fit out-only assessments.
<b>Small buildings/units</b>	For the purpose of assessing this issue, smaller buildings/units (i.e. <math> < 200\text{m}^2 </math>) and developments where heavy goods vehicles are unlikely to access the site, the criteria for the manoeuvring area need be sized only to accommodate large delivery vans (i.e. transit type or similar).  Also, requirement 3 ' <i>delivery areas are not be accessed through parking areas</i> ' can be relaxed for smaller sites if it can be confirmed that all deliveries to the building will be made by small vans and not heavy goods vehicles.

<b>Scope of issue Tra8</b>	This BREEAM issue is not assessed where the development does not have a significant vehicle delivery and manoeuvring area (ie a typical 'back-of-house' facility wouldn't comply). This is likely to be the case in most office developments. In such cases this issue will be filtered from the list of relevant issues by the assessor's spreadsheet tool.
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### Schedule of Evidence Required

<b>Req.</b>	<b>Design Stage</b>	<b>Post Construction Stage</b>
1-4	Proposed site plan clearly showing: <ul style="list-style-type: none"> <li>• Manoeuvring area</li> <li>• Delivery vehicle waiting area</li> <li>• Designated area for skips/pallets</li> </ul> Appropriate documentation or correspondence from the design team confirming: <ul style="list-style-type: none"> <li>• Likely vehicle delivery type that will access the development.</li> <li>• Predicted frequency of deliveries</li> </ul>	Assessor's building/site inspection and photographic evidence confirming the existence of a compliant delivery area.

### Additional Information

#### Relevant definitions

None.

## 8.0 Water

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
3	3	3	Wat 1 - Water Consumption	-	-	1	1	2

### Aim

To minimise the consumption of potable water in sanitary applications by encouraging the use of low water use fittings.

### Assessment Criteria

The following demonstrates compliance:

- The credits are awarded as follows:
  - One credit where consumption is 4.5 - 5.5m<sup>3</sup> per person per year
  - Two credits where consumption is 1.5 - 4.4 m<sup>3</sup> per person per year
  - Three credits where consumption is <1.5 m<sup>3</sup> per person per year
- To determine the water consumption figure for the assessed building, determine the *effective flush volumes* and flow rates for the following installed sanitary fittings and enter this data into the BREEAM Water Calculator Tool:
  - WCs
  - Urinals
  - Taps
  - Showers

Exclude kitchen taps, cleaners' sinks and external taps.
- If any rainwater collection or greywater recycling systems are specified for the purpose of meeting WC/urinal flushing demand, determine the following information (as appropriate to system type):
  - Annual rainfall for the site location (mm)
  - Rainwater catchment area (m<sup>2</sup>)
  - Catchment type e.g. pitched roof, flat roof
  - Rainwater filter co-efficient
  - Rainwater collection tank capacity
  - Percentage of tap and shower water collected and used for WC/urinal flushing.
  - Percentage of building's WC/urinals using greywater to meet flushing demand.

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.



<b>Extensions to existing buildings</b>	Where a project under assessment consists solely of an extension, and no new sanitary facilities are to be provided, facilities provided in the existing building should be assessed (this refers to the nearest accessible facilities for each gender/function, where appropriate, i.e. those likely to be used by the occupants and visitors in the extension building).
<b>Shell Only</b>	<p>If a water supply is provided to tenanted areas of the building but sanitary fittings will be specified/fitted by future tenants, compliance with this BREEAM issue can be demonstrated via one of the following means in shell only buildings/areas:</p> <ul style="list-style-type: none"> <li>• Option 1 – Use of a tenancy lease agreement between the developer and tenant/s (full value of available credits)</li> <li>• Option 2 – A Green Building Guide for tenant fit outs (half the value of the available credits)</li> <li>• Option 3 – Developer/Tenant collaboration (full value of available credits)</li> </ul> <p>Where compliance with the assessment criteria cannot be demonstrated for the shell only areas of the building, the assessor must assume that only industry-standard fittings will be installed (see additional guidance). For such instances therefore, it is likely that none of the credits will be achieved. When industry-standard fittings are not known, the following default values must be used:</p> <ul style="list-style-type: none"> <li>• Regular taps for wash hand basins (12 litres/minute)</li> <li>• High flow shower (14 litres/minute)</li> <li>• WC (6 litre cistern)</li> <li>• Cistern serving single urinal = 10 litres per use (flush).</li> <li>• Cistern serving two or more urinals = 7.5 litres per use (flush).</li> <li>• Urinals with manual flush on each stall or automatic pressure flushing valves = 1.5 litres per use.</li> </ul> <p>Refer to the <i>Scope</i> section 2.2 <i>Types of project that can be assessed using BREEAM</i> (Shell and Core / Speculative Assessments) for further description of the above options.</p>
<b>Fit Out only</b>	There are no additional or different criteria to those outlined above specific to fit out-only assessments.
<b>No Fittings specified</b>	Where no sanitary fittings are to be installed in the building being assessed then the credit must be assessed on the basis of the nearest accessible facilities likely to be used by the occupants of the assessed building.
<b>Showers with a range of flow rates</b>	Where a shower head delivers a range of flow rates, the average or typical flow rate should be used.

#### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
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1-3	<p>A copy of the relevant section of the M&amp;E specification and/or manufacturer's details confirming:</p> <ul style="list-style-type: none"> <li>• Technical specification of sanitary fittings and controls to be installed</li> <li>• Location, size and details of any rainwater and greywater collection system.</li> </ul> <p>Design plan showing the location within the building of the sanitary and grey/rainwater collection facilities.</p> <p>A copy of the output from the BREEAM Water Calculator tool.</p>	<p>Assessor's building/site inspection report and photographs or purchase orders confirming:</p> <ul style="list-style-type: none"> <li>• The type and amount of fittings and controls installed.</li> </ul> <p>Manufacturer's/installer's details for installed fittings/controls confirming:</p> <ul style="list-style-type: none"> <li>• Their technical specification</li> <li>• The rainwater collection area and capacity of rainwater or greywater systems (where specified).</li> </ul> <p>Where changes have occurred since design stage assessment, a revised copy of the output from the Water Consumption Calculator tool.</p>
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### Additional Information

#### Relevant definitions

**Greywater recycling:** The appropriate collection, treatment and storage of used shower, bath and tap water for use instead of potable water in WC flushing.

**Nett lettable area (NLA) – also called usable floor area:** this is the gross internal floor area excluding all internal structural and party walls (but not partitioning or other non load-bearing walls within the tenancy area which are included in the area), ancillary areas for services, ancillary areas to main function areas and circulation areas. Please refer to the relevant country appendix sheet to find national equivalent where relevant.

**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.

**Rainwater recycling:** The appropriate collection and storage of rain from hard outdoor surfaces for use instead of potable water in WC flushing.

**Effective flush volume:** The volume of water needed to clear the toilet pan and transport any content far enough to avoid blocking the drain.

**Dual Flush Cisterns:** Devices that have the facility to provide lower flush volume for liquids and higher flush volume for solids and paper.

Calculating the effective flushing volume of dual flush toilets: For dual flush WCs the ratio *full flush:reduced flush* is taken to be 1:3 for non-domestic buildings. The effective flush volume can therefore be calculated as follows, using a 6/4 litre dual flush volume WC:

$$((6 \text{ Litre} * 1) + (4 \text{ Litre} * 3)) / 4$$

$$= 4.5 \text{ Litre effective flushing volume}$$

BREEAM's Water Calculation Tool is used to estimate water consumption (m<sup>3</sup> per person per year) for the building based on the installed sanitary fittings.

When entering flow rates for wash hand basin taps into the Water Calculation Tool, the flow rate should be taken as 2/3 of the maximum flow rate quoted by the manufacturer. The maximum flow rate can be the flow rate achieved with a flow restrictor i.e. where flow restrictors are specified, 2/3 of the flow rate with the restrictor installed should be taken.

Where specified taps have a 'break-point' at the mid range of the flow (often referred to as 'click taps' or two stage mixer taps), the flow rate should be taken as the maximum flow rate quoted by the manufacturer for the lower range before the water break. This is typically 50 per cent of the maximum flow rate for the total range, however this should not be assumed and manufacturer's information must always be used.

The water calculator determines water consumption for the assessed building using a default occupancy figure of 1 person per 10m<sup>2</sup> of nett lettable area. Even for instances where building occupancy is known, the default occupancy figure must be used to ensure a consistent assessment.

The tool allows the assessor to account for any rainwater or greywater collection by offsetting the contribution from these sources from the total estimated water consumption figure. Please note, the calculator is a compliance tool and should not be used to size or specify rainwater and greywater recycling systems.

### **Product Certification of Low Flush WCs**

Product certification schemes provide specifiers and clients with greater assurance of manufacturers' claim regarding the performance of the actual flush volume of their products and therefore the potential water savings of different products. At present BREEAM does not require that the flushing volume of WCs (or any other water-consuming device) meet an approved standard to gain BREEAM credits.

BRE Global currently operates a certification and listing scheme for low flush WCs and products certified to this standard will be listed on [www.greenbooklive.com](http://www.greenbooklive.com). Green Book Live is a free-to-view online database designed to assist specifiers and end users in the identification of environmentally beneficial products and services. If you would like to know more information about the Certification and Listing of Low Flush WCs Scheme please contact BRE Global at [enquiries@breglobal.com](mailto:enquiries@breglobal.com)

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	1	1	Wat 2 - Water Meter	-	-	-	1	1

### Aim

To ensure water consumption can be monitored and managed and therefore encourage reductions in water consumption.

### Assessment Criteria

The following demonstrates compliance:

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. The water meter has a pulsed output to enable connection to a Building Management System (BMS) for the monitoring of water consumption.
3. For retail developments with multiple units, separate pulsed meters are required to cover the water supply to the following areas where present:
  - a. Letting area; on the water supply to each tenant unit
  - b. Common areas; e.g. covering the supply to toilet blocks
  - c. Service areas; covering the supply to outlets within storage, delivery, waste disposal areas etc.
4. For industrial developments with multiple units, a pulsed water meter is specified on the supply to each separate unit.
5. In addition, ancillary buildings separate from the main development, for example petrol stations on sites such as supermarkets, are metered separately with a pulsed meter.

### Exemplary level criteria

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

1. Where sub meters are fitted to allow the metering of individual water-consuming plant or building areas, where demand in such areas will be equal to or greater than of 10% of the total water demand of the building (see also compliance note).
2. Each sub meter has a pulsed output to enable connection to a Building Management System (BMS) for the monitoring of water consumption.

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.

<b>Extensions to existing buildings</b>	If no new water supply is being installed because occupants of the extended building will use the facilities in, and therefore water supply to the existing building, then the issue should be assessed on the basis of whether a compliant water meter is installed on the existing supply.
<b>Shell Only</b>	<p>Where metering arrangements within tenanted units/areas will be the responsibility of the future tenant, compliance with the relevant criteria for this BREEAM issue can be demonstrated via one of the following means for such areas:</p> <ul style="list-style-type: none"> <li>• Option 1 – Use of a tenancy lease agreement between the developer and tenant/s (full value of available credits)</li> <li>• Option 2 – A Green Building Guide for tenant fit outs (half the value of the available credits)</li> <li>• Option 3 – Developer/Tenant collaboration (full value of available credits)</li> </ul> <p>Where compliance with the assessment criteria cannot be demonstrated the available credits must be withheld (option 4).</p> <p>Refer to the <i>Scope</i> section 2.2 <i>Types of project that can be assessed using BREEAM</i> (Shell and Core / Speculative Assessments) for further description of the above options.</p>
<b>Fit Out Only</b>	There are no additional or different criteria to those outlined above specific to Fit Out-only assessments.
<b>No water supply to the building/unit</b>	If there is no water supply to the building during operation because there will be no installed water-consuming fittings in the building, then the issue must be assessed on the basis of the water supply to the nearest accessible building with such facilities, likely to be used by the future occupants of the assessed building.
<b>Tenanted areas with low or no water consumption – retail buildings</b>	For tenanted areas that can demonstrate that there will be no more than a couple of WC's and associated wash hand basins present in that particular unit and no other usage of water for the purposes of the retail activity, then no water meter is required on the water supply to this unit. Typical retail units that would not comply with this note are catering units, supermarkets, hairdresser, launderette etc.
<b>Industrial buildings consisting of several small units</b>	For a building consisting of a number of small units, each $\leq 200m^2$ , a water sub meter must be fitted on the water supply to each unit. A pulsed output on each sub meter is not required. A water meter with a pulsed output fitted to the main supply to the building is still required.
<b>Exemplary level criteria</b>	It is widely accepted that water usage can be decreased by how water is consumed by building users. If there are only small water consuming units used within the building such as singular toilets, small kitchen etc. It is unlikely there will be an opportunity to reduce water consumption by increased water management. And therefore there will be no benefit to installing a sub-meter; in such instances the exemplary credit is not available. Compliance with the criteria can also be demonstrated where the water metering/monitoring equipment is integral to the water consuming plant, as opposed to a sub meter on the water supply to the plant.

### Schedule of Evidence Required

<b>Req.</b>	<b>Design Stage</b>	<b>Post Construction Stage</b>
All	A copy of the specification clause confirming: <ul style="list-style-type: none"> <li>• The specification and type of water</li> </ul>	Assessor's building/site inspection report and photographs or 'as built' drawings confirming:

	<p>meter(s).</p> <p>Design plan(s) showing:</p> <ul style="list-style-type: none"> <li>• Location of the water meter(s) in each assessed building/unit.</li> </ul>	<ul style="list-style-type: none"> <li>• The location of the water meter(s).</li> </ul> <p>Manufacturer's details confirming:</p> <ul style="list-style-type: none"> <li>• The specification of a pulsed output on the installed meter(s).</li> </ul> <p>If connected to a BMS, the assessor's site inspection confirming live meter readings can be used in lieu of manufacturer's details confirming specification of a pulsed output.</p>
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### Additional Information

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#### Relevant definitions

The requirement for a pulsed output has been included to encourage the use of meters capable of transmitting (by wire or wirelessly) a continuous or pulsed signal with water management information such as total water consumed or flow rate to a Building Management System. This allows demand patterns on water systems to be monitored and evaluated over time. A significant increase in demand may indicate the presence of a leak or inappropriate or unexpected water consumption.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	1	1	Wat 3 - Major Leak Detection	P	G	VG	E	O
				-	-	-	-	-

### Aim

To reduce the impact of major water leaks that may otherwise go undetected.

### Assessment Criteria

The following demonstrates compliance:

1. A leak detection system capable of detecting major leaks on the water supply has been installed. The system must cover all mains water supply within the building and its site.
2. The leak detection system is:
  - a. Audible when activated
  - b. Activated when the flow of water passes through the water meter/data logger at a flow rate above a pre-set minimum for a pre-set period of time
  - c. Able to identify different flow and therefore leakage rates, e.g. continuous, high and/or low level, over set time periods
  - d. Programmable to suit the owner/occupiers' water consumption criteria
  - e. Where applicable, designed to avoid false alarms caused by normal operation of large water-consuming plant such as chillers.

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	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.
<b>Shell Only</b>	There are no additional or different criteria to those outlined above specific to assessments of shell-only buildings.
<b>Fit Out Only</b>	There are no additional or different criteria to those outlined above specific to Fit Out-only assessments.
<b>Mains water supply between the building and the site boundary</b>	Where the mains water supply between the building and the site boundary is not under the client's authority, but is managed by the local water authority, this can be excluded from the assessment. Where the site is owned and managed by another body such as another landlord, compliance will still need to be demonstrated.
<b>Ancillary or multiple buildings</b>	The criteria apply to the water supply to all buildings falling within the scope of the assessment.
<b>Mains supply shut-off</b>	It is not a requirement of this issue that the leak detection system shut off the water supply when the alarm is triggered.

<b>No water supply to the building/unit</b>	If there is no water supply to the building because there will be no installed water-consuming fittings in the building, then the issue must be assessed on the basis of the water supply to the nearest accessible building with such facilities, likely to be used by the future occupants of the assessed building.
<b>Leakage Rates</b>	This issue does not specify what the high and low level leakage rates should be; however, the equipment installed must have the flexibility to distinguish between different flow rates to enable it to be programmed to suit the owner/occupier's usage patterns.
<b>Pre-set flow rates</b>	Pre-set flow rates and time periods will vary depending on the building type and usage.
<b>System criteria</b>	It is anticipated that this credit will usually be achieved by installing a system which detects higher than normal flow rates at meters and/or sub-meters. It does not require a system that would directly detect water leakage along part or the whole length of the water supply system.
<b>Water authority meters</b>	Where there is a water authority meter at the site/building boundary, it may be necessary to install a separate flow meter to detect leaks; however, if the water authority agrees to some form of leak detection being installed on their meter, this would also be acceptable.

#### Schedule of Evidence Required

<b>Req.</b>	<b>Design Stage</b>	<b>Post Construction Stage</b>
1&2	<p>A copy of the specification clause confirming:</p> <ul style="list-style-type: none"> <li>• Scope and performance criteria of leak detection system.</li> </ul> <p><b>AND/OR</b></p> <p>Manufacturer's details confirming:</p> <ul style="list-style-type: none"> <li>• The technical specification the specified systems.</li> </ul>	<p>Assessor's building/site inspection and photographic evidence confirming:</p> <ul style="list-style-type: none"> <li>• The installation and operation of the leak detection system.</li> <li>• The pre-set variables of the system for triggering the alarm and the flexibility of the building occupier to vary these*.</li> </ul> <p>* This can be confirmed in a letter from the contractor/installer to the assessor.</p>

#### Additional Information

##### Relevant definitions

None.



No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	1	1	Wat 4 - Sanitary Supply Shut Off	-	-	-	-	-

### Aim

To reduce the risk of minor leaks in toilet facilities.

### Assessment Criteria

The following demonstrates compliance:

- Solenoid valves are installed on the water supply to each toilet area in the building and the flow of water through that supply is controlled by a link to either:
  - Infra-red movement detectors within each toilet facility **OR**
  - Sensors or switches placed at or on entry doors to each facility.

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	If the facilities are within the existing building then it is those existing facilities that must be assessed against the criteria of this issue.
<b>Shell Only</b>	<p>Where the installation of facilities within tenanted units/areas will be the responsibility of the future tenant, compliance with this BREEAM issue can be demonstrated via one of the following means for shell only buildings/areas:</p> <ul style="list-style-type: none"> <li>Option 1 – Use of a tenancy lease agreement between the developer and tenant/s (full value of available credits)</li> <li>Option 2 – A Green Building Guide for tenant fit outs (half the value of the available credits)</li> <li>Option 3 – Developer/Tenant collaboration (full value of available credits)</li> </ul> <p>Where compliance with the assessment criteria cannot be demonstrated the available credits must be withheld (option 4).</p> <p>Refer to the <i>Scope</i> section 2.2 <i>Types of project that can be assessed using BREEAM</i> (Shell and Core / Speculative Assessments) for further description of the above options.</p>
<b>Fit Out Only</b>	There are no additional or different criteria to those outlined above specific to fit out-only assessments.
<b>No toilet facilities in the assessed building</b>	If no toilet areas exist in the building then the assessment criteria must be assessed on the basis of the nearest accessible building with such facilities likely to be used by the occupants of the assessed building.

<b>Shut-off systems</b>	Shut-off systems may control combined toilet areas, such as male and female toilets within a core.
<b>Proximity detection criteria</b>	Proximity detection shut-off is not required for each individual sanitary appliance to achieve the credit. The requirement is for the water supply to be isolated for each toilet block on a floor when not being used by the occupants.
<b>Single WCs</b>	The criteria for this issue apply to facilities with a single WC (potentially within smaller or low occupancy buildings). In these instances shut-off can be provided via the same switch that controls the lighting (whether proximity detection or a manual switch).
<b>WCs in common public areas</b>	Programmable timed controllers linked to the shut-off device are an acceptable means of compliance for facilities in this type of space, where constant public use is to be expected during opening or visiting hours.

### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
1	<p>A copy of the specification clause confirming:</p> <ul style="list-style-type: none"> <li>The specification of shut-off valves</li> <li>The controls for the shut-off valves.</li> </ul> <p>A design plan showing:</p> <ul style="list-style-type: none"> <li>The location of the toilet facilities.</li> </ul>	<p>Assessor's building/site inspection and photographic evidence confirming:</p> <ul style="list-style-type: none"> <li>The location and installation of proximity detection controls.</li> </ul> <p><b>AND</b></p> <p>'As built' drawings showing:</p> <ul style="list-style-type: none"> <li>The specification of shut-off valves</li> </ul>

### Additional Information

#### Relevant definitions

**Solenoid valve:** An electrically operated shut-off device that controls the flow of water in pipes.

**Volume controller:** An automatic control device to turn off the water supply once a maximum preset volume is reached.

**Programmed time controller:** An automatic time switch device to switch the water supply on and/or off at predetermined times.

Light fittings in toilets are often controlled by proximity detection by IR movement detectors or sensors placed at entry doors (the latter can be less accurate as more than one person can enter or depart in the opening of one door). The sensors used to control the lighting can also be linked to a solenoid valve in the cold water supply. This will then act as a proximity detection system.

Small water leaks can result in significant losses over time, increasing costs as well as causing damage. There is a significant risk of leaks going undetected, particularly as toilet accommodation is often unoccupied for long periods. A proximity detection shut-off system prevents waste water from minor leaks by shutting off the water supply when toilet accommodation is not occupied.

Valves in cisterns supplying urinals and WCs are especially prone to failure, leading to wastage of water via the overflow. Whilst leakage from any valve is variable, a typical value for a leaking valve toilet might be 4 litres/day.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	1	1	Wat 6 - Irrigation Systems	-	-	-	-	-

### Aim

To reduce the consumption of potable water for ornamental planting and landscape irrigation.

### Assessment Criteria

The following demonstrates compliance:

- Where the irrigation method specified for internal or external planting and/or landscaping complies with **ANY ONE** of the following:
  - Drip feed subsurface irrigation that incorporates soil moisture sensors. The irrigation control should be zoned to permit variable irrigation to different planting assemblages.
  - Reclaimed water from a rainwater or greywater system.
  - External landscaping and planting that relies solely on precipitation, during all seasons of the year.
  - The planting specified is restricted to species that thrive in the local climatic conditions.
  - Where no dedicated, mains-supplied irrigation systems (including pop-up sprinklers and hoses) are specified, and planting will rely solely on manual watering by building occupier or landlord.
- Where a sub surface drip feed irrigation system is installed for external areas, a rainstat must also be installed to prevent automatic irrigation of the planting and the landscape during periods of rainfall.

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	There are no additional or different criteria to those outlined above specific to the assessment of extensions to existing buildings.
<b>Shell Only</b>	There are no additional or different criteria to those outlined above specific to shell-only projects.
<b>Fit Out Only</b>	There are no additional or different criteria to those outlined above specific to fit out-only assessments.
<b>No landscaped areas</b>	This issue does not apply where there are no landscaped areas within the construction zone of the assessed building. In such instances the BREEAM assessor's spreadsheet tool will filter the issue from the list of applicable issues.

### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
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1&2	<p>Design team confirmation via assessment meeting minutes, letter or email confirming the irrigation strategy for the site <b>AND</b></p> <p>Proposed site plan, marked up to illustrate the scope of the irrigation specified <b>AND</b></p> <p>One of the following:</p> <p>A copy of the specification clause confirming:</p> <ul style="list-style-type: none"> <li>• Type of irrigation system and controls.</li> </ul> <p><b>OR</b></p> <p>Manufacturer's information detailing:</p> <ul style="list-style-type: none"> <li>• The technical details of the specified system.</li> </ul>	<p>Assessor's building/site inspection and photographic evidence confirming:</p> <ul style="list-style-type: none"> <li>• The implementation of the proposed strategy.</li> <li>• If relevant, the installation of the specified system.</li> </ul>
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### Additional Information

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#### 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.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	-	-	Wat 7 - Vehicle Wash	-	-	-	-	-

### Aim

To minimise the volume of potable water used by vehicle washing facilities.

### Assessment Criteria

The following demonstrates compliance:

1. The vehicle washing system reclaims and recycles water that falls on, and drains off from, the vehicle pad. The reclaim system must be fully automatic.

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	There are no additional or different criteria to those outlined above specific to the assessment of extensions to existing buildings.
<b>Shell Only</b>	<p>Where present, vehicle wash facilities should be assessed in accordance with the assessment criteria. In shell only areas/building, where it is known that a vehicle wash system will be installed but final decisions concerning the specification will be made by a new owner/tenant, compliance with this BREEAM issue can be demonstrated via one of the following means:</p> <ul style="list-style-type: none"> <li>• Option 1 – Use of a tenancy lease agreement between the developer and tenant/s (full value of available credits)</li> <li>• Option 2 – A Green Building Guide for tenant fit outs (half the value of the available credits)</li> <li>• Option 3 – Developer/Tenant collaboration (full value of available credits)</li> </ul> <p>Where compliance with the assessment criteria cannot be fully demonstrated the available credits must be withheld (option 4).</p> <p>Refer to the <i>Scope</i> section 2.2 <i>Types of project that can be assessed using BREEAM</i> (Shell and Core / Speculative Assessments) for further description of the above options.</p>
<b>Fit Out Only</b>	There are no additional or different criteria to those outlined above specific to fit out-only assessments.
<b>Microbial contamination</b>	Where vehicle wash systems are specified, the assessor should ask the design team to clarify that the installed system has been designed to minimise any legionella risk (refer to BREEAM issue Hea12).

### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
1	A copy of the specification clause confirming: <ul style="list-style-type: none"> <li>• Type of vehicle wash system.</li> </ul> <b>OR</b> Manufacturer's information confirming: <ul style="list-style-type: none"> <li>• The technical details of the specified system.</li> </ul>	Assessor's building/site inspection and photographic evidence confirming: <ul style="list-style-type: none"> <li>• The installation of the specified system.</li> </ul>

### Additional Information

#### Relevant definitions

**Vehicle Wash:** A commercial automatic, semi-automatic or manual system for washing vehicles. This includes wheel and chassis wash, fixed gantry and screen wash systems using brushes, spray bars or handheld jet hoses.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
2	2	2	Wat 8 - Sustainable on-site water treatment	-	-	-	-	-

### Aim

To encourage the treatment and re-use of waste water on-site to reduce the need for environmentally-damaging centralised water treatment systems and enable the recycling of water and nutrients in a shorter time and distance.

### Assessment Criteria

The following demonstrates compliance:

#### First credit

1. A feasibility study has been carried out by an *appropriate consultant* to establish the most appropriate sustainable on-site wastewater treatment system. This study covers as a minimum:
  - a. Type of soil
  - b. Fall
  - c. Power supply
  - d. Odour nuisance
  - e. Tolerance to infiltration
  - f. Tolerance to load fluctuation (holidays and peak periods) where relevant
  - g. Installation cost
  - h. Maintenance
  - i. Required area
  - j. Effluent quality
  - k. Visual impact
2. A sustainable on-site treatment system has been specified for the building/development in line with the recommendations of the above feasibility study.
3. The feasibility study has been carried out at concept design stage or equivalent procurement stage.

#### Second credit

1. The first credit has been achieved.
2. A sustainable on-site treatment system has been designed in line with the recommendations of the above feasibility study and in accordance with EN 12566: 2000 – *small wastewater treatment systems for up to 50 PT* and is able to treat at least 30% of the building/development's wastewater to *tertiary standards*.
3. Treated water must be infiltrated or reused on-site for WC/urinal flushing or irrigation purposes.
4. The system designer or installer will provide full maintenance and operation details to the building/site occupiers, in particular with regard to the water quality level.

### Compliance Notes

<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	If the assessment is of the new extension only, then the wastewater associated with the use of the extended building may be used. If feasible however, the total wastewater of the new extension and existing building can be used. If the assessment is of the new build extension and existing building i.e. whole building, then the total wastewater must be used for the purposes of carrying out the calculation.
<b>Shell Only</b>	Assessment of this issue requires the design team to know the flush volumes of WC facilities. If WC facilities are contained within tenanted areas of the building and the sanitary fittings will be specified/installed by the future tenant, then for the purpose of the assessment of this issue, industry-standard fittings should be assumed in the tenant areas (see Additional Information section). Alternatively, if the tenant is committed through a green lease agreement to install sanitary fittings with performance standards better than industry standard, then the assessment of this issue can be based on the performance of those fittings.
<b>Fit Out Only</b>	There are no additional or different criteria to those outlined above specific to Fit Out-only assessments.
<b>Feasibility study</b>	<p>When undertaking a feasibility study at a later stage than <i>outline proposals</i>, an additional element will need to be included in the report to highlight the systems which have been discounted due to the constraints placed on the project by the late consideration, and the reason for their omission. If the feasibility study discounts all on-site treatment systems 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.</p> <p>If the feasibility was commissioned at the <i>outline proposals</i> stage or earlier and in the unlikely event the study concludes that the specification of any on-site water treatment system is unfeasible, the first credit can still be awarded. Subsequent credits for installing a system that meets the requirement will not be achievable.</p>
<b>Wastewater</b>	For the purposes of assessing this BREEAM issue, wastewater includes both greywater and blackwater.
<b>Tertiary standards</b>	Effluent water quality parameters should meet the local regulations requirements for harvested rainwater to be used in non-potable uses such as WC flushing or irrigation. Where these are not defined in the country of assessment, the default values as defined in the Additional Information section should be met.



<b>Sustainable on-site treatment systems</b>	<p>Systems with processes that proceed at 'natural' rates should be preferred to those who are usually considered 'mechanical', in order to limit the major energy input to liquid transport, partial aeration and plant harvest when applicable. Typical sustainable systems include:</p> <ul style="list-style-type: none"> <li>• Infiltration systems</li> <li>• Constructed wetlands, including vertical and horizontal flow reed beds</li> <li>• Biological sand filters</li> <li>• Anaerobic systems</li> </ul> <p>Constructed wetland systems try to mimic natural reed beds, which have been shown to be effective in treating contaminated water. Reed bed filtration systems and other wetland-based processes have become popular in recent years. They benefit from low cost and energy requirements, simple operation, and a number of environmental plus points. Large systems encourage biodiversity - extensive reed beds are among the most important habitats for a variety of rare birds, invertebrates, flora, fish, amphibians, reptiles, and mammals. From a human perspective, they can encourage local and traditional trades, such as basket making.</p> <p>The list above is not a definitive list of systems compliant with BREEAM, but includes those systems that may normally be considered to comply. If the assessor has a justified reason to doubt the credentials/feasibility of the above technologies, where specified for a development they are assessing, they can justifiably withhold the available BREEAM credits. Similarly other technologies may be developed which meet the aims of this credit and as such the assessor should seek advice from BRE when such technologies are proposed</p>
<b>Reuse of the treated wastewater on site</b>	<p>Wastewater treated through the sustainable on-site system may be reused for the flushing WCs, for irrigation purposes or any other processes associated with the activity of the building that require a frequent demand of water.</p>
<b>Calculating total predicted flushing demand</b>	<p>Total predicted flushing demand can be estimated by the design team on the basis of the following variables:</p> <ul style="list-style-type: none"> <li>• Number of building users (staff and visitors)</li> <li>• Effective flush volume of WCs/urinals</li> <li>• Estimated number* of WC/urinal uses per person per day (multiplied by the defined period of collection)</li> </ul> <p>* For staff use, unless other data is available, assume 1.3 WC uses per person per day and 2 urinal uses per person per day (assume that only 50% of the building occupants will use urinals).</p>

#### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
<b>First Credit</b>		
1&3	<p>A copy of the feasibility study report.</p> <p>Letter from the appropriate consultant confirming:</p> <ul style="list-style-type: none"> <li>• Compliance with the definition of an appropriate consultant</li> <li>• The timing of the feasibility report within the plan of works.</li> </ul>	<p>Assessor's building/site inspection (or "as built" drawings) and photographic evidence confirming:</p> <ul style="list-style-type: none"> <li>• Installation of the waste water treatment system.</li> </ul>

2	Marked-up design plan or specification confirming: <ul style="list-style-type: none"> <li>Proposed installation of waste water treatment plant.</li> </ul>	
<b>Second credit</b>		
1	Evidence (as outlined above) confirming compliance with the first credit.	Evidence (as outlined above) confirming compliance with the first credit.
2&3	Design team calculations and a copy of specification confirming (where appropriate): <ul style="list-style-type: none"> <li>Predicted WC/urinal flushing demand</li> <li>Estimated potential for waste water collection from taps/showers.</li> <li>Percentage of waste water from the building/development to be treated with the system</li> <li>Design in accordance with EN 12566</li> <li>End use of the treated water</li> </ul>	Assessor's building/site inspection and photographic evidence confirming: <ul style="list-style-type: none"> <li>The installation of the treatment system.</li> </ul> <p>Where changes have occurred since design stage assessment, a revised copy of the technical specification and sizing calculations for the installed system.</p>
4	A letter from the design team confirming: <ul style="list-style-type: none"> <li>A maintenance and operation guide will be produced and handed over to the building occupier.</li> </ul>	Assessor's building/site inspection and photographic evidence confirming: <ul style="list-style-type: none"> <li>Existence of the maintenance and operation guide in the building's O&amp;M manual/file.</li> </ul>

### Additional Information

#### Relevant definitions

**Appropriate Consultant:** a hydrological, mechanical, civil and/or public health engineer with a minimum of 2 years experience in the design of wastewater treatment systems.

**Blackwater:** water polluted with food, animal, or human waste

**Greywater:** Waste water from taps, showers and laundries.

#### Industry-standard fittings

Where a type of appliance or fitting is not specified, assume the following default fittings:

- Regular taps for wash hand basins (12 litres/minute)
- High flow shower (14 litres/minute)
- WC (6 litre cistern)
- Cistern serving single urinal = 10 litres per use (flush).
- Cistern serving two or more urinals = 7.5 litres per use (flush).
- Urinals with manual flush on each stall or automatic pressure flushing valves = 1.5 litres per use.

**Fall:** difference in heights needed to make the system work.

**Tertiary standards:** where these are not defined in the country of assessment, the following default values should be met:

**Table 18 Guideline values for bacteriological monitoring**

Parameter	Guideline values (number/100ml)
Escherichia coli	1

Intestinal enterococci	<b>1</b>
Legionella	<b>100</b>
Total coliforms	<b>10</b>

**Table 19 Guideline values for general system monitoring**

<b>Parameter</b>	<b>Guideline values</b>
Dissolved oxygen in stored rainwater	10% saturation or >1 mg/L O <sub>2</sub> (whichever is least)
Suspended solids	Visually clear and free from floating debris for all uses
Colour	Not objectionable for all uses
Turbidity	<10 NT U for all uses (<1 NT U if UV disinfection is used)
pH	5–9 for all uses
Residual chlorine	<0.5 mg/L for garden watering <2 mg/L for all other uses
Residual bromine	<2 mg/L for all uses

Conserving water in water-stressed areas in sustainable ways is important. Increasing the use of decentralised wastewater treatment plants can enable recycling of water, and nutrients, to take place within a shorter time and distance. The global and local water cycles in which ground water and rivers contribute are well known.. However, this natural cycle is often affected by human developments. Pollution, development and abstraction all contribute to degradation of the natural cycle. The use of drainage systems with centralised treatment is efficient in some ways, but it is rarely nutrient efficient. Conventional water supply treatment processes, and wastewater treatment processes, have a large footprint due to the high environmental discharges, consume chemicals and power and lead to the loss of high quantities of nutrients that could otherwise be separated from the discharge and returned back to the natural cycle.

## 9.0 Materials

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
4	4	2	Mat 1 - Materials Specification (Major Building Elements)	-	-	-	-	-

### Aim

To recognise and encourage the use of construction materials with a low environmental impact over the full life cycle of the building.

### Assessment Criteria

The following demonstrates compliance:

#### OPTION 1 – Green Guide to Specification

- The Green Guide rating for the specifications for the following building elements must be determined and entered in to the BREEAM assessor's *Mat 1 Calculator*. Green Guide ratings for the specification(s) of each element can be found at: [www.thegreenguide.org.uk](http://www.thegreenguide.org.uk)

**Table 20 Applicable elements to assessment stage**

Building Element	Offices & Retail projects		Industrial projects	
	New build & Major Refurbishment	Fit Out	New build & Major Refurbishment	Fit Out
External Walls	✓	N/A	✓	N/A
Windows	✓	N/A	N/A	N/A
Roof	✓	N/A	✓	N/A
Upper Floor Slabs	✓	N/A	N/A	N/A
Internal Walls	N/A	✓	N/A	✓
Floor Finishes / Coverings	N/A	✓	N/A	✓

The calculator awards points for each applicable element according to its Green Guide rating as follows:

Green Guide Rating	Points/element
A+	3

<b>A</b>	2
<b>B</b>	1
<b>C</b>	0.5
<b>D</b>	0.25
<b>E</b>	0

The calculator then translates the total number of points in to BREEAM credits as follows:

<b>Offices and Retail New build &amp; Refurbishments</b>	
<b>Total Points</b>	<b>Credits</b>
2	1
5	2
8	3
10	4
12	One additional exemplary credit

<b>Industrial New build &amp; Refurbishments All Fit Out assessments</b>	
<b>Total Points</b>	<b>Credits</b>
2	1
4	2
5	One additional exemplary credit

Note: Please refer to the Additional Information section of this issue for guidance on how to use the Green Guide online and accessing the appropriate ratings for the assessed elements, as well as how to use the Mat 1 calculator tool and how the tool awards the available credits.

## OPTION 2 – Other Materials Assessment Tools

### One credit

1. Use of an Embodied CO<sub>2</sub> or Embodied Energy or Carbon Footprinting tool to evaluate a range of material options for the building, and the design team can demonstrate how this evaluation has positively influenced the design.

### Two credits

1. Use of a *nationally recognised* LCA tool to evaluate a range of material options for the building elements as listed in table 20 above
2. The design team can demonstrate that the outcome has influenced design choices for some of the building elements above as follows;

<b>Offices and Retail New build &amp; Refurbishments</b>	
<b>Number of building elements</b>	<b>BREEAM Credits</b>
1	2
2	3
3	4
4	One additional exemplary credit

<b>Industrial New build &amp; Refurbishments All Fit Out assessments</b>	
<b>Number of building elements</b>	<b>BREEAM Credits</b>
1	2
2	One additional exemplary credit

3. The *nationally recognised* LCA tool used has the following features as a minimum:
- At least 3 environmental indicators including Climate Change (indicators may be weighted to provide an overall score)
  - It addresses the whole life of the building, including service life and disposal.
  - It is based on LCA principles as set out in the following International Standards:
    - ISO 14040 2006 Environmental Management -LCA- Principles & Framework
    - ISO 14044 2006 Environmental Management - LCA Requirements and guidelines
    - ISO 14025: 2006 Environmental labels and declarations — Type III environmental declarations — Principles and procedures
    - ISO 21930 2006 Building construction - Sustainability in building construction – Environmental declaration of building products

Please refer to the compliance notes table to find a list of compliant LCA tools

Note: These credits are not dependent upon the previous credit being awarded.

### **Exemplary level criteria**

The following outlines the exemplary level criteria to achieve an *innovation credit* for this BREEAM issue.

1. One exemplary BREEAM credit can be awarded as follows:

#### **OPTION 1 – Green Guide to Specification**

- Where assessing four or more applicable building elements, the building achieves at least two points additional to the total points required to achieve maximum credits under the standard BREEAM criteria.
- Where assessing fewer than four applicable building elements, the building achieves at least one point additional to the total points required to achieve maximum credits under the standard BREEAM criteria.

#### **OPTION 2 – Other Materials Assessment Tools**

- The use of a *nationally recognised* LCA tool with *minimum adequate features* to evaluate a range of material options for the building AND the design team can demonstrate that the outcome has influenced design choices for all of the building elements.

<b>Compliance Notes</b>	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different requirements to those outlined above specific to new build projects.
<b>Shell Only</b>	There are no additional or different criteria to those outlined above specific to shell-only assessments.
<b>Fit Out Only</b>	There are no additional or different criteria to those outlined above specific to Fit-Out assessments.
<b>Extensions to existing buildings</b>	Any applicable new-build elements, forming part of the new extension, must be assessed as outlined above.  Where option 1 is used, and the existing building forms part of the scope of the assessment, then any existing applicable element that is reused in situ achieves an 'A+' rating, as outlined above for refurbishments.

<b>OPTION 1 only</b>	
<b>Element consisting of more than one specification</b>	Where more than one specification is present for a given element, the rating and area for each specification should be entered into the tool and an average points score is calculated (by area).
<b>Finding exact Green Guide Ratings</b>	Whilst exact matches in specifications are not always found, it should be possible to identify a similar specification and use its rating for the purposes of assessment. Where no similar specification can be found, assessors should seek guidance from BRE on the appropriate rating.
<b>New elements containing reused materials</b>	If a new element is specified e.g. external wall, and part of that element includes a reused material e.g. reclaimed bricks, assessors should seek guidance from BRE on the appropriate rating.
<b>Mixed use developments</b>	Where the assessment covers only some of the floors in the building, the roof must still be assessed as it is protecting the assessed building below. If the roof is directly above domestic accommodation (e.g. flats), the equivalent domestic Green Guide rating for the roof must be used as opposed to the ratings for non-domestic roofs. Roof areas not protecting parts of the assessed building/space can be omitted from the assessment.
<b>Single storey buildings and upper floors</b>	Where the assessed building is a single storey building and therefore has no upper floors, the upper floor element does not need to be assessed. In such instances the BREEAM assessor's <i>Mat 1 Calculator</i> will re-calculate the requirement and award the available credits in accordance with the Green Guide ratings for the remaining applicable elements.
<b>Floor finishes in operational areas (fit out assessments only)</b>	The floor finishes in the <i>operational areas</i> of industrial buildings/units fall outside of the scope of the Green Guide. This is due to the specific performance requirement of the specifications, such as chemical resistance, temperature resistance and impact resistance, all of which limit the options available for specification. Therefore, only consider floor finishes in non operational areas of the building e.g. office areas when assessing this BREEAM issue.
<b>Floor finishes replacement by durability or fashion (fit out assessments only)</b>	Many retail premises will undergo frequent fit-out to change the "look" of a store, but other retailers will replace floor finishes purely on the basis of durability. To ascertain whether a retail scheme should be assessed on the basis of replacement by durability or fashion, typical practice historically, or in other branches of the retailer should be considered, and if the floor finish replacement cycle is 10 years or less, the "replacement by fashion" Green Guide ratings should be used for the purpose of assessment.
<b>Where integral insulated cold storage units form a part of the building fabric</b>	Please refer to the Additional Information section for guidance on accessing this issue for buildings with integral cold storage units, where the walls, floor and ceiling of that unit form a part of the buildings fabric.
<b>OPTION 2 only</b>	
<b>No Nationally recognised LCA tool</b>	<p>Where no nationally recognised LCA tool is available in the country of assessment, option 1 or other 'local' methods (ie from neighbouring countries or continental region) may be used.</p> <p>A non 'local' method may be used only in specific instances such as a building constructed in Europe with materials from another continent. Use of such a non 'local' tool would need to be justified by the design team to the satisfaction of the assessor. Acceptable justifications would be based on local tools being inappropriate for the supply chain in question.</p> <p>Any 'local' or non 'local' tools will need to comply with the minimum adequate features requirements set above.</p>

<b>Compliant LCA tools</b>	<p>Current compliant LCA tools are listed below</p> <ol style="list-style-type: none"> <li>Invest2® from BRE</li> <li>Green Globes LCA tool - <b>ATHENA® EcoCalculator for Assemblies</b></li> <li><b>ATHENA® Impact Estimator for Buildings</b></li> <li>Eco-<b>Quantum</b> from IVAM</li> <li>Equer from Ecole des Mines</li> </ol> <p>If other LCA tools not identified here are deemed by the design team to comply with the requirements set above with regard to minimum adequate features, then these may be recognised subject to <b>prior approval</b> by BRE Global.</p>
<b>Positive influence on the design</b>	<p>Positive influence on the design can be demonstrated through a comparative analysis of a typical local building with the building assessed. There are no specific requirements on the contents that have to be covered, however these need to be broad and detailed enough to allow the positive influence to be demonstrated.</p> <p>For instance, where the typical external wall specification in the country of assessment for a building of a similar design and use is an aluminium curtainwalling system, the design team should demonstrate how the use of an LCA tool has allowed the specification of other materials with a lower environmental impact over the life cycle of the building.</p>

### Schedule of Evidence Required

<b>Req.</b>	<b>Design Stage</b>	<b>Post Construction Stage</b>
<b>OPTION 1</b>		
All	<p>Specification confirming:</p> <ul style="list-style-type: none"> <li>A detailed description of each applicable element and its constituent materials.</li> </ul> <p>Design drawings or specification detailing:</p> <ul style="list-style-type: none"> <li>Location and area (m<sup>2</sup>) of each applicable element.</li> </ul> <p>A copy of the output from the Mat 1 Calculator, including Green Guide rating and element number* for each specification assessed.</p> <p>* Element numbers may change from time-to-time due to updates in the green guide data. As a result assessors should keep a note of the element numbers they use to give Green Guide rating advice on BREEAM assessments for auditing purposes.</p>	<p>Assessor's building/site inspection and photographic evidence confirming:</p> <ul style="list-style-type: none"> <li>Element in-situ (where possible)</li> </ul> <p><b>AND</b></p> <p>As built drawings and, where relevant, written design team confirmation of any changes to materials specification.</p>
<b>OPTION 2</b>		
All	<p>Specification confirming:</p> <ul style="list-style-type: none"> <li>Name of the embodied energy / LCA tool used</li> <li>A detailed description of how the tool meets the compliance requirements</li> </ul> <p>Copy of the embodied energy/LCA tool output confirming:</p>	<p>Assessor's building/site inspection and photographic evidence confirming:</p> <ul style="list-style-type: none"> <li>Element in-situ (where possible)</li> </ul> <p><b>AND</b></p> <p>As built drawings and, where relevant, written design team confirmation of any</p>



	<ul style="list-style-type: none"> <li>• Elements considered</li> </ul> <p>Examples of how the embodied energy/LCA tool used had a positive influence on the design.</p>	changes to materials specification.
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## Additional Information

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### Relevant definitions

**Ecopoint:** The Ecopoint used in the Green Guide online is single score that measures the total environmental impact of a product or process as a proportion of overall impact occurring in Europe - 100 Ecopoints is equivalent to the impact of a European Citizen. Green Guide ratings are derived by sub-dividing the range of Ecopoints/m<sup>2</sup> achieved by all specifications considered within a building element.

**Embodied energy** is defined as the total energy used through out a products life cycle i.e. in the extraction, manufacture, transport, maintenance and disposal.

**Green Guide:** The *Green Guide to Specification* is an easy-to-use comprehensive reference website and electronic tool, providing guidance for specifiers, designers and their clients on the relative environmental impacts for a range of different building elemental specifications. The ratings within the Guide are based on Life Cycle Assessment, using the Environmental Profile Methodology.

**Life Cycle Analysis (LCA):** LCA is a method of evaluating the environmental impacts of system taking into account its full life cycle, from the cradle to the grave. This means taking into consideration all the impacts associated with the production and use of a system, from the first that man has an impact on the environment till the last.

**Nationally recognised LCA Tool:** This is defined as any nationally recognised method and does not need to be government endorsed.

**Reused materials:** are materials that can be extracted from the waste stream and used again without further processing, or with only minor processing, that does not alter the nature of the material (e.g. cleaning, cutting, fixing to other materials).

**The Mat 1 Calculator:** A spreadsheet-based calculator required to determine the number of credits achieved for this BREEAM issue based on each applicable element's Green Guide rating. The Mat 1 Calculator makes four adjustments to the points achieved for each specification/element assessed, as follows:

1. The first is the scoring based on the Green Guide rating; A+ =3, A=2, B=1, C=0.5, D=0.25 and E=0.
2. The second, where an element consists of several different specifications, is to weight the points achieved according to the relative area and Green Guide rating of each of the individual specifications. So if 50% of an element was A+ and 50% was C, the score would be  $(50\%*3) + (50\%*0.5) = 1.75$ .
3. The third is to weight based on the overall area of different elements - this is done by multiplying the area of each element by the weighted Green Guide score, adding the total for all elements and then dividing by the total area of the assessed elements. As a 20 storey office block will have a smaller roof area than floor area, so the area weighting will take this into account by giving a smaller weighting to the score for the roof than the external walls.
4. The final adjustment relates to the *Ecopoints* range for each assessed element. This adjustment ensures the environmental impact of the element in relation to the impacts of other assessed elements within the building is considered. For example; the external walls have a larger *Ecopoints* range than the internal walls, therefore, if both elements achieve the same Green Guide rating the rating of the external walls achieves a higher proportion of the overall points than the rating for the internal walls, thus recognising the relatively higher reduction possible in the environmental impact of the external walls, due to the larger *Ecopoints* range for that element.

## Using the Green Guide to Specification

The Green Guide categorises ratings by building type and element. When using the Green Guide online, ([www.thegreenguide.org.uk](http://www.thegreenguide.org.uk)), the main page asks the user to select a building type. To obtain the appropriate ratings for the assessed building elements, select the corresponding building type for this BREEAM scheme.

The following elements, for the purpose of non domestic buildings, have common Green Guide ratings irrespective of the building type:

- External walls
- Landscaping
- Windows - commercial

The user can therefore search for ratings for the above elements under any building category.

### **Indoor Air Quality and the Green Guide flooring category ratings**

The Green Guide Online does not cover the potential health and comfort issues associated with flooring materials and indoor air quality, which is covered in BREEAM by issue Hea 9 *Volatile Organic Compounds*

### **Guidance for the assessment of buildings where insulated cold storage units form an integral part of the building fabric**

#### **Where the cold storage unit forms part of, or is integral to the external wall element:**

As an external wall type the insulated units will be assessed in the Green Guide on the basis that it is a normal temperature building without the extra insulation, so a standard thickness of insulation will be considered. As such, the walls of the insulated unit should be treated as part of the external wall element for the assessment of this BREEAM issue.

#### **Where the cold storage unit forms part of, or is integral to a ceiling element:**

As a roof element of the insulated unit, suspended ceilings are not included within the Green Guide. Therefore, the roof of the insulated unit will be assessed as a standard construction from the deck upwards, assuming a standard thickness of insulation. As such, the roof of the insulated unit should be treated as part of the ceiling element for the assessment of this BREEAM issue.

#### **Where the cold storage unit forms part of an internal wall element:**

The insulated unit will be treated as meeting a very specific Functional Unit outside the scope of the internal wall elements listed in the Green Guide. The wall to the insulated unit should therefore be excluded from the assessment of the internal wall element.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	1	1	Mat 2 - Hard Landscaping and Boundary Protection	-	-	-	-	-

### Aim

To recognise and encourage the specification of materials for boundary protection and external hard surfaces that have a low environmental impact, taking account of the full life cycle of materials used.

### Assessment Criteria

The following demonstrates compliance:

#### OPTION 1 – Green Guide

- Where at least 80% of all external hard landscaping and boundary protection (by area) achieves an A or A+ rating, as defined in the *Green Guide to Specification*.

Green Guide ratings for the specification(s) of each element can be found at:

[www.thegreenguide.org.uk](http://www.thegreenguide.org.uk)

#### OPTION 2 – Other Materials Assessment Tools

- Where a *nationally recognised* Life Cycle Analysis (LCA) tool is used to evaluate a range of material options for the external hard landscaping and boundary protection.
- The design team can demonstrate how this evaluation has *positively influenced the design*.
- The *nationally recognised* LCA tool used has the following features as a minimum:
  - At least 3 environmental indicators including Climate Change (indicators may be weighted to provide an overall score)
  - It addresses the whole life of the building, including service life and disposal.
  - It is based on LCA principles as set out in the following International Standards:
    - ISO 14040 2006 Environmental Management -LCA- Principles & Framework
    - ISO 14044 2006 Environmental Management - LCA Requirements and guidelines
    - ISO 14025: 2006 Environmental labels and declarations — Type III environmental declarations — Principles and procedures
    - ISO 21930 2006 Building construction - Sustainability in building construction – Environmental declaration of building products

Please refer to the compliance notes table to find a list of compliant LCA tools

Compliance Notes	
<b>New Build</b>	There are no additional or different requirements to those outlined above specific to new build projects.
<b>Refurbishment &amp; existing elements</b>	There are no additional or different requirements to those outlined above specific to new build projects.

<b>Extensions to existing buildings</b>	Any applicable new-build elements, forming part of the new extension, must be assessed as outlined above.
<b>Shell Only</b>	There are no additional or different requirements to those outlined above specific to shell only assessments.
<b>Fit Out Only</b>	Issue not applicable for Fit Out only assessments.
<b>No hard landscaping or boundary protection</b>	If one of the elements is not present, e.g. boundary protection, then the credit must be assessed on the basis of the specification of the single element e.g. hard landscaping. Where the development has neither element, the credit can be awarded.
<b>Building façade forming boundary</b>	Any part of an external building façade (of either the assessed building or any other neighbouring building) that forms a part of the site boundary should be excluded from the assessment of this credit.
<b>Secure Perimeter Zones/Areas</b>	<p>The requirements for hard surfaces are applicable only to those areas outside of the secure perimeter zone, but within the overall curtilage of the site.</p> <p>The requirements for boundary protection apply to all specifications within the secure perimeter zone and external zone, including its borders/curtilage, i.e. the whole site. The requirements DO NOT apply to the secure perimeter fence/wall or any other fencing subject to security standards.</p>
<b>Scope of hard landscaping</b>	For the purpose of assessment, hard landscaping includes parking areas, but excludes access/approach roads and designated vehicle manoeuvring areas.
<b>Option 1/2</b>	The same option chosen to assess Mat1 should be used to assess Mat2 in order to ensure consistency within one assessment.
<b>OPTION 1 only</b>	

<b>Green Guide Online</b>	When using the Green Guide for the purpose of assessing this BREEAM issue, ratings for landscaping elements are common across all building types. The rating will therefore be the same irrespective of the building type selected via the Green Guide online.
<b>Finding exact Green Guide Ratings</b>	Whilst exact matches in specifications are not always found, it should be possible to identify a similar specification and use its rating for the purposes of assessment. Where no similar specification can be found, seek guidance from BRE for the appropriate rating.
<b>Minor alteration of existing elements</b>	Where less than 20% of the total area of existing hard landscaping and boundary protection elements are subject to minor alterations or maintenance, these elements are awarded an A+ rating for the purposes of this analysis.
<b>Existing natural features</b>	Any existing or specified natural boundary protection (such as hedging or other living barrier) should be awarded with an A+ rating for the purposes of this analysis.
<b>OPTION 2 only</b>	
<b>No Nationally recognised LCA tool</b>	<p>Where no nationally recognised LCA tool is available in the country of assessment, option 1 or other 'local' methods (ie from neighbouring countries or continental region) may be used.</p> <p>A non 'local' method may be used only in specific instances such as a building constructed in Europe with materials from another continent. Use of such a non 'local' tool would need to be justified by the design team to the satisfaction of the assessor. Acceptable justifications would be based on local tools being inappropriate for the supply chain in question.</p> <p>Any 'local' or non 'local' tools will need to comply with the minimum adequate features requirements set above.</p>
<b>Compliant LCA tools</b>	<p>Current compliant LCA tools are listed below</p> <ol style="list-style-type: none"> <li>Envest2® from BRE</li> <li>Green Globes LCA tool - <b>ATHENA® EcoCalculator for Assemblies</b></li> <li><b>ATHENA® Impact Estimator for Buildings</b></li> <li>Eco-<b>Quantum</b> from IVAM</li> <li>Equer from Ecole des Mines</li> </ol> <p>If other LCA tools not identified here are deemed by the design team to comply with the requirements set above with regard to minimum adequate features, then these may be recognised subject to <b>prior approval</b> by BRE Global.</p>
<b>Positive influence on the design</b>	<p>Positive influence on the design can be demonstrated through a comparative analysis of a typical local building with the building assessed. There are no specific requirements on the contents that have to be covered, however these need to be broad and detailed enough to allow the positive influence to be demonstrated.</p> <p>For instance, where the typical external wall specification in the country of assessment for a building of a similar design and use is an aluminium curtainwalling system, the design team should demonstrate how the use of an LCA tool has allowed the specification of other materials with a lower environmental impact over the life cycle of the building.</p>

### Schedule of Evidence Required

Req.	Design Stage	PCR Stage
<b>OPTION 1</b>		
All	<p>Specification confirming:</p> <ul style="list-style-type: none"> <li>A detailed description of each applicable element and its constituent materials.</li> </ul> <p>Design drawings or specification detailing:</p> <ul style="list-style-type: none"> <li>Location and area (m<sup>2</sup>) of each applicable element.</li> </ul> <p>The Green Guide rating and element number for the assessed specifications.</p>	<p>Assessor's building/site inspection and photographic evidence confirming:</p> <ul style="list-style-type: none"> <li>Element in-situ (where possible)</li> </ul> <p>As built drawings/calculations.</p> <p>Written confirmation from the design team or contractor of any changes to the specification.</p>
<b>OPTION 2</b>		
All	<p>Specification confirming:</p> <ul style="list-style-type: none"> <li>Name of the embodied energy / LCA tool used</li> <li>A detailed description of how the tool meets the compliance requirements</li> </ul> <p>Copy of the embodied energy/LCA tool output confirming:</p> <ul style="list-style-type: none"> <li>Elements considered</li> </ul> <p>Examples of how the embodied energy/LCA tool used had a positive influence on the design.</p>	<p>Assessor's building/site inspection and photographic evidence confirming:</p> <ul style="list-style-type: none"> <li>Element in-situ (where possible)</li> </ul> <p><b>AND</b></p> <p>As built drawings and, where relevant, written design team confirmation of any changes to materials specification.</p>

### Additional Information

#### Relevant definitions

See Mat 1.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	1	1	Mat 3 - Re-Use of Facade	-	-	-	-	-

### Aim

To recognise and encourage the in-situ reuse of existing building façades.

### Assessment Criteria

The following demonstrates compliance:

1. At least 50% of the total final building façade (by area) is reused.
2. At least 80% of the reused façade (by mass) comprises in-situ reused material.

Compliance Notes	
<b>New Build</b>	New build schemes with retained façades provide a means of achieving the credit.
<b>Refurbishment</b>	Refurbishment projects are likely to achieve this credit without difficulty.
<b>Extensions to existing buildings</b>	There are no additional or different criteria to those outlined above specific to the assessment of extensions to existing buildings.
<b>Shell Only</b>	There are no additional or different criteria to those outlined above specific to shell only assessments.
<b>Fit Out only</b>	Issue not applicable for Fit Out only assessments
<b>Curtain walling &amp; windows</b>	Where existing windows are being replaced they may be excluded from the calculation of façade area; however, curtain walling counts as façade.

### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
1&2	<p>Drawings detailing:</p> <ul style="list-style-type: none"> <li>The elevations of the existing and the new-build façades.</li> </ul> <p>Calculations demonstrating:</p> <ul style="list-style-type: none"> <li>The % of façade comprising in situ material.</li> </ul> <p>These calculations should be simply based on the volume of each material and its density, with totals compared for the new and retained parts of the structure.</p>	<p>Assessor's building/site inspection and photographic evidence confirming:</p> <ul style="list-style-type: none"> <li>The existence of the reused façade.</li> </ul> <p>As built drawings/calculations.</p> <p>Written confirmation from the design team or contractor of any changes to the specification for the façade.</p>

## **Additional Information**

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### **Relevant definitions**

**Façade:** Any exposed building face, not just the front elevation. The definition excludes party walls.

In practice, reusing façades will often require extensive renovation and/or reinforcement, hence the BREEAM requirement for at least 80% by mass of the reused façade to be in situ reused material. Façades with new external cladding or internal lining therefore can gain this credit provided that this criterion is met.



No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	1	1	Mat 4 - Re-Use of Structure	P	G	VG	E	O
				-	-	-	-	-

### Aim

To recognise and encourage the reuse of existing structures that previously occupied the site.

### Assessment Criteria

The following demonstrates compliance:

1. Where at least 80% by volume of an existing primary structure is reused without significant strengthening or alteration works.
2. Where a project is part refurbishment and part new build, the reused structure comprises at least 50% by volume of the final building, i.e. any new build extension to a building being refurbished should not be larger than the original building to qualify for this credit.

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to the assessment of new build projects.
<b>Refurbishment</b>	Refurbishment projects are likely to be the only buildings to achieve this credit.
<b>Extensions to existing buildings</b>	There are no additional or different criteria to those outlined above specific to the assessment of extensions to existing buildings.
<b>Shell Only</b>	There are no additional or different criteria to those outlined above specific to shell only assessments.
<b>Fit Out Only</b>	Issue not applicable for Fit out only assessments

### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
1&2	Drawings or design team calculations detailing: <ul style="list-style-type: none"> <li>• The sections of the existing structure to be reused.</li> <li>• Any parts of the structure to be demolished and the total new structure.</li> <li>• Where appropriate, calculations confirming any strengthening/alteration are not deemed 'significant' in terms of the assessment criteria for the mass of materials used.</li> </ul>	As built drawings/calculations.  Written confirmation from the design team or contractor of any changes to the structural specification.

## **Additional Information**

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### **Relevant definitions**

**Significant strengthening or alteration:** Defined as where the mass of new material is equal to or greater than 50% of the total mass of the reused structure.

**Primary structure:** Defined as structural floors, columns, beams, load bearing walls and foundations i.e. where required for structural use by the new building.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
3	3	3	Mat 5 - Responsible Sourcing of Materials	-	-	-	-	-

### Aim

To recognise and encourage the specification of responsibly sourced materials for key building elements.

### Assessment Criteria

The following demonstrates compliance:

#### New Build and Major Refurbishment assessments

1. Up to 3 credits are available where evidence provided demonstrates that 80% of the *applicable materials* (listed below) comprising each of the following building elements are responsibly sourced:
  - a. Structural Frame
  - b. Ground floor
  - c. Upper floors (including separating floors)
  - d. Roof
  - e. External walls
  - f. Internal walls
  - g. Foundation/substructure
  - h. Staircase

#### Applicable materials

- Brick (including clay tiles and other ceramics)
- Resin-based composites and materials, including GRP and polymeric render
- Concrete (including in-situ and pre-cast concrete, blocks, tiles, mortars, cementitious renders etc.)
- Glass
- Plastics and rubbers (including EPDM, TPO, PVC and VET roofing membranes including polymeric renders)
- Metals (steel, aluminium etc.)
- Dressed or building stone including slate
- Timber, timber composite and wood panels (including glulam, plywood, OSB, MDF, chipboard and cement bonded particleboard)
- Plasterboard and plaster
- Bituminous materials, such as roofing membranes and asphalt
- Other mineral-based materials, including fibre cement and calcium silicate
- Products with recycled content

Note: Insulation materials, fixings, adhesives and additives are excluded from the assessment. For any other materials that form a part of an applicable building element, but do not fit into the applicable materials list or the exclusions list, please refer to BRE who will identify the relevant Key Process and Supply Chain Process or Processes.

2. Each *applicable material* is assigned to a responsible sourcing tier level based on the level and scope of certification achieved by the material supplier(s)/manufacturer(s) (see Table 21 Responsible Sourcing Tier Levels and Criteria and Table 22 EMS Criteria **Error! Reference source not found. Error! Reference source not found.** in the additional guidance section).

3. Follow the *Calculation Procedure* outlined in the additional guidance section, and use the *Mat 5 Responsible Sourcing Calculator* to determine the number of credits to be awarded.
4. Any non-certified timber used in the development comes from a legal source and is not included on the CITES list (see definition for legally sourced timber).

### Fit Out-only assessments

1. Up to 2 credits are available where evidence provided demonstrates that 80% of the applicable materials (listed below) comprising the following fit out elements are responsibly sourced:
  - a. Stairs
  - b. Windows
  - c. External and internal doors
  - d. Skirting
  - e. Panelling
  - f. Furniture
  - g. Fascias
  - h. Any other significant use

#### Applicable materials

- Brick (including clay tiles and other ceramics)
  - Resin-based composites and materials, including GRP and polymeric render
  - Concrete (including in-situ and pre-cast concrete, blocks, tiles, mortars, cementitious renders etc.)
  - Glass
  - Plastics and rubbers (including EPDM, TPO, PVC and VET roofing membranes including polymeric renders)
  - Metals (steel, aluminium etc.)
  - Dressed or building stone including slate
  - Timber, timber composite and wood panels (including glulam, plywood, OSB, MDF, chipboard and cement bonded particleboard)
  - Plasterboard and plaster
  - Bituminous materials, such as roofing membranes and asphalt
  - Other mineral-based materials, including fibre cement and calcium silicate
  - Products with recycled content
2. Each applicable material is assigned to a responsible sourcing tier level based on the level and scope of certification achieved by the material supplier(s)/manufacturer(s) (see *Table 21: Tier Levels and Compliance* and *Table 22 EMS criteria* in the additional guidance section).
  3. Follow the *Calculation Procedure* outlined in the additional guidance section, and use the *Responsible Sourcing Calculator* to determine the number of credits to be awarded.
  4. Any non-certified timber used in the development comes from a legal source and is not included on the CITES list (see definition for legally sourced timber).

#### Exemplary level criteria

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

1. Where, in addition to the above criteria, 95% of the applicable materials, comprised within the applicable building elements, have been responsibly sourced.

<b>Compliance Notes</b>	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	In the case of a refurbishment assess the newly specified applicable and reused materials (reused as defined below).
<b>Extensions to existing buildings</b>	There are no additional or different criteria to those outlined above specific to the assessment of extensions to existing buildings.
<b>Shell Only</b>	There are no additional or different criteria to those outlined above specific to shell-only assessments.
<b>Fit Out-Only</b>	There are no additional or different criteria to those outlined above specific to Fit Out-only assessments.
<b>Building element not present</b>	Where an element is not present in a project (e.g. an assessment of a ground floor of a building only and therefore no roof in the scope of the assessment), the points for this/these element(s) will be redistributed by the calculator to reward only the elements being assessed.
<b>Reused in-situ materials</b>	Materials reused in-situ can be excluded from the assessment. The aim of this issue is to focus on the responsible sourcing of new specified materials.
<b>Specified reused Materials</b>	Reused materials specified for the development e.g. recycled aggregates are considered equivalent to materials covered by certification schemes that fall within tier 1 of table 21 <b>Error! Reference source not found.</b>
<b>CITES list</b>	CITES (Convention on International Trade in Endangered Species) 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 development is on Appendix III it can be included as part of the assessment as long as the timber is not obtained from the country(ies) seeking to protect this species (see Additional Information for further details).
<b>A Government licence</b>	A Government licence e.g. UK Forestry Commission felling licence certificate, does not comply as a third party timber certification scheme for this credit, but can be used as evidence of legally sourced timber.
<b>Pre or post consumer waste</b>	Where materials being assessed (including timber) are part of a pre- or post-consumer waste stream, the EMS sections of the credit can be applied for; however, using an EMS scheme (ISO, EMAS etc.) for new timber does not demonstrate timber certification and therefore does not qualify for any of these BREEAM credits.
<b>Checklist A5</b>	Checklist A5 is contains information for the BREEAM assessor, including an explanation of what is required for each of the responsible sourcing tiers.

#### Schedule of Evidence Required

<b>Req.</b>	<b>Design Stage</b>	<b>Post Construction Stage</b>
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1	<p>Design plan and/or specification confirming:</p> <ul style="list-style-type: none"> <li>the location of elements and materials specified</li> <li>Details of the materials specified.</li> </ul>	<p>As built drawings or as built specifications confirming that the building has been constructed in accordance with the design stage drawings/specifications.</p> <p>Copies of purchase orders or receipts or certificate/letter of conformity for all applicable materials, including those recycled or reused</p>
2&3	<p>A copy of the output from the Responsible Sourcing of Materials Calculator Tool.</p> <p>AND EITHER</p> <p>A letter of intent from the design team confirming:</p> <ul style="list-style-type: none"> <li>The product shall be sourced from suppliers capable of providing certification to the level required for the particular tier claimed.</li> </ul> <p>OR</p> <p>If the material has been ordered, supplied or the supplier is known:</p> <ul style="list-style-type: none"> <li>Purchase order from the supplier including (as appropriate) Chain of Custody (CoC) number and/or BES6001:2008 Certificate number and/or EMS Certificate number</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>A copy of the CoC and/or BES6001 and/or EMS certificate.</li> </ul>	<p>A copy of the output from the Responsible Sourcing of Materials Calculator Tool (if different from Design Stage calculation).</p> <p>A copy of the CoC and/or BES6001 and/or EMS (EMAS/ISO14001) certificate.</p>
4	<p>Written confirmation from the developer confirming that:</p> <ul style="list-style-type: none"> <li>All timber will come from a 'legal source' and one not on the CITES list*.</li> </ul> <p>* Or in the case of Appendix III of the CITES list, it has not been sourced from the country seeking to protect this species as listed in Appendix III.</p>	<p>Where any non-certified timber is used, written confirmation from the supplier(s) confirming that:</p> <ul style="list-style-type: none"> <li>All timber comes from a legal source.</li> <li>All timber species and sources used in the development are not listed on any of the CITES appendices for endangered or threatened species (Appendix I, II, or III*).</li> </ul> <p>* Or in the case of Appendix III of the CITES list, it has not been sourced from the country seeking to protect this species as listed in Appendix III.</p>

### Additional Information

#### Calculation Procedure (using the Mat 5 calculator)

1. Choose from the list of options in the drop down box of the calculator the appropriate type of assessment and press the select button.

2. Choose from the list of options in the drop down box the relevant BREEAM scheme and press the select button (this selection ensures the appropriate 'generic specifications' for the building types are used).
3. For each element, select the number of different types of element you wish to enter in the relevant drop down box and press the select button. If the element is not present select '0'. Note: this will adjust the points required benchmarks accordingly.
4. For each element, select the 'data type' from the relevant drop down box. There are two or three options depending on the element type, 'Generic specification', 'Volume' or 'Percentage'. 'Generic specification' is not available for all element types.

#### Generic Specification

- a. Choose the specification from the relevant drop down box that matches the element specification for the building. If more than one construction specification is present for an element, select additional construction specifications from the list in element type 2, 3, 4 etc. (see point 3 for adding additional types). If no specification matches, then the specification will need to be assessed using one of the 'User Defined' methods.

Based on the specification selected from the drop down list the material types and their percentage will automatically be entered in the relevant cell of the *material type* and *percentage/volume of relevant materials present* columns. The assessor can then enter the percentage of each material that complies with either tier 1, 2, 3 or 4, as appropriate. At least 80% of the materials that make up an element type must comply with one or more of the tiers to achieve any points for that element type.

#### User Defined - Volume

- a. For all present elements, enter the names of the material types comprising each individual element in the relevant cell of the column *materials types*.
- b. Enter the volume of each individual material type in the relevant cell of the column titled *percentage/volume of relevant materials present*.
- c. Enter the total combined volume of the material types in the cell *total volume of element present*.
- d. Enter the volume of each material that complies with either tier 1, 2, 3 or 4, as appropriate. At least 80% of the total volume must comply with one or more of the tiers to achieve any points for that element type.

#### User Defined - Percentage

- a. For all present elements, enter the names of the material types comprising each individual element in the relevant cell of the column *materials types*.
- b. Enter the percentage of each individual material type (as a percentage of the whole element type) in the relevant cell of the column titled *percentage/volume of relevant materials present*.
- c. Enter the percentage of each material (as a percentage of the whole element type) that complies with either tier 1, 2, 3 or 4, as appropriate. At least 80% of the materials that make up an element type must comply with one or more of the tiers to achieve any points for that element type.

#### Combination

- a. A combination of *generic* and *user defined* data can be entered for any of the elements, simply select the number of element types you wish to enter for an element (point 3) and follow the above guidance.
3. Once all data has been entered correctly and in compliance with the criteria, the tool will calculate the total number of points achieved and translate this into the number of credits awarded.

The following scale is used to award credits for new builds and major refurbishment projects:

- a.  $\geq 15$  points            3 credits awarded
- b.  $\geq 10$  points            2 credits awarded
- c.  $\geq 5$  points              1 credit awarded

The following scale is used to award credits for fit-out projects:

- a.  $\geq 15$  points            2 credits awarded
- b.  $\geq 10$  points            1 credits awarded

Note: Where not all applicable elements are specified within the development, the number of points required to credits available are re-allocated based on the number of elements that are specified.

Although only 80% of the materials in an element have to be assessed, it may be beneficial to include even small percentages of materials that are in the higher tiers.



**Table 21 Responsible Sourcing Tier Levels and Criteria**

Tier level	Issue assessed	Points available per element	Evidence / measure assessed	Examples of compliant schemes
1	Legality & responsible sourcing	3	Certification scheme	FSC, CSA, SFI with CoC, PEFC, Reused Materials, Schemes compliant with BES6001:2008 (or similar) Excellent* and Very Good* Performance Ratings (Note; the EMS required to achieve these ratings must be independently certified)
2	Legality & responsible sourcing	2	Certification scheme	Schemes compliant with BES6001:2008 (or similar) Good* and Pass* Performance Ratings (Note; the EMS required to achieve these ratings must be independently certified)
3	Legality & responsible sourcing	1.5	Certification scheme/ EMS	Timber: MTCC, Verified**, SGS, TFT
				Other materials: Certified EMS for the Key Process and <i>Supply Chain</i> .
				Recycled Materials with certified EMS for the <i>Key Process</i>
4	Legality & responsible sourcing	1	Certification scheme/EMS	Certified EMS for key process stage.

**Note:**

Where any timber is used, it must be legally sourced. Where evidence cannot be provided to demonstrate legal sourcing for any element, no points can be awarded for the Responsible Sourcing Issue.

Where new in situ concrete (not existing concrete) is used, certification of the manufacture of the cement as the primary process, extraction of the aggregate and limestone used to make the cement as well as supply chain processes to be provided.

\* Performance ratings for schemes compliant with BES6001:2008 (or similar) can only be used to demonstrate compliance with the assessment criteria for this issue where certification covers the key process and supply chain processes for the material being assessed.

\*\* "Verified" is the name of a scheme produced by SmartWood.

**Table 22 EMS Criteria**

<b>Material</b>	<b>Key Process</b>	<b>Supply chain processes</b>
Brick (including clay tiles and other ceramics)	Product Manufacture	Clay Extraction
Resin-based composites and materials (including GRP and polymeric render but excluding timber based composites)	Composite product manufacture	Glass fibre production (or other principle matrix material) Polymer production
In situ Concrete (including ready mix and cementitious mortars and renders)	Ready mixed concrete plant	Cement production Aggregate extraction and production
Precast concrete and other concrete products (including blocks, cladding, precast flooring, concrete or cementitious roof tiles)	Concrete product manufacture	Cement production Aggregate extraction and production
Glass	Glass production	Sand extraction Soda Ash production or extraction
Plastics and rubbers (including polymeric renders, EPDM, TPO, PVC and VET roofing membranes)	Plastic/rubber product manufacture	Main polymer production
Metals (steel, aluminium etc)	Metal Product manufacture - e.g. cladding production, steel section production	Metal production: Steel: Electric arc furnace or Basic oxygen furnace process, Aluminium, ingot production, Copper: ingot or cathode production.
Dressed or building stone (including slate)	Stone product manufacture	Stone extraction
Plasterboard and plaster	Plasterboard or plaster manufacture	Gypsum extraction Synthetic gypsum (from flue gas desulphurisation) by default (recycled content)
Virgin timber	Timber from certified sources	Timber from certified sources
Cement Bonded Particle Board	Due to the significant cement content, in addition to requiring timber certification, the key supply chain process must also be considered to obtain the relevant tier: Timber from certified sources	Cement production Timber from certified sources
Wood panel and wood based composite products such as Oriented Strand Board, plywood, HPL, chipboard/particle, glulam, LVL, etc.)	Wood products, including those with recycled content, can only use the Timber Certification route	
Bituminous materials, such as roofing membranes and asphalt	Product manufacture	Bitumen production Aggregate extraction and production
Other mineral-based materials, including fibre cement and calcium silicate	Product manufacture	Cement production lime production other mineral extraction and production
Products with 100% recycled content	Product manufacture	Recycled input by default
Products with lower % of recycled content	Product manufacture	Supply chain process/processes for any virgin material in the relevant product type above. Recycled input by default
Any other product	Key processes is likely to be product manufacture	1 or 2 main inputs with significant production or extraction impacts should be identified
Excluded products: insulation materials, fixings, adhesives, additives	N/A	N/A

**Timber and Environmental Management Schemes (EMS)**

Where an Environmental management scheme is used to assess products made from recycled timber, 100% of the timber content must be recycled or sourced from one of the recognised timber certification schemes in Table 21 Responsible Sourcing Tier Levels and Criteria. A timber product with 50% recycled timber and 50% legally sourced timber will not comply with the criteria and will not be awarded any points.

Using an EMS for new timber does not demonstrate timber certification and therefore does not qualify for points.

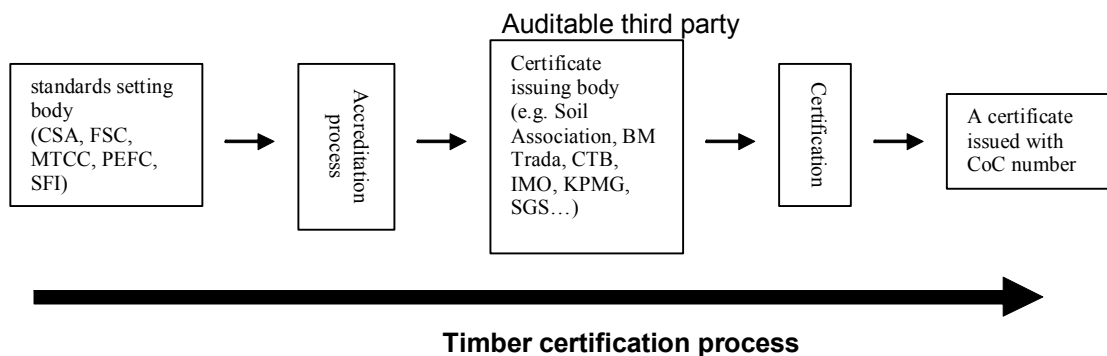
**Calculation procedure: Post Construction/Post Fit Out stage**

1. Check that the *As Built* construction matches that proposed at design stage (see *Schedule of Evidence*). Where there are any differences in the specification, obtain the relevant volumes and/ or percentages of materials for each element that differs.
2. Obtain the relevant confirmation of tier certification for post construction stage (see *Schedule of Evidence*) for all materials, from all sources/suppliers.
3. Confirm and/or re-assign a tier level to each material based on the level of certification provided (see Table 21 Responsible Sourcing Tier Levels and Criteria and *Information Required to Demonstrate Compliance*).
4. Adjust the design stage Responsible Sourcing Calculator accordingly to include any revised information following the calculation procedure used at design stage.

**Chain of Custody**

This is a process used to maintain and document the chronological history of the evidence/path for products from forests to consumers. Wood must be tracked from the certified forest to the finished product. All the steps, from transporting wood from the forest to a sawmill, until it reaches the customer, must maintain adequate inventory control systems that allow for separation and identification of the certified product. Chain-of-custody certification ensures that a facility has procedures in place to track wood from certified forests and avoid confusing it with non-certified wood. Chain-of-custody is established and audited according to relevant forest certification systems rules.

**Third party certification process**



CITES - Convention on International Trade in Endangered Species of wild fauna and flora (extract taken from the CITES website)

“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 authorized 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 utilization 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.”

#### Calculation of Timber Volumes

- a. Most of the information on areas, lengths and volumes of timber will be available from the component manufacturers or estimator, who should provide a detailed breakdown of quantities of materials.
- b. In order to calculate the volume of wood in timber frame windows, the total length of frame must be obtained. This can then be converted to a volume by multiplying the length of frame on fixed windows by 0.00653 and the length of frame on opening windows by 0.01089.
- c. In order to calculate the volume of timber in composite timber doors such as a flush door, calculate the total area of all doors summed over the whole building and multiply this by 0.02187 (this factor gives the total volume of timber in the doors and frames).

#### **BES 6001:2008 Framework Standard for Responsible Sourcing of Construction Products**

BES 6001:2008 is a BRE Global standard that provides a framework for the assessment of responsible sourcing schemes and provides a route to certification of construction products.

The framework comprises a number of criteria setting out the criteria of an organisation in managing the supply of construction products in accordance with a set of agreed principles of sustainability. To comply with the standard a product must meet a number of mandatory criteria, where a product demonstrates compliance beyond the mandatory levels, higher levels of performance can be achieved. The standard's performance ratings range from Pass to Good, Very Good and Excellent.

The development of this standard and subsequent certification schemes will, it is envisaged, provide construction products, not wholly covered under current recognised standards, a means for demonstrating their responsibly sourced credentials. In turn this will allow clients, developers and design teams to specify responsibly sourced construction products with greater assurance and provide a means of demonstrating compliance with the assessment criteria for this BREEAM issue.

To view a list of products approved to BES6001:2008 visit: [www.greenbooklive.com/page.jsp?id=169](http://www.greenbooklive.com/page.jsp?id=169).  
For further information about BES6001:2008, including a copy of the standard itself visit: [www.greenbooklive.com/page.jsp?id=153](http://www.greenbooklive.com/page.jsp?id=153)

#### **Relevant Definitions**

**Composite material:** can be defined as an engineered material made from two or more constituent materials with significantly different physical or chemical properties and which remain separate and distinct on a macroscopic level within the finished structure. Resin based composites such as GRP and polymeric render and timber composites such as Chipboard/Particleboard, MDF, OSB, plywood, hardboard, laminated veneered lumber, glulam and cement bonded particleboard are all required to be assessed for responsible sourcing.

**Frame:** The frame is any of the main structural elements that are not included in the roof, external walls and floors. For example, timber or metal studwork within a plasterboard partition would be included within the internal walls, and timber joists would be included within the floor construction.

Where a concrete or steel frame is used, this would be treated as the Frame as it would not be integral to the internal walls for example.

**Key Processes:** the final major aspects of processing that are carried out. There may be a single process or multiple processes requiring assessment, depending on the end product. The criteria for each of the assessed materials are detailed in Table 22 EMS Criteria.

**Legally Sourced Timber:** legal timber and wood derived products are those which originate from a forest where the following criteria are met:

1. The forest owner/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 & safety
  - e. Other parties' tenure and use rights
3. All relevant royalties and taxes are paid.
4. There is compliance with the criteria of CITES.

Relevant documentation demonstrating the above must be provided or made available on request subject to the availability of such materials in the country concerned. Certification from any of the timber certification schemes identified in tiers 1, 2 and 4 for this credit demonstrate legally sourced timber.

**Pre-consumer waste stream:** Waste material generated during manufacturing processes. Excluded is reutilisation of materials such as rework, regrind or scrap generated in a process and capable of being reclaimed within the same process that generated it.

**Post-consumer waste stream:** Waste material generated by households or by commercial, industrial and institutional facilities in their role as end-users of the product, which can no longer be used for its intended purpose. This includes returns of material from the distribution chain.

**Responsible Sourcing:** Demonstrated through auditable third party certification schemes.

**Reused materials:** Materials that can be extracted from the waste stream and used again without further processing, or with only minor processing, that does not alter the nature of the material (e.g. cleaning, cutting, fixing to other materials).

**Recycled Material:** Materials diverted from the pre-consumer and/or post-consumer waste streams that require significant processing before they can be used again. For further information please see *Calculating and declaring recycled content in construction products, "Rules of Thumb" Guide* (WRAP, 2008) [www.wrap.org.uk/wrap\\_corporate/news/wraps\\_rules\\_of.html](http://www.wrap.org.uk/wrap_corporate/news/wraps_rules_of.html).

**Responsible Sourcing Calculator:** A BRE spreadsheet-based tool designed to simplify assessment of this issue. Access is provided to all BRE licensed BREEAM assessors.

**Supply Chain EMS:** covers all of the major aspects of processing and extraction involved in the supply chain for the end product. Note that recycled materials are not required to demonstrate a Supply Chain EMS. If EMS certification is provided for the Key Processes for recycled materials, this is assumed by default.

**Small Company:** A company is defined as 'small' if it satisfies at least two of the following criteria:

- a. A turnover of not more than €10 million;
- b. 50 employees or fewer.

This is based on the definition stated in the European Directive 2003/361/CE.

**Tier levels** – a graded scale to reflect the rigour of the certification scheme used to demonstrate responsible sourcing, forming the basis for awarding points (all as detailed in Table 21 Responsible Sourcing Tier Levels and Criteria).

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
2	2	2	Mat 6 - Insulation	P	G	VG	E	O
				-	-	-	-	-

### Aim

To recognise and encourage the use of thermal insulation which has a low embodied environmental impact relative to its thermal properties and has been responsibly sourced.

### Assessment Criteria

The following demonstrates compliance:

- Any new insulation specified for use within the following building elements must be assessed:
  - External walls
  - Ground floor
  - Roof
  - Building services

#### First credit - Embodied Impact

- The Green Guide rating for the thermal insulation materials must be determined. Green Guide ratings for thermal insulation can be found at: [www.thegreenguide.org.uk](http://www.thegreenguide.org.uk) (please refer to the Compliance Notes for guidance where specific insulation has been assessed within an element for the Mat 1 BREEAM issues).
- Where the *Insulation Index* for the building insulation is the same as or greater than 2.
- The *Insulation Index* is calculated using the *Mat 6 Insulation Index Calculator Tool* in the BREEAM assessor's spreadsheet tool. For each type of thermal insulation used in the relevant building elements, the volume weighted thermal resistance provided by each type of insulation is calculated as follows:
  - (Area of insulation (m<sup>2</sup>) \* thickness(m)) / Thermal Conductivity (W/ m.K) **OR**
  - Total volume of insulation used (m<sup>3</sup>) / Thermal conductivity (W/m.K)

The volume weighted thermal resistance for each insulation material is then multiplied by the relevant Green Guide point(s) from the following table:

**Table 23 Green Guide rating points/element**

Green Guide Rating	Points/element
A+	3
A	2
B	1
C	0.5
D	0.25
E	0

To calculate the *Insulation Index*, the sum of these values is divided by the sum of the volume weighted thermal resistance values (an example calculation is provided in the Additional Information section).

### Second credit - Responsible Sourcing

5. At least 80% of the thermal insulation used in the building elements identified in Item 1 must be responsibly sourced, i.e. each insulation product must be certified in accordance with Levels 1, 2 or 3 described in Table 21 *Tier levels and criteria*, as outlined in Mat 5. Table 24 below shows the Key Processes and Supply Chain processes required for common insulation products.

**Table 24 EMS criteria for insulation products**

Material	Key Process	Supply chain processes
Foam Insulation	Insulation manufacture	Principal Polymer production, e.g. Polystyrene, MDI , Phenolic resin or equivalent
Stone wool, glass & cellular glass made using < 50% recycled input	Product manufacture	Any quarried or mined mineral over 20% of input
Wool	Product manufacture	Wool Scouring
Products using > 50% recycled content except those using timber	Product manufacture	Recycled content by default
Timber-based insulation materials including those using recycled timber	Product manufacture	Recycled timber by default, all other timber from one of the recognised timber certification schemes in Table 13.
Other renewable-based insulation materials using agricultural by-products (e.g. straw)	Product manufacture	By-product manufacture by default
Any other product	Product manufacture	1 or 2 main inputs with significant production or extraction impacts should be identified

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new build projects.
<b>Refurbishment</b>	There are no additional or different requirements to those outlined above specific to new build projects.
<b>Extensions to existing buildings</b>	There are no additional or different criteria to those outlined above specific to the assessment of extensions to existing buildings.
<b>Fit Out Only</b>	For a Fit Out only assessment the criteria apply to all types of new insulation specified, typically this may only require the insulation for the building services to comply. Where no new insulation is specified as part of the fit-out works, the compliance note for refurbishment projects (above) applies.

<b>Shell Only</b>	<p>It is envisaged that the majority (80%+) of fabric/services insulation will be specified/installed in the shell and core building. Where the shell only developer is not installing the majority of insulation, compliance with this BREEAM issue for the tenanted areas of the building can be demonstrated via one of the following means:</p> <ul style="list-style-type: none"> <li>• Option 1 – Use of a tenancy lease agreement between the developer and tenant/s (full value of available credits)</li> <li>• Option 2 – A Green Building Guide for tenant fit outs (half the value of the available credits)</li> <li>• Option 3 – Developer/Tenant collaboration (full value of available credits)</li> </ul> <p>Where compliance with the assessment criteria cannot be demonstrated for all relevant areas of the building the available credits must be withheld (option 4).</p> <p>Refer to the <i>Scope</i> section 2.2 <i>Types of project that can be assessed using BREEAM</i> (Shell and Core / Speculative Assessments) for further description of the above options.</p>
<b>Awarding credits</b>	Both credits can be awarded independently of each other - i.e. it is not a requirement of the second credit that the first is achieved, and vice-versa.
<b>Element consisting of more than one insulation</b>	Where more than one insulation type is present for a given element, the rating, area and conductivity for each insulation should be entered into the tool and an average is calculated (by area).
<b>Insulation incorporated as part of an off-site manufactured element</b>	If the insulation is incorporated as a component of an element that has been manufactured offsite e.g. a wall or roof, and that element has been assessed as part of Mat 1, then for the purpose of assessing the insulation for this BREEAM issue, a Green Guide rating of A+ should be used. The same rule applies to insulation that has a significant additional function, such as providing supporting structure e.g. structural insulated panels (SIPS). In the Green Guide the actual insulation will be listed within the element title, rather than under the generic insulation category.
<b>Refurbishment and materials reused in-situ</b>	For each element that is reused in-situ, BREEAM allocates an 'A+' rating. For the purpose of responsible sourcing, existing in-situ insulating materials are not assessed. If no new insulating products are being specified as part of the refurbishment both credits can be awarded.
<b>Finding exact Green Guide Ratings</b>	Where no similar insulation can be found assessors should seek guidance from BRE on the appropriate rating.
<b>Insulation incorporated as part of an off-site manufactured element</b>	If the insulation is incorporated as a component of an element that has been manufactured offsite e.g. a wall or roof, and that element has been assessed as part of Mat 1, then for the purpose of assessing the insulation for this BREEAM issue, this element may be excluded from the assessment. The same rule applies to insulation that has a significant additional function, such as providing supporting structure e.g. structural insulated panels (SIPS). .
<b>Refurbishment and materials reused in-situ</b>	For the purpose of responsible sourcing, existing in-situ insulating materials are not assessed. If no new insulating products are being specified as part of the refurbishment both credits can be awarded.



### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
<b>First credit</b>		
1-4	Marked-up design plan/elevations and/or a copy of the specification confirming: <ul style="list-style-type: none"> <li>The location of insulating materials.</li> <li>The area (m<sup>2</sup>) and thickness (m) or volume (m<sup>3</sup>) of insulation specified.</li> </ul> Manufacturer's technical details confirming: <ul style="list-style-type: none"> <li>Thickness and thermal conductivity of the insulating materials specified.</li> </ul> A copy of the output from the Insulation Index Calculator Tool.  The Green Guide rating and element number for the assessed insulation specifications.	Assessor's building/site inspection and photographic evidence confirming: <ul style="list-style-type: none"> <li>Element in-situ (where possible)</li> </ul> <b>AND</b>  As built drawings and, where relevant, written design team confirmation of any changes to the materials specification.
<b>Second credit</b>		
5	Evidence (as outlined in Mat 5) confirming compliance for the insulating materials.	Evidence (as outlined Mat 5) confirming compliance.

### Additional Information

#### Relevant definitions

**Insulation Index:** A measure of performance used in BREEAM that seeks to assess the thermal properties of insulation products used in the building relevant to the embodied impact of that insulating material.

**Insulation Index Calculator Tool:** A spreadsheet tool used by the BREEAM assessor to determine the Insulation Index and therefore, whether the BREEAM credit is achieved.

#### Example calculation

The Insulation Index is calculated for a building using the following types of insulation as follows:

##### Type 1 Walls

Area = 450m<sup>2</sup>. Thermal insulation thickness = 100mm. Thermal conductivity = 0.023 W/mK Green Guide rating = A (2 points)

Area weighted thermal resistance:  $((450 \times 0.100) / 0.023) = 1956$

Green Guide rating correction:  $1956 \times 2.0 = 3912$

##### Type 2 Building Services

Volume of insulation used = 21m<sup>3</sup>. Thermal conductivity = 0.022 W/mK

Green Guide rating = C (0.5 points)

Area weighted thermal resistance:  $(21 / 0.022) = 955$

Green Guide rating correction:  $955 \times 0.5 = 477$

##### Type 3 Roof

Area = 210m<sup>2</sup>. Thermal insulation thickness = 120mm. Thermal conductivity = 0.027 W/mK Green Guide rating = A+ (3 points)

Area weighted thermal resistance:  $((210 \times 0.120) / 0.027) = 933$

Green Guide rating correction:  $933 \times 3.0 = 2799$

Type 4 Ground Floor

Area = 210m<sup>2</sup>. Thermal insulation thickness = 120mm. Thermal conductivity = 0.027 W/mK Green Guide rating = B (1 point)

Area weighted thermal resistance:  $((210 \times 0.120) / 0.027) = 933$

Green Guide rating correction:  $933 \times 1.0 = 933$

Total area weighted thermal resistance =  $1956 + 955 + 933 + 933 = 4777$

Green Guide rating correction =  $3912 + 477 + 2799 + 933 = 8121$

Insulation Index:  $\text{Green Guide Rating Correction} / \text{Total Area weighted thermal resistance} = 8121 / 4777 = 1.7$  (credit not achieved).

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	1	1	Mat 7 - Designing for Robustness	P	G	VG	E	O
				-	-	-	-	-

### Aim

To recognise and encourage adequate protection of exposed parts of the building and landscape, therefore minimising the frequency of use of replacement materials.

### Assessment Criteria

The following demonstrates compliance:

1. Internal and external areas of the building where vehicular, trolley and pedestrian movement occur have been identified.
2. Suitable durability and protection measures or design features have been specified to prevent damage to the vulnerable parts of these building areas from such traffic. This must include, but is not necessarily limited to:
  - a. Protection from the effects of high pedestrian traffic in main entrances, public areas and thoroughfares (corridors, lifts, stairs, doors etc).
  - b. Protection against any internal vehicular/trolley movement within 1m of the internal building fabric in storage, delivery, corridor and kitchen areas.
  - c. Protection against, or prevention from, any potential vehicular collision where vehicular parking and manoeuvring occurs within 1m of the external building façade for all car parking areas and within 2m for all delivery areas.

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to the assessment of new build projects.
<b>Refurbishment</b>	Where the assessment is of a refurbished building on an existing site then the criteria apply to the areas that form a part of the works or hard landscape for that building.
<b>Extensions to existing buildings</b>	There are no additional or different criteria to those outlined above specific to the assessment of extensions to existing buildings.
<b>Shell Only</b>	There are no additional or different criteria to those outlined above specific to shell only assessments.
<b>Fit Out Only</b>	There are no additional or different criteria to those outlined above specific to fit out only assessments.
<b>Suitable durability measures</b>	<p>Suitable durability and protection measures to vulnerable parts of the building can include:</p> <ul style="list-style-type: none"> <li>• Bollards/barriers/raised kerbs to delivery and vehicle drop-off areas</li> <li>• Robust external wall construction, up to 2m high</li> <li>• Protection rails to walls of corridors</li> <li>• Kick plates/impact protection (from trolleys etc) on doors</li> <li>• Hard-wearing and easily washable floor finishes in heavily used circulation areas (i.e. main entrance, corridors, public areas etc)</li> </ul>

<b>Vehicle Impact Protection</b>	<p>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.</p> <p>In vehicle movement areas only; where the specification of 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.</p>
<b>Public / Common Areas</b>	Consideration should be given to materials specification in public/common areas (especially public waiting areas and toilet areas) to provide protection against potential malicious or physical abuse in as far as it is possible.
<b>Sales areas</b>	In any sales areas, where customer goods trolleys will be used, protection must be provided to vulnerable parts of the building (such as glass curtain walling etc.) within 1m of trolley movement.

### Schedule of Evidence Required

<b>Req.</b>	<b>Design Stage</b>	<b>Post Construction Stage</b>
1	Design drawings marked up to illustrate: <ul style="list-style-type: none"> <li>Vulnerable areas/parts of the building.</li> </ul>	Assessor's building/site inspection and photographic evidence confirming: <ul style="list-style-type: none"> <li>Vulnerable areas of the building</li> <li>The durability measures in-situ.</li> </ul>
2	Design drawings and/or specification confirming: <ul style="list-style-type: none"> <li>The durability measures specified.</li> </ul>	

### Additional Information

#### Relevant definitions

None

## 10.0 Waste

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
3	3	3	Wst 1 - Construction Site Waste Management	-	-	-	-	-

### Aim

To promote resource efficiency via the effective and appropriate management of construction site waste.

### Assessment Criteria

The following demonstrates compliance:

#### First credit

1. Where a Site Waste Management Plan (SWMP) – see definition in the Additional Information section - has been developed and implemented in accordance with Checklist A15a.:
2. In addition to the above, sites with existing buildings that will be refurbished or demolished, where demolition forms a part of the principal contractor's works contract, must comply with the following:
  - a. Completed a pre-demolition/pre-refurbishment audit of the existing building to determine if, in the case of demolition, refurbishment is feasible and, if not, to maximise the recovery of material from demolition or refurbishment for subsequent high-grade/value applications. The audit must be referenced in the SWMP and cover:
    - i. Identification of the key refurbishment/demolition materials.
    - ii. Potential applications and any related issues for the reuse and recycling of the key refurbishment and demolition materials.

#### Second credit

1. The first credit has been achieved.
2. Targets are set to reduce waste generated on site. These should be reported and justified as part of the SWMP implementation and on completion.
3. At least three key waste groups have waste reduction potential at Design stage (Checklist A15b). These should be reviewed throughout the construction process as part of implementing SWMP, and results reported in the SWMP on completion.

#### Third credit

1. At least three key waste groups or the minimum required by local regulations plus one, whichever is the most onerous, are identified for diversion from landfill at pre-construction stage SWMP and Checklist A15b has been completed accordingly.

2. Waste is sorted accordingly, either on site or offsite through a licensed external contractor where separation on the construction site is not feasible.
3. This should be quantified and reviewed during the construction phase and reported in the SWMP upon collection.
4. In addition, where there is already a national mandatory requirement to recover all waste, or where the national C&D waste recovery rate is more than 80%,
  - a. The first and second credits have been achieved.
  - b. All waste arising on site are identified for diversion from landfill at pre-construction stage.

#### **Exemplary level criteria**

The following outlines the exemplary level criteria to achieve an *innovation credit* for this BREEAM issue.

1. All three credits have been achieved.
2. All key waste groups are identified for diversion from landfill at pre-construction stage SWMP.
3. At least five key waste groups have waste reduction potential at Design stage (Checklist A15b). These should be reviewed throughout the construction process as part of implementing SWMP, and results reported in the SWMP on completion.
4. At least five key waste groups or the minimum required by local regulations plus three, whichever is the most onerous, are identified for diversion from landfill at pre-construction stage SWMP and Checklist A15b has been completed accordingly.

Buildings complying with the exemplary level criteria would therefore achieve four credits for this issue.

<b>Compliance Notes</b>	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	If the building is part refurbishment part new-build extension then the whole building must be used to determine compliance with this issue. For assessments of extensions to existing buildings, where only the extension is being assessed, it is the extension only that must comply.
<b>Shell Only</b>	There are no additional or different criteria to those outlined above specific to shell-only assessments.
<b>Fit Out Only</b>	There are no additional or different criteria to those outlined above specific to fit-out-only assessments.

<b>Resource efficiency targets</b>	<p>The objective of the second credit is to encourage developers and contractors to minimise the amount of waste arising on site through the definition and regular review of target benchmarks. BRE Global will not advice on the targets as these must be set according to best practice and will depend on the type of waste and the opportunities for reuse on site. Review of the amount of waste arising on previous projects and national best practice guidelines should be used wherever possible.</p> <p>The BREEAM International assessor shall demonstrate in the assessment report how those targets have been set and BRE Global will verify that adequate procedures have been put in place to monitor the amount of waste against those benchmarks.</p> <p>Please refer to <a href="http://www.smartwaste.co.uk/page.jsp?id=37">http://www.smartwaste.co.uk/page.jsp?id=37</a> for further information and indicative benchmarks by project type used in the UK. Targets for waste minimisation during the construction process can also be set using the Construction Excellence's Environmental performance indicator benchmarks (see <a href="http://www.constructionexcellence.org.uk">www.constructionexcellence.org.uk</a>).</p>
<b>Pre-demolition/pre-refurbishment audit</b>	<p>A pre-demolition/pre-refurbishment audit should be carried out using an appropriate methodology. BRE have developed a tool as part of the SMARTWaste system for carrying out such audits, and the UK Institution of Civil Engineers has produced guidance on pre-demolition audits, including 'A report on the Demolition Protocol'<sup>4</sup>.</p>
<b>Key waste groups</b>	<p>For the purposes of the second credit, waste groups with a reduction potential should be defined in accordance with the key waste groups defined in the European Waste Catalogue (please see Checklist A15b for the exact list).</p> <p>For the purposes of the third credit however, different types of waste may be grouped together in order to be recovered, e.g. concrete and bricks may be crushed together to produce recycled aggregates where this is supported by national/regional waste management regulation/policy/practice. Therefore, waste groups identified for diversion from landfill might be different to those listed in the European Waste Catalogue. In order for the credit to be awarded, distinct end recovery products should be identified.</p>
<b>Segregation of hazardous waste</b>	<p>Hazardous waste should be segregated on at source, to avoid contaminating non-hazardous waste streams. This is standard practice across Europe and therefore no credit will be awarded for segregating hazardous waste.</p>
<b>Limited site space for segregation and storage</b>	<p>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/recycled as appropriate.</p>
<b>Diversion from landfill</b>	<p>Any waste management operation that diverts a Construction &amp; Demolition waste material from the waste stream and which results in productive use, will be considered as acceptable for the purposes of the third credit. Acceptable routes are as follows;</p> <ul style="list-style-type: none"> <li>• Reused on site (in-situ or for new applications)</li> <li>• Reused on other sites</li> <li>• Salvaged/reclaimed for reuse</li> <li>• Returned to the supplier via a 'take-back' scheme</li> <li>• Recovered from site by a licensed external contractor and recycled.</li> </ul> <p>Recovery routes such as filling disused mines/other underground voids (except where these are required to be carried out to avoid anticipated risks to health and safety, economic activity or the natural environment) or general disposal of waste will not be considered acceptable.</p>

<b>Minor refurb/fit outs</b>	In some cases such as minor refurb/fit outs, it may not be feasible to sort and recycle five of the key waste groups. This may be because the materials are not present or because there is insufficient quantity (e.g. less than 4.5 m <sup>3</sup> of materials). In such cases, the third credit may be awarded if all applicable waste groups are being reused/recycled.
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### Schedule of Evidence Required

<b>Req.</b>	<b>Design Stage</b>	<b>Post Construction Stage</b>
<b>First credit</b>		
All	<p>A copy of the compliant Site Waste Management Plan containing the appropriate benchmarks, commitments and procedures.</p> <p>Where relevant, a copy of the pre-demolition/pre-refurbishment audit.</p> <p><b>OR</b></p> <p>A copy of the specification clause that:</p> <ul style="list-style-type: none"> <li>• Requires the principal contractor to produce a SWMP in line with the criteria</li> <li>• Contains the detailed criteria with respect to procedures to be included in the SWMP</li> <li>• Where relevant, requires the principal contractor to carry out a pre-demolition/pre-refurbishment audit.</li> </ul> <p><b>OR</b></p> <p>A letter from the client or their representative containing:</p> <ul style="list-style-type: none"> <li>• Confirmation that the specification will contain a clause on site waste management criteria.</li> <li>• An outline of the detailed criteria that will be included in that specification clause.</li> </ul> <p><b>AND in all cases</b></p> <p>A copy of the completed Checklist A15a</p>	<p>A copy of the SWMP summary datasheets or equivalent monitoring records/report and completed final copy of Checklist A15a if different from design stage confirming:</p> <ul style="list-style-type: none"> <li>• The total waste arising for the development.</li> <li>• Comparison of the total waste arising against the benchmark</li> </ul> <p>Where relevant, a copy of the pre-demolition/pre-refurbishment audit.</p>
<b>Second credit</b>		
1	Evidence (as outlined above) confirming compliance with the second credit.	Evidence (as outlined above) confirming compliance with the second credit.
2, 3	<p>A copy of the specification clause or site specific waste policy/procedure confirming:</p> <ul style="list-style-type: none"> <li>• Detail of the key waste groups</li> <li>• Targets for waste minimisation</li> <li>• An outline of the procedures to minimise waste</li> </ul>	<p>A copy of the SWMP summary datasheets or equivalent monitoring records/report confirming:</p> <ul style="list-style-type: none"> <li>• The total waste arising for the development and for the defined key waste groups,</li> <li>• Comparison of the total waste arising</li> </ul>



	<p><b>OR</b></p> <p>A letter from the client or their representative containing:</p> <ul style="list-style-type: none"> <li>Detailed requirements with respect to waste minimisation target(s) and identification of waste reduction potential.</li> </ul> <p><b>AND in all cases</b></p> <p>A copy of the completed Checklist A15b</p>	<p>against the benchmark</p> <p>Completed final copy of Checklist A15b if different from design stage</p>
<p><b>Third credit and exemplary level requirement</b></p>		
<p>1</p>	<p>A copy of the specification or procedure confirming:</p> <ul style="list-style-type: none"> <li>Detail of the key waste groups</li> <li>Reuse/recycling procedures</li> </ul> <p>Where relevant, letter from the licensed external contractor confirming:</p> <ul style="list-style-type: none"> <li>Segregation of materials is carried out to the correct standards and that materials are reused/recycled as appropriate.</li> </ul> <p><b>OR</b></p> <p>A letter from the client or their representative containing:</p> <ul style="list-style-type: none"> <li>Confirmation that the specification will contain a clause on sorting construction waste.</li> <li>Detailed requirements with respect to recycling benchmarks and target(s)</li> <li>Reuse/recycling procedures</li> </ul> <p>In addition, where there is already a national mandatory requirement to recover all waste, or where the national C&amp;D waste recovery rate is more than 80%:</p> <ul style="list-style-type: none"> <li>Evidence (as outlined above) confirming compliance with the first and second credits.</li> </ul>	<p>Monitoring records/report confirming:</p> <ul style="list-style-type: none"> <li>Quantities of waste by groupings</li> <li>Amount and proportion of waste arising that was reused, recycled and landfilled</li> <li>Custody/application/destination of reused/recycled materials.</li> </ul> <p>In addition, where there is already a national mandatory requirement to recover all waste, or where the national C&amp;D waste recovery rate is more than 80%: Evidence (as outlined above) confirming compliance with the first and second credits.</p>

**Additional Information**

**Relevant definitions**

**European Waste Catalogue:** list of wastes that has been produced by the EU to standardise the description of waste across Europe and to enable waste to be recorded, monitored and controlled more effectively.

**Significant Majority:** Defined as meeting at least the percentages required within the issue compliance section of this manual.

**Site Waste Management Plan (SWMP):** SWMP aims to promote resource efficiency and to prevent illegal waste activities. Resource efficiency includes minimising waste at source and ensuring that clients, designers and principal contractors assess the use, reuse and recycling of materials and products on and off the site. BREEAM does not require targets to be met but is encouraging the process of setting, monitoring and reporting against targets.

The implementation of a Site Waste Management Plan (SWMP) can help manage the site construction waste produced. A SWMP consists of a combination of commitments to:

- a. design out waste
- b. reduce waste generated on site
- c. develop and implement procedures to sort and reuse/recycle construction waste on and off site (as applicable).

A Site Waste Management Plan should typically include the following features;

- Identify who is responsible for producing the SWMP and ensuring that it is followed. They should have sufficient authority to ensure that others comply with the SWMP.
- Identify the types and estimated quantities of waste that will be produced at all stages of the work programme/plan.
- Identify waste management options including reference to the waste hierarchy (reduce, re-use, recycle), on- and off-site options, paying particular attention to arrangements for identifying and managing any hazardous wastes produced.
- Identify waste management sites and contractors for all wastes that require them. Ensure that the contracts are in place, emphasising compliance with any legal responsibilities that may exist.
- Set targets and procedures for monitoring progress.
- Confirmation is required that the site's construction waste is being monitored.
- Measure how much waste and what types of waste are produced. These figures should be recorded on an established system such as SmartWaste

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 Plan** ([www.smartwaste.co.uk](http://www.smartwaste.co.uk)) is a free web-based tool for preparing, implementing and reviewing a SWMP. This tool includes an integrated waste measurement tool which is aligned to defined waste groups. SMARTWaste Plan will manage all aspects of creating SWMPs and measuring waste generated on projects. Templates are available to meet the BREEAM credits and can also be downloaded. The tool includes online waste measurement, industry waste benchmarks. A carbon calculator and economic assessment of waste will also be added.

#### **UK construction waste benchmarks**

The following benchmarks used have been derived from BRE's SMARTWaste system and through a DEFRA-funded project for predicting construction waste and are updated annually. The benchmarks are based on real-life data and have been subject to a number of statistical and logical tests. The benchmarks used apply to actual volume, and standard conversion factors have been used for tonnages from the Environment Agency.

For more information on these benchmarks and to break them down by project type, please go to <http://www.smartwaste.co.uk/page.jsp?id=37>

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	1	1	Wst 2 - Recycled Aggregates	P	G	VG	E	O
				-	-	-	-	-

### Aim

To recognise and encourage the use of recycled and secondary aggregates in construction, thereby reducing the demand for virgin material.

### Assessment Criteria

The following demonstrates compliance:

1. Where the amount of recycled and secondary aggregate specified is over 25% (by weight or volume) of the total *high-grade* aggregate uses for the building. Such aggregates can be **EITHER**:
  - a. Obtained on site **OR**
  - b. Obtained from waste processing site(s) within a 30km radius of the site or from a higher distance but transported by rail or water to the construction site; the source will be principally from construction, demolition and excavation waste (CD&E) – this includes road planings **OR**
  - c. Secondary aggregates obtained from a non-construction post-consumer or post-industrial by-product source (see Compliance Notes).

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	The credit available for this issue can be awarded automatically where no new aggregate is being used. Potentially the case in most refurbishments.
<b>Extensions to existing buildings</b>	There are no additional or different criteria to those outlined above specific to the assessment of extensions to existing buildings.
<b>Shell Only</b>	There are no additional or different criteria to those outlined above specific to shell-only assessments. Where the shell and fit-out phases of the building are awarded to two different contractors, only the contractor of the shell and core phase should be assessed.
<b>Fit Out Only</b>	Issue not applicable for Fit-Out-only assessments

<b>Secondary aggregates</b>	<p>Recognised non-construction post-consumer or post-industrial by-products include:</p> <ul style="list-style-type: none"> <li>• China clay waste</li> <li>• Slate overburden</li> <li>• Pulverised Fuel Ash (PFA)</li> <li>• Ground Granulated Blast Furnace Slag (GGBFS)</li> <li>• Air-cooled blast furnace slag</li> <li>• Steel slag</li> <li>• Furnace bottom ash (FBA)</li> <li>• Incinerator bottom ash</li> <li>• Foundry sands</li> <li>• Recycled glass</li> <li>• Recycled plastic</li> <li>• Tyres</li> <li>• Spent oil shale</li> <li>• Colliery spoil</li> <li>• Municipal Solid Waste Treatment Residues</li> </ul>
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### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
1	<p>A copy of the relevant specification or contract clause confirming:</p> <ul style="list-style-type: none"> <li>• Recycled and secondary aggregate use criteria for the project.</li> </ul> <p>A letter from the design team or main contractor confirming:</p> <ul style="list-style-type: none"> <li>• The source of recycled/secondary aggregates</li> <li>• The amount and quality required can be obtained from this source.</li> </ul>	<p>Structural engineers calculations demonstrating the weight/volume of:</p> <ul style="list-style-type: none"> <li>• Total high grade aggregate used.</li> <li>• Total recycled and secondary aggregates used.</li> </ul> <p>Third party documentation as follows:</p> <p>Delivery notes for all recycled and secondary aggregates confirming:</p> <ul style="list-style-type: none"> <li>• Source of recycled/secondary aggregate.</li> </ul> <p><b>AND/OR</b></p> <p>A letter or email from the aggregate/concrete supplier confirming that:</p> <ul style="list-style-type: none"> <li>• The aggregate supplied and used was from a recycled/secondary source</li> <li>• Source of recycled/secondary aggregate.</li> </ul>

### Additional Information

#### Relevant definitions

**High Grade aggregate** uses are considered to be:

#### Bound

- Structural frame;
- Floor slabs including ground floor slabs;
- Bitumen or hydraulically bound base, binder, and surface courses for paved areas and roads.

#### Unbound

- Asphalt-based or similar road surfaces
- Granular fill and capping

- Pipe bedding
- Sub bases/building foundations
- Gravel landscaping.

More examples of how recycled and secondary aggregates can be used in construction can be found at <http://www.aggregain.org.uk/opportunities/index.html>. 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 landfill costs. Where national building regulations limit the use of recycled aggregates in concrete, this typically applies to bound aggregate uses as listed above. Where this applies to unbound uses too, please contact BRE for further guidance,

**Pre-consumer waste stream:** Waste material generated during manufacturing processes. Excluded is reutilisation of materials such as rework, regrind or scrap generated in a process and capable of being reclaimed within the same process that generated it.

**Post-consumer waste stream:** Waste material generated by households or by commercial, industrial and institutional facilities in their role as end-users of the product, which can no longer be used for its intended purpose. This includes returns of material from the distribution chain.

**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:** By-products of industrial processes that can be processed to produce secondary aggregates. Secondary Aggregates are sub-divided into manufactured and natural, depending on their source.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	1	1	Wst 3 - Recyclable Waste Storage	-	-	-	1	1

### Aim

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To recognise the provision of dedicated storage facilities for a building's operational-related recyclable waste streams, so that such waste is diverted from landfill or incineration.

### Assessment Criteria

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The following demonstrates compliance:

1. A dedicated storage space to cater for recyclable materials generated by the building during occupation, compliant with the following:
  - a. Clearly labelled for recycling
  - b. Placed within accessible reach of the building (see Compliance Notes)
  - c. In a location with good vehicular access to facilitate collections.
2. The size of the space allocated must be adequate to store the likely volume of recyclable materials generated by the building's occupants/operation. Whilst a fixed area cannot always be given, the following must be complied with as a minimum:

#### OFFICES ONLY

- a. At least 2m<sup>2</sup> per 1000m<sup>2</sup> of net floor area for buildings <5000m<sup>2</sup>
- b. A minimum of 10m<sup>2</sup> for buildings ≥5000 m<sup>2</sup>
- c. An additional 2m<sup>2</sup> per 1000m<sup>2</sup> of net floor area where catering is provided (with an additional minimum of 10m<sup>2</sup> for buildings ≥5000m<sup>2</sup>).

#### INDUSTRIAL ONLY

- a. The space provided should allow a hardstanding area that is adequate to enable the occupier to recycle materials from the operational area(s) effectively **PLUS**
- b. At least 2m<sup>2</sup> per 1000m<sup>2</sup> of net office floor area for buildings <5000m<sup>2</sup>; a minimum of 10m<sup>2</sup> for buildings ≥5000m<sup>2</sup>
- c. The dedicated space must cater for the separation and storage of the following types of recyclable materials (where generated by the end user) in accordance with the local waste collection scheme requirements:
  - Paper
  - Cardboard
  - Glass
  - Plastics
  - Packaging
  - Metals
  - Timber
  - Other process related recyclable waste.

**RETAIL ONLY**

- a. The space is sized according to the number and area of retail units that it will serve and the predicted volumes of waste that will arise from those areas.
- b. The dedicated space must cater for the separation and storage of a minimum of 6 different types of recyclable materials in accordance with the local waste collection scheme requirements, these may include:
  - Paper
  - Cardboard
  - Plastics (including packaging film)
  - Other packaging materials (not covered above)
  - Glass (segregated into brown, green and clear glass)
  - Metals
  - Batteries
  - Timber
  - Fluorescent lamps
  - Vegetable oils
  - Mineral oils
  - Food waste
  - Other process related recyclable waste.

Note: For assessments of building/units for service providers please refer to the Compliance Notes.

<b>Compliance Notes</b>	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	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 waste from the new and existing buildings.
<b>Shell Only</b>	There are no additional or different criteria to those outlined above specific to shell-only assessments.
<b>Fit Out Only</b>	Where the assessment stakeholder is a site-based tenant, who occupies a unit/floor within a larger development and uses central or common storage facilities (provided for by a landlord), then such facilities can be used to assess compliance.
<b>Accessible reach of the building</b>	Typically 'accessible reach' is defined in BREEAM as within 20m of a building entrance. In some circumstances, depending on the size of the building, site restrictions or tenancy arrangements, it may not be possible to meet a 20m requirement. If it is the opinion of the assessor that it is not feasible to meet this 20m requirement then they can use their judgement to determine if the facility is in an easily accessible location for building occupants and vehicle collection and to state their reasons in the assessment report.
<b>Inside storage area</b>	Storage areas for recyclable waste may be located inside the building where there are site restrictions as long as all the BREEAM requirements are met, and in particular the area remains in a location with good vehicular access. This supposes that if collections were to be done at night, access to the building will still be granted.

<b>Industrial buildings with an unknown end occupier</b>	Where the end occupier is not known, the space provided for recyclable waste arising from the operational area cannot be assessed. Therefore, the BREEAM International assessor should check that a hardstanding area for at least one standard 8 cubic yard skip (for units with an operational area of <math><1000\text{m}^2</math>) and two standard 8 cubic yard skips (for units with an operational area $\geq 1000\text{m}^2$ ) has been provided as a minimum in addition to the space required for the office space.
<b>Industrial buildings - separate storage areas for office and operational areas</b>	The space for storage of recyclable materials from the office and operational areas does not necessarily have to be a combined space. This is of particular importance for larger buildings where a combined storage area may result in that area not meeting the requirement for accessibility from either the office or operational building areas.
<b>Industrial buildings consisting of small units</b>	For a building/unit consisting of a number of small units, each $\leq 200\text{m}^2$ floor area, shared facilities that meet the above criteria for the building as a whole are sufficient to achieve this credit, subject to a minimum of $2\text{m}^2$ for operational waste per unit.
<b>Shopping centres &amp; retail parks</b>	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.
<b>Buildings/units for service providers</b>	For service providers, e.g. banks or post offices, the types of recyclable waste streams are likely to be limited, in the main, to paper and packaging. The scope of recyclable materials catered for and size of the space criteria should therefore match the scope of recyclable materials and volume. As a general rule there must be at least $2\text{m}^2$ per $1000\text{m}^2$ of net floor area or at least $10\text{m}^2$ for buildings with net floor area greater than $5,000\text{m}^2$ .
<b>Individual Recycling Bins</b>	Individual recycling bins located at convenient locations throughout the building are necessary to maximise recycling rates. On their own, however, these are not sufficient to obtain this credit.
<b>Internal storage areas</b>	Where the facilities are situated internally, vehicular gate heights/widths and manoeuvring and loading space must be sized correctly to ensure ease of access for vehicles collecting recyclable materials.
<b>General waste</b>	The area for recyclable waste storage must be provided in addition to the facilities commonly provided for dealing with general waste and other waste management facilities, e.g. compactors and balers, but do not necessarily need to be in separate locations.
<b>Local waste collection scheme</b>	The types of recyclable materials listed in the BREEAM criteria should be separated wherever possible. However, the local waste collection scheme may set different segregation requirements in line with the waste management company procedures that may conflict with the BREEAM criteria. In that instance, the BREEAM International assessor must provide evidence demonstrating that the separation and storage of waste is in compliance with the local waste collection scheme and that all other BREEAM requirements have been met.

### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
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All	<p>Marked-up building/site plan and/or copy of the specification confirming:</p> <ul style="list-style-type: none"> <li>• The location of the dedicated recyclable storage area</li> <li>• Storage area for general waste</li> <li>• The area (m<sup>2</sup>) of the storage space(s)</li> <li>• Description of the labelling.</li> </ul> <p>Where applicable, information from the local waste collection scheme confirming the types of recyclable materials to be separated and stored.</p>	<p>Assessor's building/site inspection and photographic evidence confirming:</p> <ul style="list-style-type: none"> <li>• The location, size and capacity of the storage provision</li> <li>• Labelling of the dedicated facilities.</li> </ul>
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### Additional Information

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#### Relevant Definitions

**Flagship or anchor tenant:** The largest and primary tenant within a retail development, typically department store-type retailers.

The following footprint dimensions can act as a guide when determining size and accessibility criteria for the recyclable storage space:

- **Compactor dimensions:** about the size of one car parking bay; 4.8 x 2.4m
- **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 8m<sup>2</sup> area for the storage and access of such containers
- **Wheeled bins:** 360 litre = 0.86m x 0.62 / 660L = 1.2m x 0.7m / 1100L = 1.28m x 0.98m
- **Roll-on-roll-off containers:** allow a minimum of 6.1m x 2.4m.
- **Vehicle access:** The following are dimensions for lorry types that are typically used to collect waste. Therefore gate height/widths should not be smaller than these measurements:
  - **Dustcart:** medium capacity; length = 7.4m Height = 4m width 3.1m
  - **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/off containers.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	-	1	Wst 4 - Compactor / Baler	-	-	-	-	-

### Aim

To recognise and encourage the provision of facilities which enable efficient and hygienic waste sorting and storage.

### Assessment Criteria

The following demonstrates compliance:

1. A static waste compactor or baler is installed and situated in a service area or dedicated waste management space.
2. At least one water outlet and necessary water drainage facilities are provided for each waste sorting and/or storing facility.
3. The recyclable waste storage criteria of BREEAM issue WST 3 have been met.

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	There are no additional or different criteria to those outlined above specific to the assessment of extensions to existing buildings.
<b>Shell Only</b>	For speculative developments where the end user is not known, the actual installation of a compactor or baler is not required, but a dedicated space for such an installation must be provided and evident on the site plan. This space must meet the following criteria: <ol style="list-style-type: none"> <li>Provide a suitable concrete standing for installation</li> <li>A three phase power supply</li> <li>Accessible for vehicle collections, but separate from other vehicle manoeuvring areas</li> <li>Provide at least one water outlet</li> </ol>
<b>Fit Out only</b>	There are no additional or different criteria to those outlined above specific to fit-out-only assessments.
<b>Shared Facilities</b>	For a building consisting of a number of small units, each $\leq 200\text{m}^2$ floor area, shared facilities that meet the above criteria for the building as a whole are sufficient to achieve this credit.
<b>Limited space or vehicle access</b>	For developments that have limited space for static installations, the credit can be assessed on the basis of the provision of adequate space for a smaller portable compactor or baler.

<b>Static waste compactor or baler</b>	Typical dimensions for a static compactor are those of a car parking bay, ie. 4.8 x 2.4m.
<b>Scope of Wst 4</b>	This BREEAM issue is applicable only where the assessed development has a dedicated waste management area/facility or is >500m <sup>2</sup> . Where it is not applicable the assessor's spreadsheet tool will filter this BREEAM issue from the list of applicable issues.

### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
1 - 2	Marked-up design plan and/or a copy of the specification confirming: <ul style="list-style-type: none"> <li>• Provision of waste compactor/baler</li> <li>• Location and size of space for waste compactor/baler</li> <li>• Water outlet</li> </ul> Manufacturer/supplier literature confirming <ul style="list-style-type: none"> <li>• The type of compactor/baler specified.</li> </ul>	Assessor's building/site inspection and photographic evidence confirming: <ul style="list-style-type: none"> <li>• The installation of the compactor/baler (or space for installation for speculative developments)</li> <li>• Installation of a water outlet</li> </ul>
3	As defined in the schedule of evidence for BREEAM issue WST 3.	As defined in the schedule of evidence for BREEAM issue WST 3.

### Additional Information

#### Relevant definitions

**Waste compactor or baler:** A machine that is designed to compress waste streams in order to improve storage and transport efficiency.

The requirement to achieve the credit for storage of recyclable materials is set in order to encourage the minimisation of the assessed development's waste streams by encouraging a more integrated approach to the issue of waste management, recycling and disposal. The provision of adequate recycling and waste management facilities helps to ensure that this objective can be achieved.

Compacting dry waste can significantly reduce the volume of waste sent to landfill. Furthermore, whether for recycling or landfill, compacting waste at source will reduce the number of trips required for the collection and delivery of the waste and therefore result in reduced fuel consumption and vehicle emissions. Reduced vehicle movements will also provide social and health & wellbeing benefits to the surrounding community and economic benefits to the building occupier.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	1	1	Wst 5 - Composting	-	-	-	-	-

### Aim

To encourage the provision of facilities that help facilitate the reduction in volume of compostable organic waste going directly to landfill during the building's operation.

### Assessment Criteria

The following demonstrates compliance:

#### Option 1

1. A vessel is installed on site for composting suitable food waste resulting from the building's daily operation and use.
2. There is adequate space for storing segregated food waste and composted organic material.
3. At least one water outlet is provided for cleaning in and around the facility.

#### Option 2

1. There is a dedicated segregated space for storing compostable food waste prior to collection and delivery to an alternative composting facility.
2. At least one water outlet is provided for cleaning in and around the facility.

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	There are no additional or different criteria to those outlined above specific to the assessment of extensions to existing buildings.
<b>Shell Only</b>	There are no additional or different criteria to those outlined above specific to shell-only assessments.
<b>Fit Out Only</b>	There are no additional or different criteria to those outlined above specific to fit-out-only assessments.
<b>Fit Out assessments of tenanted units</b>	Where the tenant is a food retailer who occupies a unit within a larger retail development with centralised waste management facilities, then such facilities can and should be used to assess compliance with the assessment criteria.
<b>Storage Capacity</b>	No criteria are defined for the type of vessel 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 development, bearing in mind the likely quantity of organic waste that will be produced by the development.

<b>Scope of Wst 5</b>	This BREEAM issue is applicable only where the assessed development has a food preparation and/or servery/dining area. Where it is not applicable the assessor's spreadsheet tool will filter this BREEAM issue from the list of applicable issues.
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### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
<b>Option 1</b>		
1-3	<p>Marked-up design plan and/or a copy of the specification confirming (as appropriate):</p> <ul style="list-style-type: none"> <li>• Specification of composting vessel</li> <li>• Location and size of space for vessel and storage of waste/compost</li> <li>• Water outlet.</li> </ul>	<p>Assessor's building/site inspection and photographic evidence confirming:</p> <ul style="list-style-type: none"> <li>• The installation of the vessel</li> <li>• The provision of adequate storage space/facilities</li> <li>• Installation of a water outlet</li> </ul>
<b>Option 2</b>		
1&2	<p>If appropriate, a letter from the occupier or service provider confirming:</p> <ul style="list-style-type: none"> <li>• Location of the off-site facility where compostable material will be delivered.</li> <li>• The procedure and frequency for collecting the compostable material.</li> </ul> <p>Marked-up design plan and/or a copy of the specification confirming (as appropriate):</p> <ul style="list-style-type: none"> <li>• Location and size of space for storing compostable waste</li> <li>• Water outlet.</li> </ul>	<p>If appropriate, a letter from the occupier or service provider confirming:</p> <ul style="list-style-type: none"> <li>• Location of the off-site facility where compostable material will be delivered.</li> <li>• The procedure and frequency for collecting the compostable material.</li> </ul> <p>Assessor's building/site inspection and photographic evidence confirming:</p> <ul style="list-style-type: none"> <li>• The provision of adequate storage space/facilities</li> <li>• Installation of a water outlet</li> </ul>

### Additional Information

#### Relevant definitions

None.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
-	1	-	Wst 6 - Floor Finishes	P	G	VG	E	O
-	1	-		-	-	-	-	-

### Aim

To encourage the specification and fitting of floor finishes selected by the building occupant and therefore avoid unnecessary waste of materials.

### Assessment Criteria

The following demonstrates compliance:

1. For tenanted areas (where the future occupant is not known), prior to full fit-out works, carpets and other floor finishes have been installed in a show area only.
2. In a building developed for a specific occupant, that occupant has selected (or agreed to) the specified floor finishes.

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	There are no additional or different criteria to those outlined above specific to the assessment of extensions to existing buildings.
<b>Shell Only</b>	There are no additional or different criteria to those outlined above specific to shell-only assessments.
<b>Fit Out Only</b>	Issue not applicable for Fit Out-only assessments.
<b>Show area</b>	A show area could be 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.

### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
1&2	<p>Marked-up design plans and a copy of the specification confirming:</p> <ul style="list-style-type: none"> <li>The type and coverage (m<sup>2</sup>) of any specified floor finishes.</li> </ul> <p>Where the future occupant is known, a letter from the client or design team confirming:</p> <ul style="list-style-type: none"> <li>That the type and coverage of carpets and other floor finishes have been specified (or agreed to) by the future occupant/client.</li> </ul>	<p>Assessor's building/site inspection and photographic evidence confirming:</p> <ul style="list-style-type: none"> <li>Coverage of floor finishes in line with the specification, or where known, future occupants' wishes.</li> </ul>

## **Additional Information**

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### **Relevant definitions**

None.

## 11.0 Land Use and Ecology

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	1	1	LE 1 - Reuse of Land	-	-	-	-	-

### Aim

To encourage the reuse of land that has been previously developed, and discourage the use of previously undeveloped land for building.

### Assessment Criteria

The following demonstrates compliance:

- At least 75% of the proposed development's footprint is on an area of land which has previously been *developed* for use by industrial, commercial or domestic purposes in the last 50 years.

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new build projects.
<b>Refurbishment</b>	In the case of refurbishment, the credit can be awarded by default where no new building work or infrastructure is being constructed as part of the refurbishment.
<b>Extensions to existing buildings</b>	Where a refurbishment includes new buildings, hard landscaping, or infrastructure, 75% of the total proposed development footprint (refurbished plus new build and/or hard landscaping and/or infrastructure) must comply with the requirement.
<b>Infill development</b>	New buildings developed within the boundary of existing sites do not automatically comply with the criteria. The land on which at least 75% of the new building will be sited must meet the definition of <i>previously developed</i> .
<b>Shell Only</b>	There are no additional or different criteria to those outlined above specific to shell-only assessments.
<b>Fit Out Only</b>	Issue not applicable for Fit Out-only assessments.
<b>Temporary works</b>	Undeveloped areas of the site to be used for temporary works (e.g. temporary offices/parking, material/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' (Ecological Value and Protection issue, LE3).
<b>Developed more than 50 years ago</b>	Where a site has been previously developed (more than 50 years ago) but is now considered undeveloped, the credit may only be awarded on this basis if the site is deemed to be "contaminated" as defined in BREEAM issue LE2.

### Schedule of Evidence Required



Req.	Design Stage	Post Construction Stage
1	Existing site plan, report or site photographs confirming: <ul style="list-style-type: none"> <li>• Type and duration of previous land use.</li> <li>• Area (m<sup>2</sup>) of previous land use.</li> <li>• Where applicable, date the photograph was taken.</li> </ul> Proposed site plan showing; <ul style="list-style-type: none"> <li>• Location and footprint (m<sup>2</sup>) of proposed development and temporary works.</li> </ul>	Assessor's building/site inspection or as built drawings confirming: <ul style="list-style-type: none"> <li>• The footprint or orientation of the developed area has not altered from that confirmed in the design stage evidence.</li> <li>• Where alteration has occurred the % must be re-calculated using 'as built' plans.</li> </ul>

### Additional Information

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#### Relevant definitions

**Proposed Development:** Is defined as the area of any building, hard landscaping, car park and access roads that fall within the boundary of the proposed site.

**Previously Developed Land:** For the purposes of this issue, BREEAM defines previously developed land as that which is or was occupied by a permanent structure, including the curtilage of the developed land and any associated fixed surface infrastructure.

The definition includes:

- a. Defence buildings

The definition excludes:

- b. Land that is or has been occupied by agricultural or forestry buildings.
- c. 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.
- d. Land in built-up areas such as parks, recreation grounds and allotments which, although may feature paths, pavilions and other buildings, have not been previously developed.
- e. Land that was previously developed 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).

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	1	1	LE 2 - Contaminated Land	-	-	-	-	-

### Aim

To encourage positive action to use contaminated land that otherwise would not have been remediated and developed.

### Assessment Criteria

The following demonstrates compliance:

- There is a risk of contamination on the site as identified using Checklist A16a and the more onerous of the following have been adopted
  - Nationally recognised strategies for reclamation have been followed;

OR

  - A robust site investigation, risk assessment and appraisal has been carried out by a competent Contaminated Land Specialist covering the requirements of Checklist A16b as a minimum.
- Where the site investigation, risk assessment and appraisal above has determined that the site was significantly contaminated, the client or contractor confirms that remediation of the site will be carried out in accordance with the recommended remediation strategy and its implementation plan as set out by the Contaminated Land Specialist and any relevant national or other legislation.

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	There are no additional or different criteria to those outlined above specific to the assessment of extensions to existing buildings.
<b>Shell Only</b>	There are no additional or different criteria to those outlined above specific to shell-only assessments.
<b>Fit Out Only</b>	Issue not applicable for Fit out-only assessments.
<b>Prior Decontamination</b>	The credit can only be awarded where remediation has taken place to enable current development of the site for the assessed building, or part of a larger phased development that includes the assessed building (see below). 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.
<b>Large sites split into smaller plots</b>	Where a large site has been decontaminated and is then 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. This is on the condition that the whole site could not have been developed without remediation work taking place.

<b>Health and Safety-related decontamination</b>	Contaminated land that has been decontaminated solely for health and safety reasons (rather than for the specific purpose of re-development) does not comply.
<b>Asbestos</b>	Where the only decontamination required is for the removal of asbestos within an existing building fabric, this 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.
<b>Nationally Recognised Strategies</b>	Strategies or systems for the identification, registration and reclamation of contaminated land set out in regulation and or nationally recognised code of practice.
<b>Checklist A16</b>	This checklist provides an indication of the likelihood of there being significant contamination problems on a site for the purposes of a BREEAM assessment only and sets out the scope of any site investigation and remedial strategy. It does not seek to evaluate types, levels or risks of contamination present on the site.
<b>Site investigation and remediation strategy</b>	Where no guidance is available in the country of assessment on how to carry out a site investigation and develop a remediation strategy, Checklist A16 sets out the appropriate scope of such a study and report for the purposes of the BREEAM assessment only. Further guidance is available from BS 10175: 2001 <i>Investigation of potentially contaminated sites – code of practice</i> and further advice and technical publications are available for download from the Environment Agency's website: <a href="http://www.environment-agency.gov.uk">www.environment-agency.gov.uk</a> , including; <ul style="list-style-type: none"> <li>• Remedial methods for contaminated groundwater.</li> <li>• Verification of treatment performance</li> <li>• Issues for the selection of remedial strategies, good practice guidance.</li> <li>• Process-based remediation of land contamination.</li> </ul>

### Schedule of Evidence Required

<b>Req.</b>	<b>Design Stage</b>	<b>Post Construction Stage</b>
1	<p>A completed copy of Checklist A16.</p> <p>Where applicable, a copy of the specialist's land contamination report confirming:</p> <ul style="list-style-type: none"> <li>• The degree, type and sources of site contamination.</li> <li>• The options for remediating the site.</li> </ul> <p>Existing site plan(s) showing:</p> <ul style="list-style-type: none"> <li>• Location of areas contaminated and to be remediated in relation to any proposed development.</li> </ul>	<p>The evidence required at the post construction stage is the same as for a design stage assessment.</p>

2	<p>A letter from the main contractor or remediation contractor confirming:</p> <ul style="list-style-type: none"> <li>• The remediation strategy for the site.</li> <li>• Summary details of the implementation plan.</li> </ul> <p>If a contractor has not yet been appointed, a letter from the client, or their representative confirming:</p> <ul style="list-style-type: none"> <li>• That the appointed contractor will undertake necessary remediation works to mitigate the risks identified in the specialist report.</li> </ul>	<p>A copy of the verification report (or relevant sections of the report) confirming:</p> <ul style="list-style-type: none"> <li>• Description of remedial works undertaken.</li> <li>• Description of relevant <i>pollution linkages</i> addressed*.</li> </ul> <p>* This may not be applicable where the contaminant is a non-native invasive plant species.</p>
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### Additional Information

The aim of this BREEAM issue is encourage clients/developers to seek out those sites that would otherwise not be considered for development. By doing this BREEAM is actively encouraging clients/developers to choose alternative sites to greenfield sites and reduce the pressure on virgin land..

### Relevant definitions

**Brownfield sites:** land or premises that have previously been used or developed. They may also be vacant, or derelict. However, brownfield sites can not be assumed to be contaminated as this will depend on previous use.

**Contaminant:** Is defined as any solid, liquid or gaseous material in, or on the ground to be covered by the building (or in its immediate vicinity), which is classed as a hazard to health and/or the environment and therefore presents an unacceptable risk. Oil refineries, railways, steel works, landfill sites, petrol stations, gas works and industrial/engineering works including accidental industrial spills may have all been sources of contamination in the past. Contamination can also come from historical activities dating back hundreds of years, such as spoil heaps from mining activities, and from naturally occurring substances. The definition also includes land significantly infested by certain *non-native invasive plant species* (see below).

**Contaminated land:** is land that has been polluted with harmful substances to the point where it now poses a serious risk to human health and the environment.

**Contaminated land specialist:** an individual achieving all the following items:

1. Holds a degree or equivalent qualification in chemistry, environmental impact assessment or a related subject. Other related subjects that are deemed to be appropriate are:
2. 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 as well as national and European legislation on the subject; including, acting in an advisory capacity to provide recommendations for remediation. Examples of relevant experience are: environmental impact assessments.

**Greenfield land:** land that has never been built on or used for industrial purposes. Such land may not be assumed to be non-contaminated as ground air or water conditions and agricultural practices can lead to hazardous pollution in certain circumstances.

**Significant contamination:** For the purposes of this issue, significant contamination is contamination compliant with the above and that, without remediation, development of the site is not possible.

**Remediation:** Activity undertaken to prevent, minimise, remedy or mitigate the risk caused by contaminated land to human health or the environment.

**Non-native invasive plant species:** Are non-indigenous species that adversely affect the habitats they invade economically, environmentally or ecologically. For the purposes of BREEAM this currently includes Japanese Knotweed and Giant Hogweed only. Further information on the control and disposal and how this fits into the legislative framework relating to such species can be obtained from DEFRA.

**Pollution Linkages:** A relevant pollutant linkage is one that has been identified during the risk assessment stage as representing unacceptable risks to human health or the environment.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	1	1	LE 3 - Ecological Value of Site and Protection of Ecological Features	-	-	-	-	-

### 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

The following demonstrates compliance:

- Land within the *construction zone* is defined as 'land of low ecological value' using either:
  - BREEAM checklist A4 **OR**
  - A *suitably qualified ecologist* who has identified the land as being of 'low ecological value' within an ecological assessment report, based on a site survey.
- All existing features of ecological value surrounding the construction zone and site boundary area are adequately protected from damage during clearance, site preparation and construction activities as listed below:
  - Trees of over 100 mm trunk diameter, and/or of significant ecological value, are protected by barriers. Barriers must prohibit construction works in the area between itself and the tree trunk. Minimum distance between tree trunk and barriers must be either the distance of branch spread or half tree height, whichever is the greater.
  - In all cases trees must be protected from direct impact and from severance or asphyxiation of the roots.
  - Hedges 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 their vicinity.
  - Watercourses and wetland areas are to be protected by cut-off ditches and site drainage to prevent run-off to natural watercourses (as this may cause pollution, silting or erosion).
- In all cases, the contractor is required to construct ecological protection prior to any preliminary site construction or preparation works (e.g. clearing of the site or erection of temporary site facilities).

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new build projects.
<b>Refurbishment</b>	A refurbishment of a building (with no new construction), must protect any existing ecological features of value. Protection includes clear exclusion procedures for construction traffic/personnel and material storage, as well as physical barriers.
<b>Extensions to existing buildings</b>	Where a refurbishment includes new building work or infrastructure, the land on which the new build area and its associated infrastructure (e.g. roads, pavements, car parks etc) will be situated, must comply with the criteria.
<b>Shell Only</b>	There are no additional or different criteria to those outlined above specific to shell-only assessments.

<b>Fit Out Only</b>	Issue not applicable for Fit out-only assessments.
<b>No features of ecological value</b>	Where the construction zone is defined as 'land of low ecological value' and where the surrounding site contains no features of ecological value, this credit can be awarded.
<b>Use of a suitably qualified ecologist</b>	<p>Where a suitably qualified ecologist is employed and has, using their professional judgement, defined the site as land of low ecological value, this assessment/judgement overrides any assessment determined using checklist A4.</p> <p>The suitably qualified ecologist must base their findings on data collected from a site visit conducted at appropriate time(s) 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 RIBA stage K, construction to practical completion). Where the ecologist has made no on-site visit, the credit cannot be awarded. See additional guidance for definition of a suitably qualified ecologist.</p>
<b>Features of little or no ecological value</b>	If a suitably qualified ecologist has confirmed that a feature has little or no ecological value, 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.
<b>Removal of features of ecological value</b>	If features of ecological value have been removed as part of site clearance then the development cannot achieve this credit, even if they are to be replaced as part of a new landscaping strategy.
<b>Site clearance prior to purchase of the site</b>	For sites that have been cleared more than five years ago, the ecological value of the site would be its present ecological value, on the basis that in the intervening five years, ecological features would have started to re-establish themselves and therefore act as an indicator of the site's ecological value. For sites that have been cleared less than five years before assessment, a suitably qualified ecologist should make an estimation of the site's ecological value immediately prior to clearance on the basis of available desktop information (including aerial photography) and the landscape type/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 credit must be withheld.

#### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
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1&2	<p>A completed copy of checklist A4 signed and dated by the client, their representative or a design team member e.g. architect.</p> <p><b>AND</b></p> <p>One of the following:</p> <p>A plan and/or site photographs of the existing site highlighting any ecological features <b>OR</b></p> <p>A copy of the ecologist's report containing:</p> <ul style="list-style-type: none"> <li>• Confirmation that the land within the construction zone is of low ecological value.</li> <li>• A description of any ecological features within the site or on the site boundary.</li> <li>• Date(s) of site survey(s).</li> </ul>	The evidence required at the post construction stage is the same as for a design stage assessment.
2&3	<p>A completed, signed copy of sections A and B of checklist A6 'Guidance for relating ecology reports to BREEAM' to confirm the ecologist's professional status</p> <p><b>OR</b></p> <p>A copy of the ecologist's report containing the information in sections A and B from the above.</p>	<p>Assessor site inspection report <b>OR</b> ecologist's report confirming:</p> <ul style="list-style-type: none"> <li>• The boundary of the site and the construction zone has not been altered.</li> <li>• Where applicable, all existing ecological features still remain.</li> </ul>

### 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, hard standing, landscaping, site access, plus a 3m boundary in either direction around these areas. It also includes any areas used for temporary site storage and buildings.

If it is not known exactly where buildings, hard standing, site access and temporary storage will be located it must be assumed that the construction zone is the entire site.

**Suitably qualified ecologist (SQE):** 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 or equivalent qualification in ecology or a related qualification. Other related qualifications will have a significant ecology component but may come from a wide range of areas including but not limited to:
  - Biologists, botanists, entomologists etc



- Arboriculturalists
  - Nature conservationists
  - Landscape engineers/architects
  - Environmental engineers/scientists
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.

Where a suitably qualified ecologist is verifying an Ecology Report produced by another ecologist who does not meet the SQE criteria, they must, as a minimum, have read and reviewed the report and confirm in writing that they have found it to:

- a. represent sound industry practice
- b. report and recommend correctly, truthfully and objectively
- c. be appropriate given the local site conditions and scope of works proposed
- d. avoid invalid, biased and exaggerated statements.

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

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
5	5	5	LE 4 - Mitigating Ecological Impact	-	-	-	2	2

### Aim

To minimise the impact of a building development on existing site ecology.

### Assessment Criteria

The following demonstrates compliance:

#### First credit

1. A suitably qualified ecologist (SQE) has been appointed to report on enhancing and protecting the ecology of the site.
  - a. The SQE provides an Ecology Report with appropriate recommendations for protection and enhancement of the site's ecology.
  - b. The report is based on a site visit/survey by the SQE prior to the commencement of initial site preparation works.
2. The general recommendations of the Ecology Report for enhancement and protection of site ecology have been, or will be, implemented.

#### Second/third/fourth/fifth credit

3. The first credit is achieved.
4. The recommendations of the Ecology Report for enhancement and protection of site ecology have been implemented, and the suitably qualified ecologist confirms that this will result in a change in ecological value of the site (x) according to Table 25 below:

**Table 25 Credits awarded depending on the change in ecological value of site**

Number of credits Awarded	Change in Ecological value of site (x)
2	$-9 \leq x < 0$
3	$0 \leq x < 3$
4	$3 \leq x < 6$
5	$x \geq 6$

5. The increase in plant species has been calculated using Ecology calculator 2, using actual species numbers.

### Compliance Notes

<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.

<b>Extensions to existing buildings</b>	There are no additional or different criteria to those outlined above specific to the assessment of extensions to existing buildings. Refer also to the note below on infill developments.
<b>Shell Only</b>	There are no additional or different criteria to those outlined above specific to shell-only assessments.
<b>Fit Out Only</b>	Issue not applicable for Fit out-only assessments.
<b>Timing of Ecologist Report</b>	It is recommended that the suitably qualified ecologist is appointed to 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 feasibility stage in order to facilitate and maximise potential ecological enhancement.
<b>General recommendations</b>	<p>'General' recommendations for enhancing and protecting the ecological value of the site are to include, and go beyond, compliance requirements for all current EU and national legislation relating to protected species and habitats.</p> <p>These 'general' recommendations may include ecological recommendations as detailed in the definitions.</p>
<b>Guidance for ecologists and assessors</b>	Please refer to Checklist A6 – Relating ecology reports to BREEAM, section D for assistance in assessing and interpreting the requirements of this issue.
<b>Native species</b>	Only native floral/plant species and those with a known attraction or benefit to local fauna can be considered for the purpose of increasing the number of species on site, as well as general enhancement.
<b>Number of plant species</b>	BREEAM measures ecological value using the number of plant species.
<b>Assessment of a single development on a larger site</b>	Where the assessment is of a single building that forms part of a larger site development and the landscaping and ecological features form a common part of the whole site, for the purposes of assessing this issue the area of the entire site must be considered.
<b>Site clearance prior to purchase of the site</b>	Refer to the compliance note in LE3 on this issue.
<b>Infill developments on existing occupied site</b>	Where a development is an infill (or new building) on an existing occupied site, then the <i>construction zone</i> for the new building would be the area of site assessed for the purposes of this issue.
<b>No ecological survey completed or construction works have commenced</b>	Where it is not possible to determine 'actual' number of species per vegetation plot type, either because an on-site ecological survey has not been conducted, or, because construction works have already commenced, the first credit only can be achieved.
<b>Green Roofs</b>	The contribution of species from a Green roof can only be incorporated where a suitably qualified ecologist has been appointed.

#### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
First Credit		

1	<p>A copy of the ecologist's report containing:</p> <ul style="list-style-type: none"> <li>• Details and scope of the site survey.</li> <li>• Information as outlined in checklist A6 – Relating ecology reports to BREEAM.</li> </ul> <p><b>OR</b></p> <p>A copy of the ecologist's report containing a completed, signed copy of checklist A6.</p>	<p>The evidence required at the post construction stage is the same as for a design stage assessment.</p>
2	<p>Proposed site plan highlighting implementation of the ecologist enhancement recommendations.</p> <p><b>AND</b></p> <p>One of the following:</p> <p>A copy of the relevant section of the specification requiring the main contractor to implement the SQE's recommendations for protection and enhancement</p> <p><b>OR</b></p> <p>A letter from the client or design team member confirming:</p> <ul style="list-style-type: none"> <li>• That the specification will require the main contractor to implement the ecologist's recommendations.</li> </ul>	<p>Assessor site inspection report and photographic evidence confirming that the ecologist's recommendations have been implemented.</p> <p>For large mixed-use/multi-building developments, where the whole site has not been completed and ecological enhancements have not been added, or where features are being added at a later date in an appropriate planting season:</p> <ul style="list-style-type: none"> <li>• A copy of the contract/specification or a letter from the main contractor confirming when the planting will be complete.</li> </ul> <p>This must be within 18 months from completion of the development.</p>
<b>Second/Third/Fourth and Fifth Credits</b>		
3-5	<p>Evidence as outlined above, confirming compliance with the first credit.</p> <p>A copy of the SQE's report containing the information outlined in checklist A6 – Relating ecology reports to BREEAM.</p> <p><b>OR</b></p> <p>A copy of the SQE's report containing a completed, signed copy of checklist A6.</p> <p><b>AND</b></p> <p>A completed copy of Ecology Calculator 2 confirming the change in ecological value of the site.</p>	<p>Evidence (as outlined above) confirming compliance with the first credit.</p>

### Additional Information

#### Relevant Definitions

**Construction zone:** As defined for issue LE3 – Ecological Value of site AND Protection of ecological features

**Suitably qualified ecologist (SQE):** As defined for issue LE3 – Ecological Value of site AND Protection of ecological features

**Ecological recommendations** are defined as measures adopted to enhance the ecology of the site, which may include:

- The planting of native species or those with a known attraction or benefit to local wildlife
- The adoption of horticultural good practice (e.g. no, or low, use of residual pesticides)
- The installation of bird, bat and/or insect boxes at appropriate locations on the site
- Development of a full Biodiversity Management Plan including avoiding clearance/works at key times of the year (e.g. breeding seasons)
- The proper integration, design and maintenance of SUDs and Green Roofs, community orchards etc.

Only native floral species or those with a known attraction or benefit to local wildlife can be considered for the purpose of enhancing the ecological value of the site.

### Calculating the change and increase in ecological value

BREEAM calculates the change in ecological value by comparing the diversity (number and area) of plant species on the site pre and post construction. The ecological value of the site is expressed as an area-weighted average of plant species for the site's landscape type. This enables BREEAM to use this as an indicator of the proposed development's impact on the site's existing ecological value.

**A simple example of the calculation is outlined below.**

1. Calculate the ecological value of a previously developed existing site:

A 2065m<sup>2</sup> existing site consists of the following types of land:

- a. 1865 m<sup>2</sup> hard landscaping = 0 species
- b. 200m<sup>2</sup> urban mosaic - infertile grassland = 17.6 species

The ecological value of the existing site is calculated as follows, for each plot type;

- Number of species on plot type x plot type area as % of total area.

Therefore, for our example site:

- a. Hard landscaping:  $\{(0 \text{ species} \times (1865\text{m}^2/2065\text{m}^2))\} = 0 \text{ species}$
- b. urban mosaic-infertile grassland:  $\{(17.6 \text{ species} \times (200\text{m}^2/2065\text{m}^2))\} = 1.70 \text{ species}$
- c. Ecological value of the existing site = 0 + 1.70 = 1.70 species

2. Calculate the ecological value of the proposed site:

The 2065m<sup>2</sup> post-construction site consists of the following types of land:

- a. 1375m<sup>2</sup> of building = 0 species.
- b. 550m<sup>2</sup> of hard landscaping = 0 species
- c. 140 m<sup>2</sup> has remained as urban mosaic-infertile grassland = 17.6 species

The ecological value of the proposed site is as follows:

- a. Building:  $\{(0 \text{ species} \times (1375\text{m}^2/2065\text{m}^2))\} = 0 \text{ species}$
- b. Hard landscaping:  $\{(0 \text{ species} \times (550\text{m}^2/2065\text{m}^2))\} = 0 \text{ species}$
- c. Urban mosaic-infertile grassland:  $\{(17.6 \text{ species} \times (140\text{m}^2/2065\text{m}^2))\} = 1.19 \text{ species}$
- d. Ecological value of the proposed site = 0 + 0 + 1.19 = 1.19 species

The ecological impact is the difference between the two ecological values:

Change in ecological value: 1.19 – 1.70 = - 0.51 species

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
2	2	2	LE 6 - Long Term Impact on Biodiversity	-	-	-	-	-

### Aim

To minimise the long term impact of the development on the site's, and surrounding area's, biodiversity.

### Assessment Criteria

The following demonstrates compliance:

One credit can be awarded where there is a commitment to achieve the mandatory criteria and at least two of the additional criteria (listed below).

Two credits can be awarded where there is a commitment to achieve the mandatory criteria and at least four of the additional criteria (listed below).

### Mandatory Criteria

1. A *suitably qualified ecologist* (SQE) has been appointed prior to commencement of activities on site.
2. The *suitably qualified ecologist* confirms that all relevant EU and national legislation relating to protection and enhancement of ecology has been complied with during the design and construction process.
3. A landscape and habitat management plan, appropriate to the site, is produced covering at least the first five years after project completion. This is to be handed over to the building occupants and includes:
  - Management of any protected features on site
  - Management of any new, existing or enhanced habitats
  - A reference to the current or future site level or local Biodiversity Action Plan.

### Additional Criteria

1. The 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 suitably qualified ecologist.
2. The contractor trains the site workforce on how to protect site ecology during the project. Specific training should be carried out for the entire site workforce to ensure they are aware of how to avoid damaging site ecology. Training should be based on the findings and recommendations for protection of ecological features highlighted within a report prepared by a suitably qualified ecologist.
3. The contractor records actions taken to protect biodiversity and monitor their effectiveness throughout key stages of construction. The requirement commits the 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 habitat that supports nationally, regionally or locally important biodiversity, and/or which is nationally, regionally or locally important itself; including any habitat listed in the Local Biodiversity

Action Plan (LBAP), those protected within statutory sites, or those within non-statutory sites identified in local plans.

5. Where flora and/or fauna habitats exist on site, the contractor programmes site works to minimise disturbance to wildlife. For example, site preparation, ground works, and landscaping 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 suitably qualified ecologist.

<b>Compliance Notes</b>	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to the assessment of refurbished buildings (unless the building is listed – see below).
<b>Extensions to existing buildings</b>	There are no additional or different criteria to those outlined above specific to the assessment of extensions to existing buildings.
<b>Shell Only</b>	There are no additional or different criteria to those outlined above specific to shell-only assessments.
<b>Fit Out Only</b>	Issue not applicable for Fit out-only assessments.
<b>Refurbishment of listed buildings</b>	The refurbishment of a listed building may be exempt from the assessment criteria if they conflict with the need to maintain the building's listed features, or are counter to the conservation criteria. Confirmation is required from a suitably qualified ecologist that all possible criteria/enhancements have been achieved before the credit can be awarded (i.e. if no suitably qualified ecologist has been appointed then this credit cannot be awarded).
<b>Biodiversity Champion</b>	A Biodiversity Champion does not have to be an ecologist or ecological expert but must have sufficient authority and time on site to influence activities and ensure that they have minimal detrimental impact on biodiversity.
<b>Local biodiversity expertise</b>	Local biodiversity expertise should be sought at, or before, the design stage to help identify species of local biodiversity importance on site. It is likely that their recommendations will draw on the Local Biodiversity Action Plan (LBAP) where one exists.
<b>The site and surrounding areas</b>	<p>The steps taken in the above criteria will depend on the nature of the site, e.g. urban sites, and the surrounding areas. It is likely that either all, or none, of the optional items will apply. Where the optional items and the mandatory item 3, the management plan, are deemed, in writing, by the appointed suitably qualified ecologist not to be applicable, all credits can be awarded. Mandatory items 1 and 2 must be met in all instances.</p> <p>This is likely to be the case in the majority of assessments in central town/city areas which have a high proportion of surrounding and existing development and no existing external landscaped areas within the boundary of the assessed site.</p>
<b>Sites of no ecological value</b>	Where a site is deemed to have no ecological value, it is still necessary to employ a suitably qualified ecologist to achieve this credit. The ecologist must confirm that all the mandatory items (1), (2) and (3) have been achieved and provide guidance on how to achieve optional item (4). Note that in such cases, mandatory item (1) and additional requirement (4) is likely to be applicable in relation to any ecological enhancements (e.g. green roofs, bird boxes, etc.) adopted in order to enhance the site ecology.

<p><b>Not all additional items are applicable</b></p>	<p>Where the SQE confirms that not all additional items are applicable to the development, for example it is a city centre refurbishment on a confined site with no external areas, then the credits can be awarded accordingly:</p> <table border="1"> <thead> <tr> <th>No. applicable items</th> <th>No. of BREEAM credits</th> <th>Criteria</th> </tr> </thead> <tbody> <tr> <td>1 item</td> <td>Two credits</td> <td>Meet mandatory reqs. plus applicable item</td> </tr> <tr> <td>2 items</td> <td>Two credits</td> <td>Meet mandatory reqs. plus all applicable items</td> </tr> <tr> <td rowspan="2">3 items</td> <td>One credit</td> <td>Meet mandatory reqs. plus 2 applicable items</td> </tr> <tr> <td>Two credits</td> <td>Meet mandatory reqs. plus all applicable items</td> </tr> <tr> <td rowspan="2">4 items</td> <td>One credit</td> <td>Meet mandatory reqs. plus 3 applicable items</td> </tr> <tr> <td>Two credits</td> <td>Meet mandatory reqs. plus all applicable items</td> </tr> </tbody> </table>	No. applicable items	No. of BREEAM credits	Criteria	1 item	Two credits	Meet mandatory reqs. plus applicable item	2 items	Two credits	Meet mandatory reqs. plus all applicable items	3 items	One credit	Meet mandatory reqs. plus 2 applicable items	Two credits	Meet mandatory reqs. plus all applicable items	4 items	One credit	Meet mandatory reqs. plus 3 applicable items	Two credits	Meet mandatory reqs. plus all applicable items
No. applicable items	No. of BREEAM credits	Criteria																		
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	Two credits	Meet mandatory reqs. plus all applicable items																		

**Schedule of Evidence Required**

Req.	Design Stage	Post Construction Stage
<p><b>Mandatory Criteria</b></p>		
<p>1&amp;2</p>	<p>The SQE report or letter confirming:</p> <ul style="list-style-type: none"> <li>• That they were appointed prior to commencement of activities on site.</li> <li>• All relevant EU and national legislation will be complied with.</li> </ul> <p><b>AND</b></p> <p>A completed, signed copy of checklist A6 – Relating ecology reports to BREEAM</p> <p><b>OR</b></p> <p>A copy of ecology report containing the information outlined in checklist A6.</p>	<p>A letter from the SQE confirming:</p> <ul style="list-style-type: none"> <li>• That all relevant EU and national legislation relating to protection and enhancement of ecology has been complied with.</li> </ul>



3	<p>A copy of the site management plan.</p> <p><b>OR</b></p> <p>A copy of the specification requiring the development of plan and outlining the scope of its content.</p> <p><b>OR</b></p> <p>Where the timing of assessment does not permit either of the above, a letter from the client confirming:</p> <ul style="list-style-type: none"> <li>• A commitment to produce a management plan</li> <li>• The scope of the management plan</li> </ul>	<p>A copy of the site's landscape and habitat management plan.</p>
<b>Additional Criteria</b>		
1	<p>A letter from the contractor confirming:</p> <ul style="list-style-type: none"> <li>• The appointment of the biodiversity champion and their job title.</li> <li>• Their on site role and responsibilities.</li> </ul> <p><b>OR</b></p> <p>Where not yet appointed, a copy of the specification clause requiring the appointment of a biodiversity champion.</p>	<p>A copy of the relevant sections of the site log book, highlighting:</p> <ul style="list-style-type: none"> <li>• Details of any action/events taken by the biodiversity champion.</li> </ul> <p>If no actions required/taken, this should be confirmed in the log book.</p>
2	<p>Training schedule or letter of confirmation from the contractor committing to provide relevant training.</p> <p><b>OR</b></p> <p>Where not yet appointed, a copy of the specification clause requiring the training of the site's workforce.</p>	<p>A record of training undertaken by the site workforce confirming:</p> <ul style="list-style-type: none"> <li>• Who delivered &amp; developed the training</li> <li>• The scope of the training delivered.</li> </ul>
3	<p>A letter from the contractor confirming:</p> <ul style="list-style-type: none"> <li>• Monitoring and reporting criteria for the development.</li> <li>• The records will be publicly available if and when requested.</li> </ul> <p><b>OR</b></p> <p>Where not yet appointed, a copy of the specification clause outlining the contractor's monitoring and reporting criteria.</p>	<p>A copy of the relevant sections of the site log book, highlighting:</p> <ul style="list-style-type: none"> <li>• Records of monitoring and actions taken to protect biodiversity.</li> <li>• Records and outcome of any requests to view such information.</li> </ul>
4	<p>A copy of the proposed site plan highlighting the new ecologically valuable habitat.</p> <p>A SQE's report or letter confirming that the habitat supports the relevant biodiversity action plan(s)</p>	<p>Assessor's (or SQE's) site inspection report and photographic evidence confirming the existence of the proposed habitat.</p>

5	<p>The SQE's report or letter confirming:</p> <ul style="list-style-type: none"> <li>• Wildlife on site that needs to be accounted for in programming works.</li> <li>• Actions required with respect to programming site works to minimise disturbance.</li> </ul> <p>A copy of the contractor's main programme of works.</p> <p><b>OR</b></p> <p>A copy of the relevant section of the main contract confirming:</p> <ul style="list-style-type: none"> <li>• The programme of site works will minimise disturbance to wildlife in accordance with SQE's recommendations.</li> </ul>	<p>A letter from the SQE, or a copy of their report confirming:</p> <ul style="list-style-type: none"> <li>• Site works executed in a manner that minimised disturbance to wildlife in accordance with their recommendations.</li> </ul>
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### Additional Information

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#### Relevant definitions

##### **Biodiversity Champion**

A biodiversity Champion is a designated person who holds the responsibility to provide leadership and inspiration and empower those with resources to halt the loss of biodiversity and maximise its gain in relation to the assessed building's locality. The champion should use their position to ensure that biodiversity matters are not overlooked and are addressed appropriately. As part of their role the Champion should ensure that biodiversity is on meeting agendas and that there is proper discussion of issues where a decision is likely to have an impact on biodiversity.

**Suitably qualified ecologist (SQE):** As defined for Issue LE3 – Ecological Value of site AND Protection of ecological features

**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.

## 12.0 Pollution

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	1	1	Pol 1 - Refrigerant GWP – Building Services	-	-	-	-	-

### Aim

To reduce the contribution to climate change from refrigerants with a high global warming potential.

### Assessment Criteria

The following demonstrates compliance:

1. The building has no refrigerants **OR**
2. The refrigerants used within the building services have an ODP of zero and a GWP less than 5.

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	If the extended and existing building share the same building services, then these services 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 services, only these need be assessed against the Assessment Criteria.

<b>Shell Only</b>	<p>If the building is designed to be fully naturally ventilated, and therefore no refrigerant using building services will be specified for the fit out, then this credit can be awarded. If the building is not designed to be naturally ventilated and the refrigerant type cannot be confirmed, because its specification is the responsibility of a future tenant as part of their fit out works, then compliance with this BREEAM issue can only be demonstrated via one of the following means in shell only buildings/areas:</p> <ul style="list-style-type: none"> <li>• Option 1 – Use of a tenancy lease agreement between the developer and tenant/s (full value of available credits)</li> <li>• Option 2 – A Green Building Guide for tenant fit outs (half the value of the available credits)</li> <li>• Option 3 – Developer/Tenant collaboration (full value of available credits)</li> </ul> <p>Where compliance with the assessment criteria cannot be demonstrated the available credits must be withheld (option 4).</p> <p>Refer to the <i>Scope</i> section 2.2 <i>Types of project that can be assessed using BREEAM (Shell and Core / Speculative Assessments)</i> for further description of the above options.</p>
<b>Fit Out Only</b>	<p>The criteria apply to both new systems specified as part of a fit out and the refrigerants used in any existing systems that will remain post fit out.</p> <p>Any existing systems that use refrigerants with an ozone depleting potential or a global warming potential of more than 5 must have been converted to use a refrigerant with a zero ODP and GWP less than 5. Where this is not possible such systems will need to be replaced to meet the assessment criteria.</p>
<b>Industrial units without offices &amp; with untreated operational areas</b>	<p>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.</p>
<b>Solid refrigerant</b>	<p>The credit can be awarded by default where a solid refrigerant is used.</p>
<b>Refrigerant charge less than 5kg</b>	<p>The credit can be awarded where the total refrigerant charge used in the building services is less than 5kg (e.g. heat pumps etc).</p>
<b>Multiple split units</b>	<p>In the case of multiple split units, through-the-wall or other packaged units, the credit can be awarded where the <b>total</b> collective refrigerant charge is less than 5kg. If the <b>total</b> collective refrigerant charge in such systems is greater than 5kg, then the refrigerant(s) must comply with the BREEAM criteria.</p>
<b>Office server and comms rooms</b>	<p>Refrigerants used in services for typical office server and comms rooms cannot be excluded from the assessment.</p> <p>Where air conditioning equipment is provided, the equipment may not be able to achieve this credit as smaller systems often require refrigerants with a GWP &gt; 5. In this instance the credit cannot be awarded by default as there are alternatives for designers to consider. These alternatives include revisiting the design and the room conditions specification to see if the cooling equipment is necessary. In addition, whilst a manufacturer or supplier may specify a narrow temperature band for server equipment, acceptable limits detailed in ASHRAE guidance may allow a greater temperature range without adverse effect and thus the cooling equipment may not be necessary.</p>
<b>GWP data not available</b>	<p>Where GWP data for the specified refrigerant is not available, the credit cannot be awarded on a default basis.</p>

<b>Cold stores</b>	Refrigerants specified in plant used for integral cold storage purposes should not be assessed under this issue. There is a separate BREEAM issue for such systems.
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### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
1&2	<p>A copy of the specification clause confirming either:</p> <ul style="list-style-type: none"> <li>Absence of refrigerant in the development OR</li> <li>Type(s) of refrigerant to be used.</li> </ul> <p><b>AND</b></p> <p>Manufacturer's information confirming:</p> <ul style="list-style-type: none"> <li>ODP and GWP of each refrigerant.</li> </ul>	<p>Assessor's building/site inspection and as built drawings confirming:</p> <ul style="list-style-type: none"> <li>Presence or absence of any refrigeration plant.</li> </ul> <p><b>OR</b></p> <p>A letter from the design team/developer confirming:</p> <ul style="list-style-type: none"> <li>The refrigerant type specified remained unchanged.</li> </ul> <p><b>OR</b></p> <p>Where a change has occurred, written confirmation from the design team confirming:</p> <ul style="list-style-type: none"> <li>Type of refrigerant(s) used.</li> </ul> <p><b>AND</b></p> <p>Manufacturer's information confirming:</p> <ul style="list-style-type: none"> <li>ODP and GWP of each refrigerant.</li> </ul>

### Additional Information

**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 blowing agent, 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). The ODP of the refrigerants is not assessed under this issue and there is no link between GWP and ODP.

**Refrigerant:** there are three main make-ups of refrigerants:

- 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 our ozone.
- 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.
- Chlorofluorocarbon Refrigerants (CFCs) contain chlorine, fluorine and carbon. These refrigerants carry high amounts of chlorine so they are known for being the most hazardous to the ozone layer.

**Table of refrigerants and their Global Warming Potentials:** the table below includes available substances which are capable of acting as refrigerants. Many are not currently used as such and some have been phased out and withdrawn from the market.

**Table 26 Refrigerant GWP**

Refrigerant type	GWP	Refrigerant type	GWP
R11 (CFC-11) *	4000	R32 (HCFC-32) *	580
R12 (CFC-12) *	8500	R407C (HFC-407)	1600
R113 (CFC-113) *	5000	R152a (HFC-152a)	140
R114 (CFC-114) *	9300	R404A (HFC blend)	3800
R115 (CFC-115)*	9300	R410A (HFC blend)	1900
R125 (HFC-125)	3200	R413A (HFC blend)	1770
Halon-1211	N/A	R417A (HFC blend)	1950
Halon-1301	5600	R500 (CFC/HFC) *	6300
Halon-2402	N/A	R502 (HCFC/CFC) *	5600
Ammonia	0	R507 (HFC azeotrope)	3800
R22 (HCFC-22) *	1700	R290 (HC290 propane)	3
R123 (HCFC-123) *	93	R600 (HC600 butane)	3
R134a(HFC-134a)	1300	R600a (HC600a isobutane)	3
R124 (HCFC-124) *	480	R290/R170(HC290/HC170)	3
R141b (HCFC-141b) *	630	R1270 (HC1270 propene)	3
R142b (HCFC-142b) *	2000	R143a (HFC-143a)	4400

N/A Indicates that there is insufficient data available to give a GWP value.

- Global warming potential (GWP) values are based on best available data at the time of writing and are based on a 100-year time horizon. Other published data may be based on different time horizons.
- All CFC/HCFC refrigerants (marked \*) have an ODP > 0 and as such are illegal for new installations. Existing equipment may continue to use them at present. The use of CFCs and HCFCs as refrigerants has been addressed under the Montreal protocols. Phase out programmes have been agreed resulting in these substances no longer being used as refrigerants in all new build 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.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
2	2	1	Pol 2 - Preventing Refrigerant Leaks	P	G	VG	E	O
				-	-	-	-	-

### Aim

To reduce the emissions of refrigerants to the atmosphere arising from leakages in cooling plant.

### Assessment Criteria

The following demonstrates compliance:

1. The building has no refrigerants **OR**

#### Refrigerant leak detection

2. Systems using refrigerants are contained in a moderately air tight enclosure (or a mechanically ventilated plant room), and a refrigerant leak detection system is installed covering high-risk parts of the plant. **OR**
3. An automatic permanent refrigerant leak detection system is specified, which is NOT based on the principle of detecting or measuring the concentration of refrigerant in air.

#### Refrigerant recovery system

4. The automatic shutdown and pump down of refrigerant occurs on the detection of high concentrations of refrigerant in the plant room/enclosure. For the majority of cases only systems in mechanically ventilated/moderately air tight plant rooms (or enclosures) comply.
5. Automatic pump-down to either a separate storage tank or into the heat exchanger is acceptable but only where automatic isolation valves are fitted to contain the refrigerant once fully pumped down.
6. The alarm threshold that triggers automatic pump down is set to a maximum of 2000ppm (0.2%), but lower levels can be set. The credit cannot be awarded for manual systems.

**Note:** For retail and office buildings, compliance with the refrigerant leak detection requirements will allow the first credit to be awarded. Compliance with the refrigerant recovery system requirements will give the second credit. The first credit must be achieved in order to award the second credit.

**Note:** For industrial buildings, the credit can be awarded where both a refrigerant leak detection AND a refrigerant recovery system are specified in compliance with the above requirements.

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.

<b>Extensions to existing buildings</b>	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 existing plant must be assessed against the criteria of this issue. If the extension is served by independent services, only these need be assessed against the Assessment Criteria.
<b>Shell Only</b>	<p>If the building is designed to be fully naturally ventilated, and therefore no refrigerant using building services will be specified for the fit out, then this credit can be awarded. If the building is not designed to be naturally ventilated and the refrigerant leak detection/recovery cannot be confirmed, because its specification is the responsibility of a future tenant as part of their fit out works, then compliance with this BREEAM issue can only be demonstrated via one of the following means in shell only buildings/areas:</p> <ul style="list-style-type: none"> <li>• Option 1 – Use of a tenancy lease agreement between the developer and tenant/s (full value of available credits)</li> <li>• Option 2 – A Green Building Guide for tenant fit outs (half the value of the available credits)</li> <li>• Option 3 – Developer/Tenant collaboration (full value of available credits)</li> </ul> <p>Where compliance with the assessment criteria cannot be demonstrated the available credits must be withheld (option 4).</p> <p>Refer to the <i>Scope</i> section 2.2 <i>Types of project that can be assessed using BREEAM</i> (Shell and Core / Speculative Assessments) for further description of the above options.</p>
<b>Fit Out Only</b>	The criteria apply to any existing cooling plant and new plant specified as part of the fit out.
<b>Industrial units without offices and untreated operational areas</b>	This issue will be filtered from the scope of assessment for industrial units designed without offices and an untreated operational area, i.e. not designed to be air conditioned.
<b>Type of refrigerant</b>	This issue is applied in instances where any type of refrigerant is present, i.e. even if the ozone depleting potential (ODP) of the refrigerant is zero and the global warming potential (GWP) is less than 5.
<b>Solid refrigerant</b>	The credit can be awarded by default where a solid refrigerant is used.
<b>CO<sub>2</sub> as a refrigerant</b>	When CO <sub>2</sub> is used as a refrigerant, the refrigerant recovery system credit can be awarded by default.
<b>Total refrigerant charge less than 5 kg</b>	The credit can be awarded by default where the total refrigerant charge used in the building is less than 5kg.
<b>Multiple split systems</b>	For installations of small multiple hermetic systems only, where the refrigerant charge in each unit is less than 5kg but the total refrigerant charge in the building is greater than 5kg, the credit can be awarded by default. This is on the basis that the risk of a large refrigerant leak is minimised and individual leaks from each system will be small i.e. <5kg.
<b>High-risk parts</b>	High-risk parts of refrigeration plant typically include the pipe work and compressor. Evaporator or condenser coils can be omitted from the coverage of the system.
<b>Manual refrigerant recovery system</b>	The provision of any manual system, including manual storage cylinders on site, does not comply with the criteria of this issue.



<b>Cold food storage</b>	The criteria of this issue apply to cold food storage refrigeration equipment (where the charge is $\geq 5\text{kg}$ ), i.e. cold rooms and/or centralised equipment serving a group of cold storage cabinets. Cabinets and refrigerated bottle shelves with integral refrigeration plant on average have a charge of 0.3kg; therefore in most circumstances, individual or small-scale multiple installations will not fall within the scope of this issue. However, the assessor should ask the design team to confirm that the charge is $\leq 5\text{kg}$ .
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### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
1	A copy of the specification clause or design plan confirming: <ul style="list-style-type: none"> <li>Absence of refrigerants in the development.</li> </ul>	Assessor's building/site inspection and photographic evidence confirming: <ul style="list-style-type: none"> <li>Absence of refrigeration plant.</li> </ul>
2&3	A copy of the specification clause or letter from the M&E engineer confirming: <ul style="list-style-type: none"> <li>Type of leak detection system(s).</li> <li>Scope of the system(s)</li> <li>Where relevant, containment strategy for such equipment.</li> </ul>	Assessor's building/site inspection and photographic evidence confirming: <ul style="list-style-type: none"> <li>Installation of leak detection system(s)</li> <li>Installation of automatic refrigerant recovery equipment</li> <li>Pre-set threshold level for automatic pump down.</li> </ul>
4,5&6	A copy of the specification clause or letter from the M&E engineer confirming: <ul style="list-style-type: none"> <li>Type, scope and operation of automatic refrigerant recovery equipment</li> <li>Details of the plant room enclosure where the refrigeration plant is installed</li> <li>Alarm threshold for triggering automatic pump down.</li> </ul>	

### Additional Information

#### Relevant definitions

**Moderately airtight enclosure:** this can be defined as an enclosure that does not produce a draught or significant fresh air ingress that would dilute any leaked refrigerant gas (dilution may prevent detection).

**Refrigerant Leak Detection:** a permanently installed multi-point sensing system; this may be aspirated or have multiple sensor heads linked to a central alarm unit or BMS. Various sensor types are available including infra-red, semi-conductor or electro-chemical. Please see below for further guidance on the coverage of refrigerant leak detection systems.

**Refrigerant Recovery:** The process of removing refrigerant from a system and storing it in an airtight container.

#### Leak detection systems/devices

- Handheld detectors (which include semi-conductor and corona discharge types) do not comply with BREEAM criteria.
- Corona discharge detectors are not suitable where flammable refrigerants are used, or in potentially explosive atmospheres.
- Indicator dyes: these consist of fluorescent or coloured dyes added to the refrigerant to show leakage sites. The use of the dye should be approved by the compressor manufacturer. Some compressor manufacturers do not approve the use of indicator dyes, in which case either an alternative type of equipment should be used, or an alternative type of leak detection specified.

- Halide torch detectors: this type of detection is only appropriate for chlorine-based substances such as CFCs and HCFCs, and should not be used in areas where naked flames are prohibited. Compounds which do not contain chlorine, e.g. HFCs, cannot be detected by this method. When awarding this credit in instances where these detectors are in use, the assessor should confirm that the refrigerant is chlorine based.
- Electronic leak detectors: these must be designed to detect a certain type of, or multiple types of, refrigerant, i.e. CFC, HFC, HCFC, etc.
- Standing hold test: systems based on monitoring pressure drops within the pipe work are not necessarily compliant with the BREEAM criteria. There are natural fluctuations to the pressure of the refrigerant due to changes in volume and temperature of the system, and to the ambient temperature of the surroundings. Low pressure and high pressure switches, which are standard equipment on refrigerant plant, are therefore not sufficient to award the credit. Other methods exist, such as pressurising the system with a high pressure, dry nitrogen gas for a period of time and then identify whether or not the pressure drops during this time. However, this requires systems to be shut down for a period of time (usually overnight or longer).
- Systems NOT based on the principle of detecting or measuring the concentration of refrigerant in air: Such systems (for example based on sensing the presence of refrigerant vapour in liquid-carrying pipes or based on detecting whether a system is low on charge) are now commercially available.

### **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 1990 Environmental Protection Act 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/reclamation.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	-	1	Pol 3 - Refrigerant GWP – Cold Storage	-	-	-	-	-

### Aim

To reduce the contribution to climate change from refrigerants with a high global warming potential.

### Assessment Criteria

The following demonstrates compliance:

1. All refrigerant types used in cold storage systems have a zero Ozone Depleting Potential (ODP) and a global warming potential (GWP) of less than 5.
2. The requirement applies to refrigerants used in systems integral to the building, including where specified:
  - a. Cold storage enclosures.
  - b. Cold store services including: Chilled water pipework, refrigerant pipework and ductwork etc
  - c. Fixed cold or chilled storage cabinets
  - d. Fixed cold drink coolers.

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	There are no additional or different criteria to those outlined above specific to the assessment of extensions to existing buildings.
<b>Shell Only</b>	It is assumed that systems integral to the building will not be installed as part of the shell and core works, as cold storage facilities are unlikely to be installed in a speculative development. Where this is not the case the credit cannot be awarded where the refrigerant GWP of the cold storage that has or will be installed is not confirmed.
<b>Fit Out Only</b>	<p>The criteria apply to new and replaced storage systems specified as part of a fit out and the refrigerants used in any existing systems that will remain post fit out.</p> <p>Any existing system that use refrigerants with an ozone depleting potential or a global warming potential of more than 5 must have been converted to use a refrigerant with a zero ODP and GWP less than 5. Where this is not possible, such systems will need to be replaced to meet the assessment criteria.</p>

<b>Domestic-scale refrigeration equipment &amp; small plug-in chillers</b>	The scope of this BREEAM issue excludes domestic-scale refrigeration equipment and small 'plug-in' chillers and therefore plant not integral to the building.
<b>GWP data not available</b>	Where GWP data is not available, the credit cannot be awarded by default.
<b>No cold food storage</b>	For developments where the tenant or end use function is known and cold food storage is not required, then this issue does not need to be assessed.

### Schedule of Evidence Required

<b>Req.</b>	<b>Design Stage</b>	<b>Post Construction Stage</b>
1&2	<p>A marked-up design plan highlighting the cold food storage areas/plant in the building.</p> <p>A copy of the specification clause confirming either:</p> <ul style="list-style-type: none"> <li>Type(s) of refrigerant to be used.</li> </ul> <p><b>AND</b></p> <p>Manufacturer's information confirming:</p> <ul style="list-style-type: none"> <li>ODP and GWP of each refrigerant.</li> </ul>	<p>A letter from the design team/developer confirming:</p> <ul style="list-style-type: none"> <li>The refrigerant type specified remained unchanged.</li> </ul> <p><b>OR</b></p> <p>Where a change occurred, written confirmation from the design team confirming:</p> <ul style="list-style-type: none"> <li>Type of refrigerant(s) used.</li> </ul> <p><b>AND</b></p> <p>Manufacturer's information confirming:</p> <ul style="list-style-type: none"> <li>ODP and GWP of each refrigerant.</li> </ul>

### Additional Information

#### Relevant definitions

Please refer to BREEAM issue Pol 1.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
3	3	2	Pol 4 - NO <sub>x</sub> emissions from heating source	-	-	-	-	-

### Aim

To encourage the supply of heat from a system that minimises NO<sub>x</sub> emissions, and therefore reduces pollution of the local environment.

### Assessment Criteria

The following demonstrates compliance:

1. Where manufacturer's details demonstrate that the plant installed to meet the building's space heating demand has dry NO<sub>x</sub> emission levels at 0% excess O<sub>2</sub> as follows:

#### Offices & retail only

**Table 27 Dry NO<sub>x</sub> emissions level depending on nominal heat input – offices & retail**

Credits	Nominal heat input < 70kW		Nominal heat input > 70kW	
	Dry NO <sub>x</sub> level (mg/kWh)	Boiler class (EN 297:1994)	Dry NO <sub>x</sub> level (mg/kWh)	Boiler class (EN 676:2003)
1	100	4	120	2
2	70	5	80	3
3	40	-	50	-

#### Industrial only

**Table 28 Dry NO<sub>x</sub> emissions level depending on nominal heat input - industrial**

Credits	Nominal heat input < 70kW		Nominal heat input > 70kW	
	Dry NO <sub>x</sub> level (mg/kWh)	Boiler class (EN 297:1994)	Dry NO <sub>x</sub> level (mg/kWh)	Boiler class (EN 676:2003)
1 (office and associated areas)	70	5	80	3
1 (operational area(s))	70	5	80	3

The emissions should be estimated under normal operating conditions (not standby).

#### Exemplary level criteria

The following outlines the exemplary level criteria to achieve an *innovation credit* for this BREEAM issue.

1. An exemplary credit can be awarded where manufacturer's details demonstrate that the plant installed to meet the building's space heating demand has zero dry NO<sub>x</sub> emission levels at 0% excess O<sub>2</sub>.

<b>Compliance Notes</b>	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new build projects.
<b>Refurbishment</b>	If the heating demand for the refurbished building is being met by an existing system, then the NO <sub>x</sub> emission level for the existing system must be assessed against the criteria of this issue.
<b>Extensions to existing buildings</b>	The rule above for refurbishment projects also applies to new build extensions to existing buildings.
<b>Shell Only</b>	<p>Where the specification and installation of heating systems within tenanted units/areas will be the responsibility of the future tenant, compliance with this BREEAM issue can only be demonstrated via one of the following means in shell only buildings/areas:</p> <ul style="list-style-type: none"> <li>• Option 1 – Use of a tenancy lease agreement between the developer and tenant/s (full value of available credits)</li> <li>• Option 2 – A Green Building Guide for tenant fit outs (half the value of the available credits)</li> <li>• Option 3 – Developer/Tenant collaboration (full value of available credits)</li> </ul> <p>Where compliance with the assessment criteria cannot be demonstrated the available credits must be withheld (option 4).</p> <p>Refer to the <i>Scope</i> section 2.2 <i>Types of project that can be assessed using BREEAM</i> (Shell and Core / Speculative Assessments) for further description of the above options.</p>
<b>Fit Out Only</b>	The criteria apply to any existing or new heating plant specified as part of the fit out. For fit outs of tenant units/floors where heating is provided and managed centrally by a third party, i.e. landlord; the central system must be assessed against the criteria for this issue. If the NO <sub>x</sub> emission level for this system cannot be confirmed the credits must be withheld.
<b>Building designed to be unheated</b>	Where the building is designed to be ultimately unheated and no boilers are installed (as it might be the case in some Mediterranean locations), then the issue is not applicable and will be automatically filtered out by the spreadsheet.
<b>Industrial buildings with no office space</b>	Where the assessed building is designed without an office area or where the office area is designed to be unheated, the first credit does not apply. This issue will be automatically filtered from the assessment by the assessor's spreadsheet tool.
<b>Industrial buildings with an unheated operational area</b>	Where the operational area of the assessed building is designed to be unheated, the second credit does not apply. This issue will be automatically filtered from the assessment by the assessor's BREEAM spreadsheet tool.
<b>Highly insulated building</b>	Where the heating load for a highly insulated/exemplar environmental building is less than or equal to 7% of the heat load for a Building Regulations-compliant building of the same size and type, 1 credit can be awarded regardless of the primary fuel used. Figures used for calculations of the percentage of total heat demand must be based on the output from an <i>appropriate energy modelling software</i> .
<b>NO<sub>x</sub> data provided in different units</b>	Where data is provided in different units, or at a level of excess oxygen greater than zero, the manufacturer/supplier should be asked to convert this to comply with the BREEAM criteria. Alternatively, the assessor may correct these using the correction factors provided in the Additional Information section.

<b>Grid electricity</b>	Where some of the building's space heating is fuelled by electricity from the National Grid, please refer to Checklist A9 to find the average NO <sub>x</sub> emissions of grid electricity in the country of assessment.
<b>Low NO<sub>x</sub> grid electricity</b>	Where the project assessed is located in a country where the NO <sub>x</sub> emissions level of the national grid electricity is less than the levels required by BREEAM, then the credits can be awarded accordingly.  In particular, where the NO <sub>x</sub> emissions level is already less than 40mg/kWh, all three credits can be awarded by default. However, the additional innovation credit will not be available.
<b>Electricity from a renewable source</b>	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 <sub>x</sub> emissions.
<b>Heat pumps</b>	Heat pumps powered by grid electricity indirectly produce emission rates higher than those required by BREEAM and may therefore be unable to achieve any credits under Pol 4. However, the energy saved by using certain types of heat pumps is recognised in BREEAM issue Ene 1 and the reduced emissions are recognised under BREEAM issue Ene 5. Refer to the additional guidance section for guidance on calculating NO <sub>x</sub> emission levels for heat pumps.
<b>District heating</b>	District heating systems that incinerate waste or biomass usually have NO <sub>x</sub> emission rates higher than the levels set to achieve any BREEAM credits. However, district heating systems combined with a cogeneration plant may have lower NO <sub>x</sub> emissions. Evidence will need to be provided as per the schedule of evidence to demonstrate compliance with the BREEAM requirements.  Where the local authority requires district heating to be used for the project, one point can be awarded by default where the project has achieved at least 8 points under Ene 1.
<b>Heat recovery</b>	Heat recovery can be considered as having zero NO <sub>x</sub> emissions for the purpose of this issue.
<b>Combined Heat &amp; Power</b>	Refer to the additional guidance section for guidance on calculating NO <sub>x</sub> emission levels from CHP.
<b>Biomass</b>	Whilst Biomass systems are recognised as low carbon systems, they can produce a significant amount of NO <sub>x</sub> and so may not achieve this credit; however they can score highly in the Energy section of BREEAM. Biomass systems are also recognised as reducing the impact of fossil fuel depletion by employing a renewable combustion fuel source.
<b>More than one heating system</b>	Refer to the additional guidance section for guidance on calculating NO <sub>x</sub> emission levels where heat is provided by more than one system.
<b>Green Tariff</b>	Commitments to use a Green tariff to supply electricity to heat the building or power heat pumps are not recognised in this issue due to the uncertainty that this electricity will be zero emission.
<b>Point of use heaters</b>	Where specified, point of use heaters must be included in the assessment regardless of whether or not they are integral to the building structure.

### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
1	<p>A copy of the specification clause confirming:</p> <ul style="list-style-type: none"> <li>Type of heating system(s) installed.</li> </ul> <p>For each system specified, a letter, email or literature from the manufacturer(s) confirming:</p> <ul style="list-style-type: none"> <li>Dry NO<sub>x</sub> emissions rate in mg/kWh.</li> </ul> <p>If more than one system is providing heat, design team calculations confirming:</p> <ul style="list-style-type: none"> <li>The average NO<sub>x</sub> emission rate.</li> </ul>	<p>Assessor's building/site inspection and photographic evidence confirming:</p> <ul style="list-style-type: none"> <li>Heating system(s) installed.</li> </ul> <p><b>OR</b></p> <p>A letter from the design team or main contractor confirming:</p> <ul style="list-style-type: none"> <li>No changes to the specification.</li> </ul>

### Additional Information

#### Relevant definitions

**Appropriate energy modelling software:** Refer to BREEAM issue Ene 1 for a definition.

**NO<sub>x</sub> emissions:** are pollutant gases produced by the combustion of fossil fuels. NO<sub>x</sub> 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.

**Dry NO<sub>x</sub> Levels:** the NO<sub>x</sub> emissions (mg/kWh) resulting from the combustion of a fuel at 0% excess oxygen levels.

#### Calculating NO<sub>x</sub> emission levels from fossil energy fired boilers:

For fossil fuel boilers, the NO<sub>x</sub>-emission rate for heat production can either be directly obtained from manufacturers data or calculated from measurements. It is only possible to measure NO<sub>x</sub>-emissions in mg/m<sup>3</sup> combustion air. Please find conversion rates below.

#### Calculating NO<sub>x</sub> emission levels from Combined Heat & Power (CHP) systems

Where CHP systems are present or specified, only the heat-related emissions are considered for the assessment of this issue. For a combined heat and power production unit, it is not possible to clearly charge NO<sub>x</sub> emissions to either heat or electricity, as both are produced at the same time with a certain NO<sub>x</sub> emission. Therefore it is necessary to use a reference NO<sub>x</sub>-emission for the produced electricity in the country of assessment, subtract it from the total NO<sub>x</sub> -emission produced by the plant and then allocate the remaining NO<sub>x</sub> emissions to the heat output. The following formula should be used to determine this:

$$m_{Heat} = \frac{M - W_{el} \times m_{el,ref.}}{W_{Heat}}$$

Where:

$m_{Heat}$  = NO<sub>x</sub> emissions per unit of heat generated in mg/kWh<sub>heat</sub>

$M$  = total NO<sub>x</sub> emissions generated by plant in mg

$W_{el}$  = total quantity of electricity produced in kWh<sub>el</sub>

$m_{el,ref.}$  = country-specific electricity reference NO<sub>x</sub>-emissions in mg/kWh<sub>el</sub> – please refer to Checklist A9 to find the relevant information

$W_{Heat}$  = total quantity of electricity produced in kWh<sub>Heat</sub>



The above methodology determines the net NO<sub>x</sub> emissions from CHP-generated electricity compared with central generation of electricity and allocates this amount to the heat production. Where  $m_{\text{Heat}}$  is calculated to be negative, it should be assumed to be zero.

#### Calculation example:

The manufacturer states that the CHP systems emits 50 tonnes of NO<sub>x</sub> emissions per year and produces 55,000 MWh of heat and 50,000 MWh of electricity. The project is located in Denmark. The specific heat-related NO<sub>x</sub> emissions of the plant are as follows;

$$M = 50 \text{ tonnes}$$

$$W_{\text{el}} = 50,000 \text{ MWh}_{\text{el}}$$

$$m_{\text{el,ref}} = 570 \text{ mg/kWh (taken from Checklist A9)}$$

$$W_{\text{Heat}} = 55,000 \text{ MWh}_{\text{Heat}}$$

$$m_{\text{Heat}} = (50 \cdot 10^9 \text{ mg} - 50 \cdot 10^6 \text{ kWh}_{\text{el}} \cdot 570 \text{ mg/kWh}_{\text{el}}) / (55 \cdot 10^6 \text{ kWh}_{\text{Heat}}) = 390.9 \text{ mg/kWh (No credits are awarded)}$$

If the same project was assessed in Czech Republic, the specific heat-related NO<sub>x</sub> emissions of the plant would now be:

$$W_{\text{el,ref}} = 1315 \text{ mg/kWh (taken from Checklist A9)}$$

$$m_{\text{Heat}} = (50 \cdot 10^9 \text{ mg} - 50 \cdot 10^6 \text{ kWh}_{\text{el}} \cdot 1315 \text{ mg/kWh}_{\text{el}}) / (55 \cdot 10^6 \text{ kWh}_{\text{Heat}}) = -286.4 \text{ mg/kWh (Three credits are awarded)}$$

#### Calculating NO<sub>x</sub> emission levels for heat pump systems

Heat pumps use electrical energy to produce heating energy. Therefore the reference emission of electricity should be multiplied by the used electricity and allocated to the heat output.

$$m_{\text{Heat}} = \frac{m_{\text{el,ref}} \cdot W_{\text{el}}}{W_{\text{Heat}}}$$

Where:

$m_{\text{Heat}}$  = NO<sub>x</sub>-emissions per unit of heat generated in mg/kWh<sub>heat</sub>

$W_{\text{el}}$  = total quantity of electricity produced in kWh<sub>el</sub>

$m_{\text{el,ref}}$  = country-specific electricity reference NO<sub>x</sub>-emissions in mg/kWh<sub>el</sub> – please refer to Checklist A9 to find the relevant information

$W_{\text{Heat}}$  = total quantity of electricity produced in kWh<sub>Heat</sub>

The equation can easily be transformed using the Energy Efficiency Ratio EER or the Coefficient of Performance COP that can usually be found in manufacturers' data:

$$EER = \frac{W_{\text{Heat}}}{W_{\text{el}}}$$

$$m_{\text{Heat}} = m_{\text{el,ref}} \cdot \frac{W_{\text{el}}}{W_{\text{Heat}}} = \frac{m_{\text{el,ref}}}{EER}$$

#### Calculation example:

A heat pump has an EER of 3.8. It is located in Spain with a reference emission of 1205 mg/kWh:

$$m_{\text{Heat}} = 1205/3.8 = 317 \text{ mg/kWh (no credits are awarded)}$$

The same heat pump located in Austria with a reference emission of 140:

$$m_{\text{Heat}} = 140/3.8 = 36.8 \text{ mg/kWh (3 credits can be awarded).}$$

### Calculating the average NO<sub>x</sub> emission level where heat is provided by more than one system

Where heat is provided by more than one system, an average NO<sub>x</sub> emission rate should be used based on the ratio of power outputs from each source, i.e. multiply the emissions of each boiler by the percentage of heat demand it supplies and total these values. This is likely to be the case where a CHP system has been sized on the base power demand rather than the heat demand and therefore a secondary heating system is required. The following formula can be used:

$$\text{Average NO}_x \text{ Emission Rate} = (N_1 \times (H_1/H_T)) + (N_2 \times (H_2/H_T)) \dots\dots + (N_n \times (H_n/H_T))$$

Where:

N<sub>1</sub> = NO<sub>x</sub> emissions rate for source 1

N<sub>2</sub> = NO<sub>x</sub> emissions rate for source 2

N<sub>n</sub> = NO<sub>x</sub> emissions rate for source n

H<sub>T</sub> = Total heat output from all sources

H<sub>1</sub> = Heat output from source 1

H<sub>2</sub> = Heat output from source 2

H<sub>n</sub> = Heat output from source n

Where different boiler sizes have been specified, the assessment criteria levels should be averaged using the same formula. For instance, for one credit, N<sub>n</sub> should be replaced by 100 mg/kWh for boilers with a nominal heat input < 70 kW, and 120 mg/kWh for boilers with a nominal heat input > 70 kW. The average NO<sub>x</sub> emission rate criteria should then be compared to the actual average NO<sub>x</sub> emission rate specified in the building to award the credits.

### Conversion factors

Manufacturers should be asked to supply dry NO<sub>x</sub> emissions data in mg/kWh. Where this is not possible the assessor may use the following conversion factors to convert figures in ppm, mg/MJ, mg/m<sup>3</sup> or wet NO<sub>x</sub>. 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.

- Figures in mg/m<sup>3</sup> should be multiplied by 0.857 in order to gain emissions in mg/kWh. A conversion may also be necessary for data not calculated at 0% excess oxygen (see below).
- Figures in parts per million (ppm) should be multiplied by 1.76 in order to obtain mg/kWh. A conversion may also be necessary for data not calculated at 0% excess oxygen. (see below)
- Figures in mg/MJ should be divided by 3.6 in order to show emissions in mg/kWh (1 kWh = 3.6 MJ). A conversion may also be necessary for data not calculated at 0% excess oxygen (below).
- This Issue's criteria are based on *dry* NO<sub>x</sub> values – almost all manufacturers will quote emissions in *dry* NO<sub>x</sub>. However if wet NO<sub>x</sub> figures are supplied, these should be converted to *dry* NO<sub>x</sub>. This can be done by multiplying the wet NO<sub>x</sub> figure by 1.75.

**Excess Oxygen Correction:** If a NO<sub>x</sub> emission rate is quoted by the manufacturer in mg/m<sup>3</sup> or ppm, then it should be established at what % 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<sub>x</sub>. 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:

% Excess O <sub>2</sub>	Conversion (c)
3 %	x 1.17
6%	x 1.40
15%	x 3.54

Conversion factor  $c = 20.9/(20.9 - x)$

Where  $x = \% \text{ excess O}_2$  (NOT excess air) and 20.9 is the percentage of O<sub>2</sub> in the air.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
3	3	3	Pol 5 - Flood Risk	-	-	-	-	-

### Aim

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To encourage development in low flood risk areas or to take measures to reduce the impact of flooding on buildings in areas with a medium or high risk of flooding.

### Assessment Criteria

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The following demonstrates compliance:

#### Two credits

1. Where the assessed development is situated in a flood zone that is defined as having a *low annual probability of flooding*. Please refer to the appropriate compliance note for a definition of risk.
2. This is confirmed by a flood map developed by the *relevant national water authority*, or where no flood maps are available, by a flood risk assessment of the site conducted by the *relevant local authority*. Confirmation must be based on historical AND geological data (e.g altitude) and take all sources of flooding into consideration.

#### One credit

1. Where the assessed development is situated in a flood zone that is defined as having a *medium or high annual probability of flooding*. Please refer to the appropriate compliance note for a definition of risk.
2. This is confirmed by a flood map developed by the *relevant national water authority*, or where no flood maps are available, by a flood risk assessment of the site conducted by the *relevant local authority*. Confirmation must be based on historical AND geological data (e.g altitude) and take all sources of flooding into consideration.
3. The development is appropriately flood resilient and resistant from all sources of flooding to the satisfaction of the local authority and statutory body.
4. The ground level of the building, and access to it 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 note 6 & 7).

#### Additional credit for attenuation measures

1. Where on-site attenuation measures are specified to ensure that:
  - a. 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 for all events up to the 100-year return period.
  - b. The **additional** predicted volume of rainwater discharge caused by the new development, for a 1 in 100 year event is entirely reduced using infiltration AND / OR is made available for use in the building as a replacement for potable water use in non-potable applications such as WC flushing.

2. Those measures must be designed using dynamic wave methods and in accordance with EN 752:2008 and EN 12056-3:2000.
3. The capacity of the attenuation measures must include an allowance for climate change.
4. Any residual additional rainwater volume that cannot be prevented from being discharged (reasons must be provided with supporting evidence), the peak discharge rate from the site should be reduced to:
  - a. The pre-development site's estimated mean annual flood flow rate ( $Q_{bar}$ ); or
  - b. A minimum flow rate (litres per second), based on good practice guidelines to prevent easy blockage, by ensuring the outlet throttle is not too small;

<b>Compliance Notes</b>	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new build projects.
<b>Refurbishment</b>	Refurbishment projects, where no new building or hard landscaping areas are developed, are likely to achieve the credit for attenuation of surface water run-off. In such instances, as a minimum, a Flood Risk Assessment must have been carried out and any identified opportunities to reduce surface water run-off as a result of the refurbishment works must be implemented.
<b>Extensions to existing buildings</b>	There are no additional or different criteria to those outlined above specific to the assessment of extensions to existing buildings.
<b>Shell Only</b>	There are no additional or different criteria to those outlined above specific to shell-only assessments.
<b>Fit Out Only</b>	This issue is not assessed in Fit Out-only assessments.
<b>Definition of risk</b>	<p>The definition of flood zones and probabilities of flooding will generally be similar throughout the EU. Please refer to the relevant country reference sheet to find the appropriate water authority and risk definition in the country of assessment.</p> <p>Where these aren't defined in the country of assessment, the following definitions should be used to carry out the flood risk assessment:</p> <ul style="list-style-type: none"> <li>• Low annual probability of flooding: less than 1 in 100 chance (&lt;1%)</li> <li>• Medium or high annual probability of flooding: 1 in 100 or greater chance of river flooding (&gt;1%) OR land where water has to flow or be stored in times of flood (floodplain).</li> </ul>
<b>Flood maps</b>	Where flood maps or equivalent are available in the area of assessment, the BREEAM International assessor should get confirmation that the definition of risk is at least as onerous as the default definition above, and that flood maps have been developed based on historical AND geological data (e.g altitude) and take all sources of flooding into consideration, including whether the land is on a functional floodplain. Where this is not the case, the relevant local authority should further confirm the flood risk at the location taking that additional information into account in order for the credits to be awarded.

<b>Sources of flooding</b>	<p>The following sources (where applicable) should be considered when defining the risk of flooding at any location:</p> <ul style="list-style-type: none"> <li>• Fluvial (rivers)</li> <li>• Tidal (including sea level rise risk)</li> <li>• Surface water: sheet run-off from adjacent land (urban or rural)</li> <li>• Groundwater: most common in low-lying areas underlain by permeable rock (aquifers)</li> <li>• Sewers: combined, foul or surface water sewers.</li> </ul>
<b>Functional flood plain</b>	<p>The BREEAM credit for locating in a flood zone of 'high annual probability' cannot be awarded where the building is located in the functional flood plain ie a 'zone that comprises land where water has to flow or be stored in times of flood'. If the building assessed is or has been defined as 'water-compatible development', please refer to the BREEAM office for guidance on assessing this BREEAM issue.</p>
<b>Pre-existing flood defences</b>	<p>In an area protected by existing flood defences (designed to withstand a certain magnitude of flooding) the appropriate number of credits can be awarded where the defences reduce the risk to 'low' <b>and</b> the following conditions are met:</p> <ol style="list-style-type: none"> <li>1. The development <b>is not located</b> 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 and/or its wider master plan</li> <li>2. The development <b>is located</b> on a previously developed land (as defined by the criteria in BREEAM issue LE1 Re-use of land) and the appropriate statutory body confirm that, as a result of the existing defences, the risk of a flood event occurring is reduced to low (as appropriate to the credit levels set in BREEAM). If firm confirmation is not provided then the credit cannot be awarded</li> <li>3. The relevant agency confirms that, as a result of such defences, the risk of a flood event occurring is reduced to low risk.</li> </ol> <p>A statutory body's local/regional office may be able to provide more information on existing defences in the area in which the assessed development is located.</p>
<b>600mm threshold</b>	<p>It is accepted that, for buildings located in a high flood zone, areas of the car park and site access may be allowed to flood and therefore fall below the 600mm 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 600mm above the design flood level) to ensure the building/site does not become an 'island' in the event of a flood.</p> <p>Where the development has been permitted and the ground levels of the topography/infrastructure immediately adjacent to the site fall below the 600mm 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, meets 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.</p>
<b>Third-party defences</b>	<p>There are many 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 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.</p>

<b>Effectiveness of the water run-off attenuation measures</b>	To ensure effective operation of the water run-off attenuation measures, the facilities must discharge half their volume within 24-48 hours (unless advised otherwise by a statutory body) of the storm event in readiness for any subsequent storm inflow.
<b>Calculating peak rate of run-off</b>	The assessor is not required to perform any calculation as this should be provided by the design team to demonstrate that they have sized the attenuation facilities to store the relevant volume of storm water necessary to achieve the credit.
<b>Residual additional rainwater volume</b>	Where rainwater is being discharged to a public sewer or adopted surface water sewer, and there is a specific minimum requirement defined by the Sewerage Undertaker that conflicts with the BREEAM requirement, then the BREEAM requirement can be discounted as long as supporting evidence has been provided to justify it.
<b>Rainfall</b>	Local figures for rainfall should be used wherever possible. Please refer to the relevant country appendix sheet to find country specific sources of information. Where local rainfall figures are not available, rainfall data for major cities in each country can be found from the World Meteorological Office <a href="http://www.worldweather.org">http://www.worldweather.org</a> . Data for the closest city from the location of assessment should be used.
<b>Discharge to the sea or estuaries</b>	If all run-off is discharged directly from the site to either the sea, the foreshore, estuaries covered by a shoreline management plan or designated wildlife areas (as part of habitat management) then the credit can be awarded without the need to specify additional attenuation measures.
<b>More stringent criteria</b>	Where the local authority (or other statutory body) requires a greater attenuation than the percentages above, and/or a more onerous design flooding frequency than that recommended in EN 752: 2008, then the higher criteria must be met in order to achieve the credit.
<b>Recommendations from an appropriate statutory body</b>	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.

### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
<b>First &amp; Second Credit</b>		
1&2	<p>A copy of a flood map or a letter from the relevant local authority confirming:</p> <ul style="list-style-type: none"> <li>Flood zone or annual probability of flooding in the site location.</li> <li>Sources of flooding considered</li> </ul> <p>Where appropriate, correspondence from the appropriate statutory body confirming:</p> <ul style="list-style-type: none"> <li>Reduced annual probability of flooding due to existing flood defences.</li> </ul>	As design stage, no further evidence is needed.
3	<p>Site plans/sections confirming:</p> <ul style="list-style-type: none"> <li>The design flood level for the site</li> <li>The design ground level(s) for all developed areas of the site.</li> <li>Safe access and escape routes</li> </ul>	'As built' site plans/sections.

Additional Credit for attenuation measures		
All	<p>Confirmation of the appointment of an appropriately qualified engineer or consultant to carry out the calculations and provide design criteria for all relevant elements.</p> <p>Copy of the consultant's or engineer's report confirming the following:</p> <ul style="list-style-type: none"> <li>• Type and storage volume (l) of the water run-off attenuation measures</li> <li>• Total area of hard surfaces (m<sup>2</sup>)</li> <li>• Peak flow rate (l/s) for the design storm event</li> <li>• Use of dynamic wave methods</li> <li>• Design in compliance with EN 752:2008 and EN 12056-3:2000.</li> <li>• Additional allowance for climate change designed in to the system</li> </ul> <p>Copies of any drawings, site plans and specification text necessary to support the claims made.</p>	<p>Assessor's building/site inspection and photographic evidence confirming:</p> <ul style="list-style-type: none"> <li>• Installation of water run-off attenuation measures</li> <li>• No changes to the evidence provided at the interim 'design' assessment stage.</li> </ul> <p>A letter from the design team or main contractor confirming:</p> <ul style="list-style-type: none"> <li>• No changes to the specification.</li> </ul> <p>Where changes have occurred, copies of as-built designs and calculations must be provided.</p>

### Additional Information

#### Relevant definitions

**Appropriate Consultant:** a hydrological consultant or engineer with a minimum of 2 years experience in surface water run-off calculations and design of flood prevention measures. Where complex flooding calculations and prevention measures are required, this must be a specialist hydrological engineer.

**Catchment:** the area contributing surface water flow to a point on a drainage or water course. It can be divided into sub-catchments.

**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 flood event:** an historic or notional flood event of a given annual flood probability, against which the suitability of a proposed development is assessed and mitigation measures, if any, are designed.

**Design 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.

**Flood defences:** Flood defences do not completely remove the risk of flooding, but they do reduce it. Building in areas where flood defences are present (and appropriately designed to withstand a certain magnitude of flooding) is therefore preferable to those built in medium/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. Localised flood defence schemes may simply create a problem further downstream

**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, a 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* on the site and elsewhere. A Flood Risk Assessment should be prepared according to good practice guidance as outlined in Development and Flood Risk: A practice guide companion to PPS 25, available from [www.communities.gov.uk](http://www.communities.gov.uk).

**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.

**Flood zone:** please refer to the relevant country reference sheet to find the definition of flood zones in the country of assessment where these are defined.

**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/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, soakaways and so on.

**Natural watercourses:** any natural channel that conveys surface water.

**Peak run-off rate** (referred to as  $Q_p$  [ $m^3/sec$ ]): 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/developer (or, where the client has owned/occupied the site for a number of years, its current state).

**Relevant local authority/national water authority:** refers to the body responsible for setting the flood risk such as the local water authority or local sewage utility company. Please refer to the relevant country reference sheet for further guidance.

**Run-off:** this is usually rainwater, but can also be groundwater or overspill from sewers and other sources.

**Run-off rate:** the rate of discharge of water from a surface.

**Run-off attenuation measures:** this covers the range of construction and equipment which can be employed to attenuate run-off from hard surfaces and roofs. Measures include: underground storage, oversized pipes, holding ponds, swales, reed beds, permeable paving, green roofs, local or centralised soakaways etc.

**Peak flow rate:** the peak rate of discharge of water from hard surfaces. For the purpose of calculating the peak flow rate volume, a 60 min duration of the design storm event should be used (unless a different duration is required by a statutory body).

**Sewerage undertaker:** this is a water company with statutory responsibility for sewerage and sewerage disposal and also surface water from roofs and yards of premises.

**Shoreline Management Plan:** SMPs provide a large-scale assessment of the risks associated with coastal processes and present a policy framework to reduce these risks to people and the developed, historic and natural environment in a sustainable manner.

**SUDS** - sustainable drainage systems or sustainable (urban) drainage systems: a sequence of management practices and control structures designed to drain surface water in a more sustainable fashion than some conventional techniques. SUDS devices include:

- Holding ponds
- Swales
- Reed beds
- Permeable paving - in areas where local geological and hydrological conditions allow this to function, e.g. block paved surface on permeable sub-base over gravel bed to store the water and allow it to seep into the soil. For less permeable soils, the gravel layer might be deeper and the water taken to a soakaway although this is not an option in some areas.
- Local or centralised soakaways either as full systems or as 'overflow' or 'holding' systems, in areas where local geological and hydrological conditions allow them to function.
- Run-off from roofs collected as a part of a rainwater harvesting system.
- Run-off from roofs directed to a local soakaway or other holding facility such as tanks, ponds, swales etc.
- Green roofs.

**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.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	1	1	Pol 6 - Minimising Watercourse Pollution	-	-	-	-	-

### Aim

To reduce the potential for silt, heavy metals, chemicals or oil pollution to natural watercourses from surface water run-off from buildings and hard surfaces.

### Assessment Criteria

The following demonstrates compliance:

1. Where run-off drains are in areas with a relatively **low risk** source of watercourse pollution, specification of Sustainable Drainage Systems (SUDs) or source control systems such as permeable surfaces or infiltration trenches
2. Where there is a **high risk** of contamination or spillage of substances such as petrol and oil, specification of oil/petrol separators (or equivalent system) in surface water drainage systems (see Compliance Notes for a list of areas).
3. Confirmation from the *appropriate statutory body* that they are content with the proposals.
4. A comprehensive and up-to-date drainage plan of the site will be made available for the building/site occupiers.

In addition, where the building has chemical/liquid gas storage areas the following must also be achieved:

5. Shut-off valves fitted to the site drainage system to prevent the escape of chemicals to natural watercourses (in the event of a spillage or bunding failure).

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	Please refer to the compliance note below regarding ' <i>infill building on an existing site</i> '.
<b>Shell Only</b>	There are no additional or different criteria to those outlined above specific to shell only assessments.
<b>Fit Out Only</b>	The criteria apply to any existing or new facilities that fall within the scope of the fit out works.

<b>Areas that are a source of pollution</b>	For the purpose of assessing this issue 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.
<b>Areas where oil separators are required</b>	The following site areas (where present) require oil separators in surface water drainage systems: <ul style="list-style-type: none"> <li>• Car parks larger than 800m<sup>2</sup> or with 50 or more parking spaces</li> <li>• Smaller car parks discharging to a sensitive environment</li> <li>• Areas where goods vehicles are parked or manoeuvred</li> <li>• Vehicle maintenance areas</li> <li>• Roads</li> <li>• Industrial sites where oil is stored or used</li> <li>• Refuelling facilities</li> </ul>
<b>SUDS and oil interception</b>	In some instances, where the risk of contamination is infrequent and potential spills will be small, oil interceptors may not be required if appropriately designed Sustainable Urban Drainage systems are specified.
<b>Infill building on existing site</b>	Where the assessment is of an individual building on an existing site, i.e. infill development, the requirements 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.
<b>Suitable level of treatment</b>	In all cases the assessor should determine the operational use of the site in order to determine if the proposed surface water run-off strategy is suitable.
<b>Rainwater run-off</b>	This issue is not intended to cover the treatment of rainwater run-off except where there is a risk of significant pollution arising.
<b>Underground/covered areas</b>	Where it can be demonstrated that there will be no drainage or wash down facilities that may lead water from inside the underground or covered area to natural watercourses, then such areas comply with the assessment criteria by default.
<b>Roof plant</b>	Roof top plant space must be considered where there is a risk from substances such as petrol or oil. Refrigerants are not assessed under this issue, as the only risk of pollution is to air and not the watercourse.
<b>No areas at risk from pollution</b>	Where it can be demonstrated that there are no external areas that present a pollution risk, e.g. parking, delivery, manoeuvring or servicing facilities (including individual parking spaces), external waste storage space or other hard standing areas AND there is no plant supported on the roof, then this credit can be awarded by default.
<b>Permeable paving system</b>	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 of this issue for car parks and access roads.
<b>Drainage plan</b>	A comprehensive and up-to-date drainage plan of the site, which accurately identifies all drains, must be produced and handed over to the new occupier. If there is no in-house expertise to do this, a reputable drainage company should be used.
<b>Workshop areas in retail buildings</b>	Where workshop areas are specified, they should be assessed against the above criteria. 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.

### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
1&2	Marked-up proposed site plan highlighting: <ul style="list-style-type: none"> <li>• Low and high risk areas of the site.</li> </ul> A copy of the specification or design plan confirming: <ul style="list-style-type: none"> <li>• Type of pollution control systems specified.</li> </ul>	Assessor's building/site inspection and photographic evidence confirming: <ul style="list-style-type: none"> <li>• Installation of pollution control system(s).</li> </ul>
3	A letter from the appropriate statutory body confirming that they are content with the proposals.	A letter from the design team or main contractor confirming: <ul style="list-style-type: none"> <li>• No changes to the evidence provided at the interim 'design' stage assessment.</li> </ul>
4	A letter from the design team confirming: <ul style="list-style-type: none"> <li>• A copy of the drainage plan will be produced and handed over to the building occupier.</li> </ul>	Assessor's building/site inspection and photographic evidence confirming: <ul style="list-style-type: none"> <li>• Existence of the drainage plan in the building's O&amp;M manual/file.</li> </ul>
5	A copy of the specification or site plan confirming: <ul style="list-style-type: none"> <li>• Installation of shut-off valves and system type.</li> </ul>	Assessor's building/site inspection and photographic evidence confirming: <ul style="list-style-type: none"> <li>• Installation of shut-off valves.</li> </ul>

### Additional Information

#### Relevant definitions

**Appropriate statutory body:** This refers to the body responsible for giving permissions and setting the conditions for the discharge of roof- and surface water to watercourse.

**Low risk areas:** Low risk areas can be defined as areas where the risk of contamination or spillage of substances such as petrol and oil is reduced. For the purpose of this credit, roofs and small car parks may be considered as low risk areas.

**Soakaways:** A sub-surface structure designed to promote the infiltration of surface water in to the ground. As a general point, soakaways may be shallow and broad – as in a blanket under permeable paving, or deeper structures. Deeper, point source soakaways should be avoided for road and car-park drainage, but shallow structures providing infiltration in an extensive way (infiltration trenches and permeable paving) do not need oil separators. See Pollution Prevention Guideline (PPG) 3 "*Use and design of oil separators in surface water drainage systems*", Environment Agency/SEPA/Environment & Heritage Service, 2006 for further guidance.

#### 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 and/or for trapping large spillages.

Both classes can be produced as 'full retention' or 'by pass' separators:

- **Full retention separators** 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** 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.

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	1	1	Pol 7 - Reduction of Night Time Light Pollution	-	-	-	-	-

### Aim

To ensure that external lighting is concentrated in the appropriate areas and that upward lighting is minimised, reducing unnecessary light pollution, energy consumption and nuisance to neighbouring properties.

### Assessment Criteria

The following demonstrates compliance:

1. The external lighting strategy has been designed in compliance with the limits set for light technical parameters in section 2.7 of CIE 150-2003 and table 2 of CIE 126-1997.
2. *Illuminated advertisements*, where specified, must meet the following criteria:
  - a. The uniformity of illuminance must comply with the following:

**Table 29 Recommendations for the uniformity of illuminance**

Type of illumination	Illuminated Area	Uniformity of illuminance
External	Over 1.5m <sup>2</sup>	10:1
External	Up to 1.5m <sup>2</sup>	6:1
Internal	Above and between the light sources	1.5:1

- b. The maximum luminance (CD/m<sup>2</sup>) must comply with the following (please refer to the Additional Information section for a definition of the different zones).

**Table 30 Recommendations for Maximum Luminance (CD/m<sup>2</sup>)**

Illuminated Area (m <sup>2</sup> )	Zone E1	Zone E2	Zone E3	Zone E4
Up to 10.00	100	600	800	1000
Over 10.00	n/a	300	600	600

3. All external lighting (except for safety and security lighting as well as illuminated advertisements) can be automatically switched off between 2300hrs and 0700hrs. This can be achieved by providing a timer for all external lighting set to the appropriate hours. Illuminated advertisements must comply with the criteria under point 2 above except in Zone E1 the maximum luminance value shall be zero post-curfew.
  4. If safety or security lighting is provided and will be used between 2300hrs and 0700hrs, this part of the lighting system complies with the lower levels of lighting recommended during these hours in CIE 150-2003 and CIE 126-1997, for example by using an automatic switch to reduce the lighting levels at 2300 or earlier.

<b>Compliance Notes</b>	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new build projects.
<b>Refurbishment</b>	For refurbishment projects, in addition to any new external lighting specified, any existing lighting that will remain post development must be assessed against the criteria of this issue.
<b>Extensions to existing buildings</b>	If the scope of the assessment covers the new extension only, then it is only new lighting specified as part of that extended works that must be assessed against the criteria for this issue. If the new and existing building is being assessed as one, then the rule for refurbishments (above) applies to the existing building.
<b>Shell Only</b>	There are no additional or different criteria to those outlined above specific to shell-only assessments.
<b>Fit Out Only</b>	There are no additional or different criteria to those outlined above specific to fit out-only assessments.
<b>Individual building on existing site</b>	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, must be assessed.
<b>No external lighting</b>	If there is no external lighting on or around the assessed development the credit can be awarded by default.
<b>Safety lights</b>	Flush stud lights used for safety purposes in vehicle manoeuvring areas may be excluded from the assessment.
<b>Floodlighting, signage lighting</b>	The 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 as per requirement 4.
<b>Essential lighting between 2300 and 0700</b>	Where essential lighting is provided between 2300 and 0700, i.e. for 24-hour operating buildings, the system is able to automatically switch to the lower levels of lighting recommended in the CIE 150-2003 and CIE 126-1997 for lighting during these hours (or provide these lower levels at all times). The more restrictive values, applying after the curfew hour, are predicated on the maintenance of amenity and environmental integrity being the dominant considerations. The need for the proposed lighting and its use during curfew hours should be considered in the first instance.
<b>Different curfew time</b>	Where a different curfew time applies for other reasons (e.g. noise control), consideration should be given to the co-ordination of the curfews, i.e. 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.
<b>Specific security criteria</b>	Any light fittings in the areas outlined above that are specified to comply with specific security criteria/standards, and where those criteria and the BREEAM assessment criteria are not complementary, can be excluded from the assessment of this issue. In these circumstances the assessor must obtain evidence confirming that such criteria are applicable to the assessed development.



<b>Maximum luminance</b>	When considering the zone in which the 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.
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### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
1-3	<p>A marked-up copy of the site plan showing:</p> <ul style="list-style-type: none"> <li>• Areas of the building and site that will be externally lit</li> <li>• Any nearby properties.</li> </ul> <p>A copy of the specification clause requiring, or external lighting design confirming:</p> <ul style="list-style-type: none"> <li>• The external lighting design in compliance with CIE Guidance</li> <li>• Controls for all external lighting.</li> <li>• Design of any illuminated advertisements</li> </ul> <p>In the case of the external lighting design, the M&amp;E engineer or lighting designer must provide indicative examples of where and how the strategy complies with the assessment criteria.</p>	<p>Assessor's building/site inspection and photographic evidence confirming:</p> <ul style="list-style-type: none"> <li>• Cut-off luminaires, if provided, have been angled to limit spill light to potentially obtrusive directions.</li> <li>• External lighting controls</li> </ul> <p>A letter from the design team or main contractor confirming:</p> <ul style="list-style-type: none"> <li>• Installation of systems in accordance with compliant design.</li> <li>• No changes to the evidence provided at the interim 'design' stage assessment.</li> </ul>

### 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 credit 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.

Compliance checking of the design should be carried out against the Commission Internationale D'éclairage 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.

**Illuminated advertisements:** an advertisement which is designed or adapted to be illuminated by artificial lighting, directly or by reflection, and which is so illuminated.

**Illuminance uniformity:** ratio of the maximum luminance to the minimum luminance,

**Lighting zones:** the contrast with the surrounding or background and therefore the lighting environment of the building change the perception of luminance. The maximum luminance of the advertisement needs therefore to be adapted depending on the lighting environment. Four lighting zones can be defined as follows;

**Table 31 Environmental lighting zone**

<b>Zone</b>	<b>Surrounding</b>	<b>Lighting Environment</b>	<b>Examples</b>
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

No. of credits available			Issue Title	Minimum Standards				
Ret	Off	Ind		P	G	VG	E	O
1	1	1	Pol 8 - Noise Attenuation	P	G	VG	E	O
				-	-	-	-	-

### Aim

To reduce the likelihood of noise from the new development affecting nearby noise-sensitive buildings.

### Assessment Criteria

The following demonstrates compliance:

1. There are, or will be, existing *noise-sensitive areas or buildings* within 800m radius of the assessed development.

Where there are or will be no *noise-sensitive areas or buildings* in the locality of the assessed development, the credit can be awarded by default.

2. A noise impact assessment in compliance with ISO 1996 has been carried out and the following noise levels measured/determined:
  - c. 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.
  - d. The rating noise level resulting from the proposed noise-source. This can be based upon reference to similar installations or sites, or determined by calculation.

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 in the additional guidance section).

3. Where the specific noise level of the noise source(s) from the site/building is +5dB during the day (0700hrs to 2200hrs) and +3dB at night (2200hrs to 0700hrs) compared to the background noise level, the credit can be awarded.
4. Where the rating level of the noise source(s) from the site/building is greater than the background noise level, measures have been installed to attenuate the noise at its source to a level where it will comply with requirement 3.

Compliance Notes	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	There are no additional or different criteria to those outlined above specific to the assessment of extensions to existing buildings.

<b>Shell Only</b>	<p>Where the specification and installation of building services systems within the building/tenanted areas will be the responsibility of the future tenant, the acoustician will need to make an assumption for the worst case noise rating level. This can be based upon reference to servicing strategy/installations and sites similar to that of the assessed building or on a maximum design fit out specification.</p> <p>Alternatively, compliance with this BREEAM issue can be demonstrated via one of the following means:</p> <ul style="list-style-type: none"> <li>• Option 1 – Use of a tenancy lease agreement between the developer and tenant/s (full value of available credits)</li> <li>• Option 2 – A Green Building Guide for tenant fit outs (half the value of the available credits)</li> <li>• Option 3 – Developer/Tenant collaboration (full value of available credits)</li> </ul> <p>Where compliance with the assessment criteria cannot be demonstrated the available credits must be withheld (option 4).</p> <p>Refer to the <i>Scope</i> section 2.2 <i>Types of project that can be assessed using BREEAM</i> (Shell and Core / Speculative Assessments) for further description of the above options.</p>
<b>Fit Out Only</b>	<p>The criteria for fit out assessment are the same as those outlined above, subject to the following:</p> <ol style="list-style-type: none"> <li>1. If the fit out includes the replacement of building servicing plant or changes to site layout/access that are likely to result in the creation of a specific noise that will raise the ambient noise level, then an assessment must be carried out.</li> <li>2. The credit can be awarded where it can be demonstrated that the creation of a specific noise is unlikely to raise the ambient noise above the existing background level. This may be the case where the BREEAM-assessed unit forms part of a larger development and as a result, specific attenuation measures specified for the building/unit would have little or no effect on the overall ambient noise level.</li> <li>3. If the fit out results in no new specific noise source then the credit can be awarded.</li> </ol>
<b>Part of a larger mixed-use development</b>	<p>If the development forms part of a larger mixed-use development, where noise sensitive buildings exist or will be developed, then the noise assessment must be carried out to ensure noise from the assessed building will not create a future problem.</p>
<b>Assessed building is defined as <i>noise sensitive</i></b>	<p>If the assessed building is itself defined as a <i>noise sensitive building</i> then a noise impact assessment must be carried out regardless of the assessed buildings locality to other <i>noise sensitive areas or buildings</i>.</p>
<b>Scope of the noise impact assessment</b>	<p>For the purposes of BREEAM the noise impact assessment relates only to building services plant; additional process-related noise does not have to be considered. Stand-by generating plant should also not be included.</p>
<b>Standard not appropriate / not applicable</b>	<p>Where a suitably qualified acoustician confirms that ISO 1996 is not an appropriate standard of assessment for the proposed building/site, their assessment of the likelihood of complaint from noise impact can be accepted for the purpose of assessing this issue.</p>
<b>Industrial buildings with an untreated operational area and no office</b>	<p>Where the industrial unit has no office space and an untreated operational area, this issue will be filtered from the list of applicable credits.</p>

### Schedule of Evidence Required

Req.	Design Stage	Post Construction Stage
1	Site plan highlighting: <ul style="list-style-type: none"> <li>• All existing and proposed noise-sensitive buildings local to, and within, the site boundary</li> <li>• Proposed sources of noise from the new development</li> <li>• Distance (m) from these buildings to the assessed development.</li> </ul>	Assessor's building/site inspection report and photographic evidence confirming: <ul style="list-style-type: none"> <li>• All noise-sensitive buildings local to, and within, the site boundary</li> <li>• Proposed noise sources within the development</li> <li>• Distances (m) from these buildings to the assessed development.</li> </ul>
2&3	A copy of the acoustician's report.  The acoustician's qualifications and professional status.  <b>OR</b>  A copy of the specification clause requiring: <ul style="list-style-type: none"> <li>• A noise assessment in compliance with ISO 1996 by a suitably qualified acoustician.</li> </ul> <b>OR</b>  A formal 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.	A copy of the acoustician's report with measurements based on installed and operating plant.
4	Acoustician's report with recommendations for noise attenuation measures.  <b>AND</b>  A marked-up design plan highlighting the specification of the acoustician's attenuation measures  <b>OR</b>  A formal letter from the client or design team confirming that: <ul style="list-style-type: none"> <li>• If relevant, attenuation measures recommended by an appointed suitably qualified acoustician will be installed.</li> </ul>	Assessor's building/site inspection report and photographic evidence confirming: <ul style="list-style-type: none"> <li>• The existence of the specified noise attenuation measures.</li> </ul> <b>OR</b>  A formal letter from the acoustician confirming that all specified attenuation measures have been installed to the required standard.

### Additional Information

#### Relevant definitions

**Suitably qualified acoustician:** Refer to BREEAM issue Hea 13 for the relevant definition.

**Ambient noise:** totally encompassing sound in a given situation and given time usually composed of sounds from sources near and far.

**Background noise level:** the A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90% of a given time interval.

**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:

- Residential areas
- Hospitals, health centres, care homes, doctor's surgeries etc.
- Schools, colleges and other teaching establishments.
- Libraries
- Places of worship
- Wildlife areas, historic landscapes, parks and gardens.
- Located in an area of Outstanding natural beauty or near a Site of Special Scientific Interest (SSSI).
- Any other development that can be considered noise sensitive.

**Rating noise level:** the specific noise level plus any adjustments for characteristics features of the noise (typically 5dB).

**Residual noise:** the ambient noise remaining at a given position in a given situation when the specific noise source is suppressed to a degree such that it does not contribute to the ambient noise.

**Specific noise level:** the equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source over a given reference time interval.

**Specific noise source:** the noise source under investigation for assessing the likelihood of complaints.

## 13.0 Innovation

Issue ID	Issue Title	No. of credits available	Minimum standards
Inn 1	Innovation	10	No

### Aim

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To provide additional recognition for a procurement strategy, design feature, management process or technological development that innovates in the field of sustainability, above and beyond the level that is currently recognised and rewarded within standard BREEAM issues.

### Assessment Criteria

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The following demonstrates compliance:

#### Up to 10 credits are available by meeting Exemplary Performance for existing BREEAM issues

- Exemplary performance is demonstrated by meeting Exemplary Performance criteria for existing BREEAM Issues. Please refer to the table below for a list of BREEAM issues with defined exemplary performance criteria (this is also found in section 3.0 of the manual, *Scoring and Weighting*). For the specific Assessment Criteria please refer to the section of the technical guidance containing the relevant BREEAM issue.

**Table 32 BREEAM issues with exemplary level criteria**

<b>Man 3</b> - Construction Site Impacts
<b>Hea 1</b> - Daylighting
<b>Hea 9</b> - Volatile Organic Compounds
<b>Hea 14</b> - Office Space (BREEAM Retail & Industrial Schemes only)
<b>Ene 1</b> - Energy Efficiency
<b>Ene 5</b> - Low or Zero Carbon Technologies
<b>Tra 3</b> - Alternative modes of transport
<b>Wat 2</b> - Water Meter
<b>Mat 1</b> - Materials Specification
<b>Mat 5</b> - Responsible Sourcing of Materials
<b>Wst 1</b> - Construction Site Waste Management
<b>Pol 4</b> - NOx emissions of heating source

<b>Compliance Notes</b>	
<b>New Build</b>	There are no additional or different criteria to those outlined above specific to new-build projects.
<b>Refurbishment</b>	There are no additional or different criteria to those outlined above specific to refurbishment projects.
<b>Extensions to existing buildings</b>	There are no additional or different criteria to those outlined above specific to the assessment of extensions to existing buildings.
<b>Shell Only</b>	There are no additional or different criteria to those outlined above specific to shell only projects.
<b>Fit Out only</b>	There are no additional or different criteria to those outlined above specific to fit-out only projects.
<b>Credit limit for Innovation section</b>	A maximum of ten credits may be sought in the Innovation section.

#### **Schedule of Evidence Required**

<b>Req.</b>	<b>Design Stage</b>	<b>Post Construction Stage</b>
1	As defined within existing BREEAM Issues	As defined within existing BREEAM Issues

#### **Additional Information**

##### **Relevant definitions**

None.



## 14.0 Technical Checklists

### 14.1 Technical Checklist A2: Man 2 Constructors' Environmental and Social Code of Conduct

#### 1 Safe and adequate access

This section is intended to demonstrate that the constructor operates the site in a manner that guarantees a safe and appropriate access to, around and on the site.

The following items demonstrate compliance with this section:

REF	Criteria	√	Evidence/reference required	Validation/Justification
a	<p>Appropriate and safe access to the site is provided. This must include as a minimum:</p> <ul style="list-style-type: none"> <li>• Provision of parking on or near site OR a public transport node with an average frequency under 30minutes within 500m OR a dedicated transport service to a major public transport node provided by the contractor.</li> <li>• Good lighting AND Adequate barriers AND uniform surfaces ie no trip hazards outside the site boundary</li> <li>• All accesses to be clean and mud free</li> <li>• Hoarding or scaffolding to be well lit at night AND scaffold netting is in place and well maintained</li> </ul>		<p>See copy of parking plan &amp; check transport / dedicated service timetables.</p> <p>View on site.</p> <p>View on site.</p> <p>View on site.</p>	
b	<p>Appropriate and safe access on site is provided. This must include as a minimum:</p> <ul style="list-style-type: none"> <li>• Footpaths marked with ramps and signs</li> <li>• Pathways wide enough for wheelchairs</li> <li>• Accessibility of all areas by visually or hearing impaired visitors</li> <li>• All site hazards advertised at the site entrance</li> </ul>		<p>View on site and check that list of hazards is complete</p>	
c	<p>Site entrances and exits are clearly marked for visitors and delivery drivers to see.</p>		<p>View on site</p>	
d	<p>Site reception is clearly signposted OR all visitors are escorted to the reception</p>		<p>Check on arrival for the signs OR see a copy of the induction</p>	

			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 onsite, notices are printed in the common local language		Check the area and the staffs register for a minority culture community. Where this is present on- or off-site, check for signs in the communities language.	
g	All road signs / names can be seen OR when a road sign / name is obstructed a replacement has been erected		View on site	
h	Where a site with severe congestion has a delivery point remote from a site, deliveries can then be made in smaller vehicles at times 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:

REF	Criteria	√	Evidence/reference required	Validation/Justification
a	Introductory letters have been / will be sent to all neighbours AND there is a commitment to write and thank neighbours at the end of the contract for their forbearance AND provide feedback form		See copies of letters with 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 along a procedure to monitor the results and implement changes for future work.	

b	<p>Site hours and noisy work restrictions are appropriate to the area, in particular when the site is located near:</p> <ul style="list-style-type: none"> <li>• Houses</li> <li>• Schools</li> <li>• Hospitals</li> <li>• Industrial Units</li> <li>• Major public Transport Nodes</li> <li>• City centres</li> <li>• Shopping facilities</li> </ul>		Copy of statement of intent, policy, agreement etc to be provided	
c	<p>The site boundary is clearly and safely marked and appropriate to the environment:</p> <ul style="list-style-type: none"> <li>• The colour of the hoarding has been considered in terms of the surrounding environment.</li> <li>• Pedestrians have a suitable, safe and protected passage around the site boundary</li> <li>• There are well lit warning signs for the benefit of the pedestrian and road user</li> <li>• The site's surroundings are seen by the public as tidy and clean</li> </ul>		<p>Ask site manager if any thought was given to the hoarding and the location of the site. Is the hoarding clearly /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.</p>	
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	
e	<p>Local people are appropriately informed by the use of a notice board:</p> <ul style="list-style-type: none"> <li>• Of the site progress</li> <li>• Of the company contact details (telephone number / web site / email address)</li> </ul>		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	<p>Site personnel are discouraged from using local facilities in their site clothes. Examples of how this might be achieved include :</p> <ul style="list-style-type: none"> <li>• A canteen</li> <li>• Staggered breaks for different gangs.</li> <li>• Provision of showers / wash rooms.</li> <li>• Provision of lockers.</li> <li>• A request to leave PPE on site.</li> </ul>		<p>View on site. Check procedures with the Site Manager.</p>	

h	There is a volume restriction on radio use or there is a radio ban	Check if restriction / ban is in place and how this is enforced	
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### 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:

REF	Criteria	√	Evidence/reference	Validation/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: <ul style="list-style-type: none"> <li>• Low energy lighting</li> <li>• Switching off equipment when not in use</li> <li>• Installing thermostats</li> <li>• Installing timers</li> <li>• Choosing energy efficient equipment</li> </ul> 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.		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.	
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 / 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	
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#### 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:

REF	Criteria	√	Evidence/reference	Validation/Justification
a	Adequate facilities are provided on-site for workers and visitors. These must include as a minimum: <ul style="list-style-type: none"> <li>• Separate male, female and disabled toilets</li> <li>• Working usable showers AND suitable changing areas e</li> <li>• Lockers in the drying room</li> <li>• Dedicated smoking area</li> </ul>		View on site	
b	Site facilities are well maintained and clean. This must cover as a minimum: <ul style="list-style-type: none"> <li>• Areas around the canteen, offices and skips</li> <li>• Site welfare facilities</li> <li>• Dedicated smoking area</li> </ul>		View on site.	
c	Private or visually-impacting areas are screened. These must include as a minimum: <ul style="list-style-type: none"> <li>• Areas around the canteen, offices and skips where necessary.</li> <li>• Toilets</li> <li>• Dedicated smoking area</li> </ul>		View on site.	
d	Clean 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: <ul style="list-style-type: none"> <li>• Appropriate training of all staff including non native operatives to understand H&amp;S best practices and information displayed on site</li> <li>• Operatives' exposure to the sun</li> <li>• Operatives' identification; all operatives to be provided with a photo ID clip card</li> </ul>		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	

	<ul style="list-style-type: none"> <li>Reporting of all incidents (minor and serious) and near misses</li> <li>Ensuring that an appropriate number of first aiders and first aid equipment are available for the site.</li> </ul>		<p>qualifications (must be less than 3 years old). Check that each first aiders have a box with basic equipment and that they have access to more equipment if necessary and that they know where to find it.</p>	
f	<p>There is posted material indicating nearest police Station and Hospital (with Accident &amp; Emergency facilities) in the following areas as a minimum:</p> <ul style="list-style-type: none"> <li>Site reception</li> <li>Site canteen</li> <li>Main site office</li> </ul>		<p>Spot check managers, operatives, reception staff to check they know this information or at least where they would find it. Check induction talk.</p>	
g	<p>An inspection has been carried out by a Health and Safety inspector or equivalent.</p>		<p>View on site.</p>	
h	<p>Emergency escape routes well identified and clear emergency evacuation procedure AND drills carried out.</p>		<p>View on site. Written proof of fire drill procedure.</p>	

**Signed by:**

**BREEAM Assessor** \_\_\_\_\_

**Site representative** \_\_\_\_\_

## 14.2 Technical Checklist A3: Man 3 Construction Site Impacts

<b>a. Monitor, report and set targets for CO<sub>2</sub> production of energy use arising from site activities</b>		
<b>Compliance requirement</b>	<b>Tick</b>	<b>Evidence/Reference</b>
Monthly measurements of energy use will be/has been recorded and displayed on site.		
Appropriate target levels* of energy consumption will be/were set and displayed (targets could be annual, monthly, or project targets). These should be based on the actual consumption figures from previous projects and should be appropriate to each construction stage.		
As a minimum, monitoring will/did include checking the meters and displaying some form of graphical analysis in the site office to show consumption over the project duration and how actual consumption compares to the targets set.		
The design/site management team will/did nominate an individual who will be responsible for the monitoring and collection of data.		
<p>* Notes:</p> <ul style="list-style-type: none"> <li>Targets for energy consumption during the construction process should be set using Constructing Excellence' Environmental KPI benchmarks. These documents do not specify targets but facilitate projects in setting appropriate targets.  <a href="http://www.constructingexcellence.org.uk/zones/kpizone/default.jsp">www.constructingexcellence.org.uk/zones/kpizone/default.jsp</a> or  <a href="http://www.ccinw.com/sites/kpi_pages.html?site_id=5&amp;section_id=171">http://www.ccinw.com/sites/kpi_pages.html?site_id=5&amp;section_id=171</a></li> <li>BREEAM does not require targets to be met but is encouraging the process of setting, monitoring and reporting against targets.</li> </ul>		
<b>b. Monitor and report CO<sub>2</sub> or energy arising from commercial transport to and from the site</b>		
<b>Compliance requirement</b>	<b>Tick</b>	<b>Evidence/Reference</b>
<p>A site monitoring system will be/was in place to monitor and record deliveries*. This system will/did record:</p> <ul style="list-style-type: none"> <li>The number of deliveries</li> <li>The mode of transport</li> <li>The km/miles travelled for all deliveries</li> </ul>		
The design/site management team will/did nominate an individual responsible for the monitoring and collection of data.		

Notes:
<ul style="list-style-type: none"> <li>• Where the delivery is specifically for the site, a figure of total distance travelled should be used, i.e. a round trip (from the point of origin, to the site and back to the point of origin).</li> <li>• Where the delivery to the site is part of a multiple delivery route, the recorded figure for distance travelled should be the distance travelled to the site (from the previous delivery), plus the distance to the next delivery or return.</li> <li>• This information can then be used to estimate a total figure for kg of CO<sub>2</sub> for the project. BREEAM does not require this information to be converted to CO<sub>2</sub> but the information must be made available to the senior project and site management staff/suppliers to establish benchmarks and aid future decision-making towards improving site and transport efficiency. If the project team wishes to convert this information into CO<sub>2</sub> emissions there are tables provided at the end of this checklist which can be used to do this.</li> </ul>

#### c. Monitor, report and set targets for water consumption arising from site activities

Compliance requirement	Tick	Evidence/Reference
Monthly measurements of water consumption will be/were recorded and displayed on site.		
Appropriate target* levels of water consumption will be/were set and displayed (targets could be annual, monthly or project targets). These should be based on the actual consumption figures from previous projects and should be appropriate to each construction stage.		
As a minimum, monitoring will/did include checking the meters and displaying some form of graphical analysis in the site office to show consumption over the project duration and how actual consumption compares to targets set.		
The design/site management team will/did nominate an individual responsible for the monitoring and collection of data.		

Notes:
<ul style="list-style-type: none"> <li>• Targets for water consumption during the construction process should be set using Constructing Excellence' Environmental KPI benchmarks. These documents do not specify targets but facilitate projects in setting appropriate targets. <a href="http://www.constructingexcellence.org.uk/zones/kpizone/default.jsp">www.constructingexcellence.org.uk/zones/kpizone/default.jsp</a> or <a href="http://www.ccinw.com/sites/kpi_pages.html?site_id=5&amp;section_id=171">http://www.ccinw.com/sites/kpi_pages.html?site_id=5&amp;section_id=171</a></li> <li>• BREEAM does not require targets to be met but is encouraging the process of setting, monitoring and reporting targets.</li> </ul>

#### d. Adopt best practice policies in respect of air (dust) pollution arising from site activities

Compliance requirement	Tick	Evidence/Reference
The site will/did adopt best practice procedures in relation to minimising air/dust pollution. This should include: <ul style="list-style-type: none"> <li>• 'dust sheets'</li> <li>• regular proposals to damp down the site in dry weather</li> <li>• covers to skips etc.</li> </ul>		
This information will be/was disseminated to site operatives.		



Notes:

- Further information can be obtained from BRE/EA publications 'Control of Dust from Construction and Demolition Activities' and Pollution Control Guide Parts 1-5 provide good practice guidelines on construction related pollution.

**e. Adopt best practice policies in respect of water (ground and surface) pollution occurring on the site**

Compliance requirement	Tick	Evidence/Reference
The site will/did adopt best practice procedures in relation to minimising impact, as outlined in the following documents. Where these do not exist, compliance should be demonstrated in accordance with: PPG 1 - General guide to the prevention of pollution. Environment Agency PPG 5 - Works in, near or liable to affect watercourses. Environment Agency PPG 6 - Working at demolition and construction sites. Environment Agency		
This information will be/was disseminated to site operatives.		

**f. A main contractor with an environmental materials policy**

Compliance requirement	Tick	Evidence/Reference
The main contractor operates an environmental materials policy, used for sourcing of construction materials to be utilised on site. The policy should cover/promote the following: <ul style="list-style-type: none"> <li>• Use of local materials (where possible)</li> <li>• Use of responsibly sourced materials</li> <li>• Re use of materials</li> <li>• Use of materials with a high recycled content</li> <li>• Waste minimisation and recycling</li> <li>• Use of non-toxic materials &amp; refrigerants with a low global warming potential</li> <li>• Use of materials with a low embodied impact</li> <li>• Use of durable materials</li> </ul>		
Post construction: indicative examples have been provided to demonstrate the policy in action.		

**g. A main contractor that operates an Environmental Management System\***

Compliance requirement	Tick	Evidence/Reference
The main contractor operates an Environmental Management System covering their main operations. The EMS must be third party certified, to ISO14001/EMAS or equivalent standard (e.g national EMS for small and medium enterprises).		

**h. 80% of site timber is reclaimed, re-used or responsibly sourced**

<b>Compliance requirement</b>	<b>Tick</b>	<b>Evidence/Reference</b>
80% of timber used during construction, including formwork, site hoardings and other temporary site timber used for the purpose of facilitating construction, will be/was procured from sustainably managed sources, independently certified by one of the top two levels as set out in the Responsible Sourcing of Materials Issues (BREEAM issue Mat 5) in the Materials section of this document.		
Additionally 100% of all site timber will be/was legally sourced.		
Notes: <ul style="list-style-type: none"> <li>• Re-used timber from off site can be counted as equivalent but re-usable formwork only complies if it meets the above criteria.</li> <li>• This credit can be awarded where all the timber used is reclaimed timber.</li> </ul>		

**Existing building fit out assessment only items****Adopt best practice policies in respect of air (dust) pollution arising from site activities**

<b>Compliance requirement</b>	<b>Tick</b>	<b>Evidence/Reference</b>
The site will/did adopt best practice procedures in relation to minimising air/dust pollution. This should include: <ul style="list-style-type: none"> <li>• 'dust sheets'</li> <li>• regular proposals to damp down the site in dry weather</li> <li>• covers to skips etc.</li> </ul>		
This information will be/was disseminated to site operatives.		
Notes: <ul style="list-style-type: none"> <li>• Further information can be obtained from BRE/EA publications 'Control of Dust from Construction and Demolition Activities' and Pollution Control Guide Parts 1-5 provide good practice guidelines on construction related pollution.</li> </ul>		

<b>Appointment of a fit out contractor who has an environmental materials policy</b>		
<b>Compliance requirement</b>	<b>Tick</b>	<b>Evidence/Reference</b>
<p>The fit out contractor operates an environmental materials policy, used for sourcing of construction materials to be utilised on site. The policy should cover/promote the following:</p> <ul style="list-style-type: none"> <li>• Use of local materials (where possible)</li> <li>• Use of responsibly sourced materials</li> <li>• Re use of materials</li> <li>• Use of materials with a high recycled content</li> <li>• Waste minimisation and recycling</li> <li>• Use of non-toxic materials &amp; refrigerants with a high global warming potential</li> <li>• Use of materials with a low embodied impact</li> <li>• Use of durable materials</li> </ul>		
<p>Post construction: indicative examples have been provided to demonstrate the policy in action.</p>		
<b>Appointment of a fit contractor who operates an Environmental Management System</b>		
<b>Compliance requirement</b>	<b>Tick</b>	<b>Evidence/Reference</b>
<p>The fit out contractor operates an Environmental Management System covering their main operations. The EMS must be third party certified, to ISO14001/EMAS or equivalent standard.</p>		

## Assessor Information

### Monitoring Site Transport CO<sub>2</sub>

The following tables are taken from the DEFRA 'Guidelines for Company Reporting on Greenhouse Gas Emissions' and COPERT II emission factors, and can be used to convert the information gathered from monitoring deliveries into total kg CO<sub>2</sub>.

Table 33 Standard road transport fuel conversion factors					
Fuel used	Total units used	Units	x	kg CO <sub>2</sub> per unit	Total kg CO <sub>2</sub>
Petrol		litres	x	2.30	
Diesel (inc. Low Sulphur)		litres	x	2.63	
Compressed Natural Gas		kg	x	2.65	
Liquid Petroleum Gas		litres	x	1.49	

Source: National Atmospheric Emissions Inventory for 2003 developed by Netcen (2005). UK Greenhouse Gas Inventory for 2003 developed by Netcen (2005), Digest of UK Energy Statistics DTI 2004 and carbon factors for fuels from UKPIA (2004)

Table 34 Standard road transport fuel conversion factors					
Size of car and distance units	Total units travelled	Units	x	kg CO <sub>2</sub> per unit	Total kg CO <sub>2</sub>
Small petrol car max. 1.4 litre engine		miles	x	0.26	
		km	x	0.16	
Medium petrol car max. 1.4-2.1 litre engine		miles	x	0.30	
		km	x	0.19	
Large petrol car above 2.1 litres		miles	x	0.35	
		km	x	0.22	
Average petrol car		miles	x	0.29	
		km	x	0.18	

Source: NAEI (Netcen, 2005) based on data from DfT combined with factors from TRL as functions of average speed of vehicle derived from test data under real world testing cycles

<b>Table 35 Standard Road Transport Fuel Conversion Factors</b>					
<b>Size of car and distance units</b>	<b>Total units travelled</b>	<b>Units</b>	<b>x</b>	<b>kg CO<sub>2</sub> per unit</b>	<b>Total kg CO<sub>2</sub></b>
Small Diesel car 2.0 litres engine and under		miles	x	0.26	
		km	x	0.16	
Large Diesel car over 2.0 litres - 2.1 litre engine		miles	x	0.31	
		km	x	0.19	
Average Diesel car		miles	x	0.27	
		km	x	0.17	

Source: NAEI (Netcen, 2005) based on data from DfT combined with factors from TRL as functions of average speed of vehicle derived from test data under real world testing cycles.

<b>Table 36 Freight road mileage conversion factors</b>							
<b>Type of lorry</b>	<b>Total km travelled</b>	<b>x</b>	<b>Litre Fuel per km</b>	<b>x</b>	<b>Fuel Type</b>	<b>Fuel Conversion Factor</b>	<b>Total kg CO<sub>2</sub></b>
Articulated		x	0.35	x	Petrol	2.30	
					Diesel	2.63	
					LPG	1.49	
Rigid		x	0.40	x	Petrol	2.30	
					Diesel	2.63	
					LPG	1.49	

Source: Guidelines for Company Reporting on Greenhouse Gas Emissions, DEFRA. Continuing Survey of Road Goods Transport 2001.

## 14.3 Technical Checklist A4: LE3 Land of Low Ecological Value

<b>Section 1: Ecological features of the site</b>		
<b>Instruction:</b> criteria 1.1-1.5 can be used to determine the presence of existing ecological features across the total site. However, if YES is recorded against <b>any</b> question in Section 1 for the <i>construction zone</i> , then it cannot be defined as <i>land of low ecological value</i> and the credit cannot be awarded. If the <i>construction zone</i> records a NO against <b>all</b> the questions in Section 1 then proceed to Section 2.		
1.1	Does the site contain any trees or hedges above 1m high or with a trunk diameter greater than 100mm?	YES <input type="checkbox"/> NO <input type="checkbox"/>
1.2	Are there any ponds, streams or rivers on, or running through the site?	YES <input type="checkbox"/> NO <input type="checkbox"/>
1.3	Is there any marsh or other wetland present on the site?	YES <input type="checkbox"/> NO <input type="checkbox"/>
1.4	Are there any meadows or species-rich grassland present on the site?	YES <input type="checkbox"/> NO <input type="checkbox"/>
1.5	Is there any heath land such as heather present on site?	YES <input type="checkbox"/> NO <input type="checkbox"/>
<b>Section 2: Type of land to be used for the new building</b>		
<b>Instruction:</b> in addition to answering NO to all the questions in Section 1, if YES is recorded against one or more of the questions in Section 2 then the <i>construction zone</i> can be defined as <i>land of low ecological value</i> . This credit can then be awarded, as long as all features of ecological value (as defined in Section 1) in the surrounding site and boundary area are adequately protected from damage.		
2.1	Does the <i>construction zone</i> consist of land which is entirely within the footprint of existing building(s) or building(s) demolished within the past 2 years?	YES <input type="checkbox"/> NO <input type="checkbox"/>
2.2	Does the <i>construction zone</i> consist of land which is entirely covered by other construction such as hard surfaces, car parking or such constructions which have been demolished within the past two years?	YES <input type="checkbox"/> NO <input type="checkbox"/>
2.3	Does the <i>construction zone</i> consist of land which is contaminated by industrial or other waste to the extent that it would need decontamination to facilitate development?	YES <input type="checkbox"/> NO <input type="checkbox"/>
2.4	Does the <i>construction zone</i> consist of land which is a mixture of either existing building(s), hard surfaces and/or contaminated land?	YES <input type="checkbox"/> NO <input type="checkbox"/>
2.5	Does 80% of the land within the <i>construction zone</i> comply with statements 2.1, 2.2 or 2.3 and the remaining 20% of the footprint of the <i>construction zone</i> extend into land which has been either: a. Used for single-crop arable farming for at least 5 years, OR b. Consists of regularly cut lawns and sports fields	YES <input type="checkbox"/> NO <input type="checkbox"/>

## 14.5 Technical Checklist A5: Mat 5 Responsible Sourcing of Materials

**Table 37 Checklist of criteria for Tiers 1-4**

Tier	Criteria	Examples of compliant schemes	Checklist of documentation required
1	<p>Third party certification scheme with CoC and rigorous stakeholder consultation (at both standard setting and during implementation)</p> <p>Scheme must have developed standards which meet the criteria outlined in Table 39 below.</p>	<p>FSC CSA SFI with CoC PEFC Reused materials, Schemes compliant with BES6001:2008 (or similar) Excellent* and Very Good* Performance Ratings (Note; the EMS required to achieve these ratings must be independently certified)</p>	<p><b>Design</b> One of the following indicating that the material will comply with the relevant certification scheme.</p> <ul style="list-style-type: none"> <li>○ Letter of intent from supplier OR</li> <li>○ Purchase order from the supplier including CoC number (if the material has been ordered) or BES6001:2008 Certificate number OR</li> <li>○ Chain of Custody (CoC) or BES6001 certificate (if material has already been supplied)</li> </ul> <p><b>Post Construction</b></p> <ul style="list-style-type: none"> <li>• A copy of the CoC certificate and/or BES6001:2008 certificate for all appropriate materials/elements. AND</li> <li>• Delivery notes for all appropriate materials/elements.</li> </ul>
2	<p>Third party certification scheme with CoC and stakeholder consultation.</p> <p>Scheme must have developed standards which meet the criteria outlined in Table 39 below.</p>	<p>Schemes compliant with BES6001:2008 (or similar) Good* and Pass* Performance Ratings (Note; the EMS required to achieve these ratings must be independently certified)</p>	<p>As above.</p>

Tier	Criteria	Examples of compliant schemes	Checklist of documentation required
3	<p>Certification Scheme for timber</p> <p>Environmental Management System at <b>extraction &amp; process stages</b> - see Table 38 below for description of stages.</p>	<p>ISO 14001 EMAS Evidence of BS8555 (for SME's) MTCC Verified** SGS TFT</p>	<p><b>Design</b></p> <p><u>Timber</u></p> <p>One of the following indicating that the material will comply with the relevant certification scheme.</p> <ul style="list-style-type: none"> <li>○ Letter of intent from supplier OR</li> <li>○ Purchase order from the supplier including CoC number (if the material has been ordered) OR</li> <li>○ Chain of Custody (CoC) certificate (if timber has already been supplied)</li> </ul> <p><u>Non timber materials</u></p> <p>One of the following indicating that the material will comply with the relevant EMS standards (see issue for further information).</p> <ul style="list-style-type: none"> <li>● EMS (or equivalent) certificate from the manufacturers at the process and extraction stages OR</li> <li>● Signed letter from the manufacturers at the process and extraction stages confirming EMS (or equivalent) certification details OR</li> <li>● Letter of intent from the developer to use a manufacturer at the process and extraction stages, who has an EMS (or equivalent), if supplier is not yet appointed.</li> </ul>



Tier	Criteria	Examples of compliant schemes	Checklist of documentation required
3			<p><b>Post Construction</b></p> <ul style="list-style-type: none"> <li>• Delivery notes for all appropriate elements</li> </ul> <p><u>Timber</u></p> <ul style="list-style-type: none"> <li>• CoC certificate for all appropriate elements</li> </ul> <p><u>Non timber materials</u></p> <p>One of the following indicating that the material will comply with the relevant EMS standards (see issue for further information).</p> <ul style="list-style-type: none"> <li>• EMS certificate (or equivalent) from the manufacturers at the process and extraction stages OR</li> <li>• Signed letter from the manufacturers at the process and extraction stages confirming EMS (or equivalent) certification details</li> </ul> <p>In addition:</p> <ul style="list-style-type: none"> <li>• Delivery notes for all appropriate elements</li> </ul>
4	<p>Environmental Management System at <b>process stages</b> for other materials - see Table 38 below for description of stages.</p>	<p>EMAS ISO 14001</p>	<p><b>Design</b></p> <p>One of the following indicating that the material will comply with the relevant EMS standards (see issue for further information).</p> <ul style="list-style-type: none"> <li>• EMS (or equivalent) certificate from the manufacturers at the process stage OR</li> <li>• Signed letter from the manufacturers at the process stage confirming EMS (or equivalent) certification details OR</li> <li>• Letter of intent from the developer to use a manufacturer at the process stage, who has an EMS (or equivalent), if supplier is not yet appointed.</li> </ul>

Tier	Criteria	Examples of compliant schemes	Checklist of documentation required
			<p><b>Post Construction</b></p> <p>One of the following indicating that the material will comply with the relevant EMS standards (see issue for further information).</p> <ul style="list-style-type: none"> <li>• EMS certificate (or equivalent) from the manufacturers at the process stage</li> <li>OR</li> <li>• Signed letter from the manufacturers at the process stage confirming EMS (or equivalent) certification details.</li> </ul>

\* Performance ratings for schemes compliant with BES6001:2008 (or similar) can only be used to demonstrate compliance with the criteria of this issue where certification covers the key process and supply chain processes for the material being assessed.

\*\* 'Verified' is the name of a scheme

To view a list of products approved to BES6001:2008 (including copies of their certificates) visit: [www.greenbooklive.com/page.jsp?id=169](http://www.greenbooklive.com/page.jsp?id=169)

**Where ANY non certified timber is used (even if only a small quantity) the following must also be provided in ALL cases:**

- Written confirmation from the timber supplier(s) (or at the design stage of assessment, the developer where a supplier is not yet appointed) confirming that all timber species and sources used in the development are not listed on any of the CITES appendices for endangered and threatened species (see issue for further information).
- Written confirmation from the timber supplier(s) (or at the design stage of assessment the developer where a supplier is not yet appointed) confirming that all timber is to be legally sourced (see issue for further information).

**Table 38 Diagram of how the required EMS relates to the process and extraction phases**

Stage of production process	Extraction	Process	Manufacture	
<b>Materials</b>	Stone	Bricks		
	Aggregate (sand, limestone etc.)	Cement or alternative		Concrete / blocks
	Hematite	Glass		
	Bauxite	Metals	Composites	
	Clay	Other materials (plastic etc)		
	Raw materials - other	Pre-cast concrete		
<p><b>Points available</b></p> <div style="display: flex; justify-content: space-between; align-items: center;"> <div style="width: 60%;"></div> <div style="text-align: center;"> <p style="margin: 0;">1 point</p> <p style="margin: 0;">1.5 points</p> </div> </div>				

As this issue is looking at responsible sourcing, currently the manufacture stage is not considered.

## NOTE TO ASSESSORS

This list is included for information, you are not expected to evaluate whether a scheme complies with this criteria. All new schemes claiming to meet the criteria listed below will be evaluated by BRE, and will be included in the list of compliant schemes where appropriate.

### Table 39 Features of a top tier (1) comparable certification scheme: Standard setting

When setting standards for a materials certification scheme the following should be addressed in order to be considered comparable to Tier 1/2 of this issue.

- The scheme must include a third party chain of custody certification scheme covering all stages of the product throughout the supply chain
- The scheme must verify that all local and national legislative criteria are met.
- The process for policy and standards development is transparent, clear and accessible.
- The scheme is independent and standards are developed in a way which balances the interests of all stakeholders. This should be done through a rigorous consultation process which makes best use of the stakeholder knowledge, methodically and comprehensively considering all feedback and after such consideration, aims to implement all feasible stakeholder suggestions
- The scheme is inclusive, striving to involve all interested people and groups in the development of the scheme's policies and standards.
- Monitoring and assessment must be integral to the scheme and conducted appropriate to the scale and intensity of the industry/ materials assessed by the scheme. This requirement is likely to be fulfilled by the incorporation of an EMS such as ISO14001 for SME's.
- The scheme should contain principles by which the scheme should be governed. These should be specific to industry/materials but should also be composed of the fundamental issues related to the environment. These issues should focus on specific practices associated with sourcing virgin and other materials.
- The scheme should assess that initiatives are in place to ensure continuous performance and environmental improvement.
- The scheme should provide for small to medium sized business as well as larger businesses. SME's grouping together to achieve group certification should be an option. This could, for example, take place on a regional or other relevant basis.
- The scheme should include a mechanism to revise the standard within a defined, suitable time frame to ensure that the current knowledge or upcoming robust scientific or other professional evidence can be incorporated (in good time) into the standard as an update. It should ensure that all updates are well adapted to the local/regional and/or global conditions.
- The scheme should also aim to consider social and economic aspects widening the scope to sustainability under the umbrella of a Corporate Social Responsibility (CSR). This is in line with the future aims of BREEAM and could be assessed within this issue in the future.

NOTE: The scheme may be generic for the materials industries or specific for individual materials sectors.

**Differences between Tier 1&2**

Tiers 1 and 2 follow the standard setting process outline above, however there are differences in the rigour of the two schemes which is why they fall into two different categories. These are outlined below:

1. The top tier category schemes comprehensively address a consultation process with local community. This is done at source via a management company, as the focus is on sustainable project management at source.
2. The top tier category must have no reservations/uncertainty/pending charge or indictment identified by any professional bodies in the relevant materials sectors.

## 14.6 Technical Checklist A6: Guidance for relating ecologist's report to BREEAM

Before completing this form please read the following:

1. This guidance document is to be used for BREEAM Europe 2009 assessments, where an ecologist has been appointed and produced an ecology report as part of a proposed development.
  2. As an ecologist may have been appointed to carry out ecological site surveys and produced an ecology report without being aware that a BREEAM assessment has been, or is to be conducted, the purpose of this document is to help assist assessors relate the contents of such a report to the land use and ecology criteria of BREEAM.
  3. The assessor is to request that the appointed ecologist complete all sections of this guidance and return it to the BREEAM assessor along with all relevant documentation required to demonstrate compliance with the BREEAM criteria.
  4. The assessor is to use this completed document in conjunction with the latest version of the relevant BREEAM technical guidance manual and information provided by the developer / client to carry out the assessment of the land use and ecology BREEAM issues.
- There are 6 sections (sections A - F) in this document.
  - Section A requires contact details for the ecologist and developer / client.
  - Section B1 determines whether the appointed ecologist is '*suitably qualified*' (under BREEAM); and if not, section B2 determines whether the report has been verified by an ecologist who is '*suitably qualified*'.
  - Section C determines whether the findings of the report have been based on data collected from site surveys conducted at appropriate times of the year to determine whether different species are evident.
  - **If 'no' is recorded for either Section B or C then the contents of the ecology report cannot be used to determine compliance with the BREEAM criteria.**
  - Section D provides the BREEAM assessor with the necessary information to complete the assessment of the ecology related BREEAM issues.
  - Section E provides details of the documentation / information required by BREEAM as evidence of compliance.
  - Section F requires the signature of the appointed ecologist who has completed this document.

*Please note: it is only the appointed qualified and licensed BREEAM assessor who can award or withhold a credit for all BREEAM assessments.*

## Section A: Contact Details

### Ecologist's Details

Company name:

Company address:

Contact name:

Contact telephone number:

Ecology report reference:

### Developer / Client Details

Company name:

Company address:

Contact name:

Contact telephone number:

## Section B1: Ecologist's Qualifications

1. Do you hold a degree (or equivalent qualification) in ecology or related subject?

Yes  No

If yes, please provide details.....  
.....  
.....

2. Are you a practising ecologist with a minimum of 3 years relevant experience within the last 5 years? *Relevant experience must clearly demonstrate a practical understanding of factors affecting ecology in relation to construction and the built environment and will include acting in an advisory capacity to provide recommendations for ecological protection, enhancement and mitigation measures, e.g. ecological impact assessments.*

Yes  No

If yes, please provide details.....  
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**If 'no' has been answered for any question in Section B1 then the BREEAM requirement for a 'suitably qualified ecologist' has not been met. The ecology report CANNOT be used to assess the BREEAM Ecology issues unless it is verified by an individual who is 'suitably qualified' (see section B2 below).**



## Section B2: Report Verification

### Details on verifying an ecology report for a BREEAM assessment:

1. The individual verifying the report must provide written confirmation that they comply with the definition of a '*suitably qualified ecologist*' (as detailed in Section B1 above).
2. The verifier of the report must confirm in writing they have read and reviewed the report and found it to:
  - represent sound industry practice
  - report and recommend correctly, truthfully, and objectively
  - be appropriate given the local site conditions and scope of works proposed
  - avoid invalid, biased, and exaggerated statements.

Written confirmation from the third party verifier on all the points detailed under 1 and 2 above (for section B2) must be included in an appendix to this guidance (see section E).

**If the appointed ecologist does not meet the criteria of a '*suitably qualified ecologist*' and the report has not been verified by an individual who does meet these criteria, then the report CANNOT be used as evidence of compliance with the ecology related BREEAM.**

## Section C: Site Survey

1. Have the findings of the ecology report been based on data collected from a site survey(s)? *The site visit(s) and survey(s) must be conducted at appropriate times of the year when it is possible to determine the presence, or evidence of the presence, of different plant and animal species.*

Yes

No

If yes, please provide details to justify this (e.g. date(s) and scope of site survey(s))

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**If 'no' has been answered to question 1 of Section C then the ecology report CANNOT be used to determine compliance with the criteria of the relevant BREEAM ecology issues.**

*Note to suitably qualified ecologist and BREEAM assessor: the contents of the ecology report must be representative of the site's existing ecology prior to the commencement of initial site preparation works.*

## Section D: Site Survey Details

### LE3 Ecological value of land and protection of ecological features

1. Is the land within the 'construction zone' deemed by the *suitably qualified ecologist* to be of low ecological value?

*The construction zone is defined as any land on the site which is being developed (and therefore disturbed) for buildings, hard standing, landscaping, site access, plus a 3m boundary in either direction around these areas. It also includes any areas used for temporary site storage and buildings.*

Yes  No

If yes, please provide a brief statement explaining how it has been deemed to be of low ecological value:

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2. Are there any features / areas of ecological value that fall within the site, but outside the *construction zone*?

*If you have deemed this area to be of low ecological value then there will be no features of ecological value to protect. However, if there is a feature(s) or area(s) of low ecological value you wish to advise be retained and enhanced, e.g. a species-poor hedgerow to a species-rich hedgerow, then full details of the protection and enhancement advice should be entered under LE4 Impact on site ecology.*

Yes  No

*p.t.o*

If yes, please provide a brief statement outlining the advice / recommendations given for protecting **all** existing features and areas of ecological value:

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**LE4 Impact on site ecology**

3. Are you able to provide the following information for before and after construction:

- habitat types
- An estimate of the number of floral species present per habitat type (based on appropriate census techniques and confirmed planting regimes)?

Yes

No

a. If yes a brief description of the landscapes and habitats surrounding the development site

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b. The total site area (in m<sup>2</sup>). *This will be the same before and after development.*

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*p.t.o*

c. Please fill in the table below with site details before development<sup>1</sup>:

Habitat Type*	Area of type (m <sub>2</sub> )	No. of plant species per habitat type

d. Please fill in the table below with site details after development<sup>1</sup>:

Habitat Type*	Area of type (m <sub>2</sub> )	No. of plant species per habitat type

\* Habitat types will include natural areas, e.g. various grasslands and woodlands; as well as areas of the built environment, e.g. buildings, hard landscaping. The area of each habitat type when added together must always equal the total area of the development site.

<sup>1</sup> Note to assessor (and ecologist where requested to carry our calculations); the information contained in tables c. and d. above can be used to calculate both LE4 Impact on site ecology.

4. Has the client / developer required you to provide advice and make recommendations for enhancing site ecology?

*Note: these are to include, and go beyond, compliance criteria for all current EU and UK legislation relating to protected species and habitats.*

Yes  No

If yes, please provide a brief statement outlining the advice / recommendations given on enhancing and protecting the ecological value of the site:

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5. Has the client / developer requested you to carry out the calculation for LE4 Impact on site ecology (where relevant)?

*The calculations must be carried out in line with the methodology provided in the current version of the relevant BREEAM scheme's technical guidance manual.*

Yes                       No

If yes, please provide all stages of calculations and state what the total change in ecological value is:

a. Calculation of *ecological value* before development:

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b. Calculation of *ecological value* after development:

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c. Change in *ecological value* (c = b – a):

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**LE6 Long term impact on biodiversity**

6. Were you appointed prior to commencement of development work activities on site?

Yes                       No                       Don't know

7. Has the client / developer given you the responsibility to confirm whether all current EU and UK legislation relating to protection and enhancement of ecology has been (or will be) complied with during the design and construction process?

Yes                       No

If yes, please provide details on all current EU and UK legislation that relates to the site:

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8. Has the developer / client appointed you to produce an appropriate landscape/site ecology management plan covering at least the first 5 years after project completion?

Yes  No

EITHER:

a. If yes, and the management plan has already been produced does it include the following:

- management of any protected features on site
- management of any new, existing, or enhanced habitats
- a reference to the current or future site level Biodiversity Action Plan?

Yes  No

OR

b. If yes, but the management plan is still to be produced (due to it being too early in the design/construction phase), have you provided the following information to the developer / client:

- scope of management plan
- key responsibilities, and with whom these responsibilities lie, e.g. owner, landlord, occupier?

Yes  No

If you have answered 'yes' to either question 8a or 8b please provide a brief explanation outlining the details



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9. Has the client / developer required you, as part of your responsibilities, to provide recommendations and advice to minimise detrimental impacts on site biodiversity?

Yes  No  N/A

If yes, or not applicable, please briefly explain your reasoning:

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10. Do your responsibilities to the client / developer include providing advice and recommendations for the protection of ecological features?

Yes  No  N/A

If yes, or not applicable, please briefly explain your reasoning:

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11. Do your responsibilities to the client / developer include providing advice on the creation of a new ecologically valuable habitat, which is appropriate to the local area and is either nationally, regionally, or locally important, or supports nationally, regionally, or locally important biodiversity?

Yes  No  N/A

If yes, or not applicable, please briefly explain your reasoning:

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12. Do your responsibilities to the client / developer include providing advice and recommendations on when site works are to be avoided so as to minimise the disturbance to wildlife?

Yes  No  N/A

If yes, or not applicable, please briefly explain your reasoning

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## Section E: Schedule of Evidence

Copies of the following documentation are required to support the above statements and act as evidence of compliance with the BREEAM ecology criteria:

- The *suitably qualified ecologists* site/project specific report
- Written confirmation from the verifier of the ecology report (where necessary)
- Any supplementary documentation e.g. maps, plans, drawings, letters / emails of correspondence, etc.

Please include these details along with the appropriate reference to each document in the table below:

Document	Reference

## Section F: Statement of Verification

I confirm the information provided on this document is truthful and accurate at the time of completion.

Name of ecologist: .....

Signature of ecologist: .....

Date: .....

## 14.6 Technical Checklist A7: Energy efficient features

Feature	Additional Requirements / Guidance	Credits available	Credits achieved
<b>Cooling System</b>			
<p><b>Applicable to ‘Southern and Mediterranean’ climatic zone only</b></p> <p>Where the building incorporates a free cooling strategy that completely displaces the need for conventional mechanical cooling systems and the thermal comfort requirements of credit Hea 10 are achieved.</p>	<p>Where the building has <b>ANY</b> of the following free cooling strategies. If multiple systems, only give highest credit, don't sum them:</p> <ol style="list-style-type: none"> <li>1. Ground water cooling;</li> <li>2. Surface water cooling;</li> <li>3. Evaporative cooling, direct or indirect;</li> <li>4. Desiccant dehumidification and evaporative cooling, using waste heat;</li> <li>5. Absorption cooling, using waste heat;</li> <li>6. The building does not require any form of cooling (i.e. naturally ventilated).</li> </ol>	1	
<p><b>Applicable to ‘Southern and Mediterranean’ climatic zone only</b></p> <p>Where there is mechanical cooling, at least 80% of cooling demand is served by systems using a refrigerant to distribute cooling to each zone and seasonal mixed mode controls adopted</p> <p><b>OR</b></p> <p>No mechanical cooling (apart from where required as part of building regulations)</p>	<p>That is, cooling distribution is not by air or water based systems.</p> <p>Mechanical cooling is only operated when otherwise overheating would occur.</p> <p>For buildings above 10MW of cooling load, water systems are allowed if Seasonal Energy Efficiency Ratio (SEER) is above 3.3.</p> <p>Examples include mechanical cooling by split or multi-split units, or mechanical cooling via high-efficiency VRF unit with Variable speed drives, with one outdoor condensing unit/system, that comply with EU Ecolabel standards.</p>	1	
<p><b>Applicable to all climatic zones except ‘Southern and Mediterranean’</b></p> <p>Where the building incorporates a free cooling strategy that completely displaces the need for conventional mechanical cooling systems and the thermal comfort requirements of credit Hea 10 are achieved.</p>	<p>Where the building has <b>ANY</b> of the following free cooling strategies. If multiple systems, only give highest credit, don't sum them:</p> <ol style="list-style-type: none"> <li>1. Night-time cooling (requires fabric to have a high thermal mass);</li> <li>2. Ground coupled air cooling (eg labyrinths);</li> <li>3. Ground water cooling;</li> <li>4. Surface water cooling;</li> <li>5. Evaporative cooling, direct or indirect;</li> <li>6. Desiccant dehumidification and evaporative cooling, using waste heat;</li> <li>7. Absorption cooling, using waste heat;</li> <li>8. The building does not require any form of cooling (i.e. naturally ventilated).</li> </ol>	1	

Feature	Additional Requirements / Guidance	Credits available	Credits achieved
<b>Heating System</b>			
<p><b>Applicable to all climatic zones except 'Southern and Mediterranean'</b></p> <p>Construction of walls, floors, roof, windows, doors etc:</p> <p>Average U-value [W/m<sup>2</sup>K] is 20% better than current national regulations (based on values from confirmed construction specifications (see U-Values in Europe<sup>[4]</sup>)</p> <p>If national regulations do not exist then the values to achieve for compliance are: Walls = 0.35 W/m<sup>2</sup>K, Floors = 0.25 W/m<sup>2</sup>K, Roofs = 0.25 W/m<sup>2</sup>K</p> <p><b>AND</b></p> <p>Glazing - If 95 % of the total area of windows is double or triple glazed with low emissivity (but no other) coating and the area of glazing is ≤ 50% of all external wall areas (excluding retail display windows).</p>	<p>Glazing shading and thermal mass are not considered directly for credits as their carbon impact needs to be calculated for each project - there may be an advantage or disadvantage depending on other circumstances.</p> <p>This credit assumes that the heating advantage is dominant and that cooling and daylighting are not compromised by multi-layer glazing. The exclusion of other coatings is because they often compromise daylight availability.</p>	1	
<b>Air leakage</b>			
<p>All ductwork and Air Handling Units (AHUs) if used are certificated to meet the best leakage standards</p> <p><b>OR</b></p> <p>No mechanical ventilation (apart from where required as part of building regulations; such systems should also comply with the leakage standard above)</p>	<p>For example ductwork meets EN13779<sup>[5]</sup> class B, AHUs meet EN1886<sup>[6]</sup> class L1.</p>	1	
<b>Fan Power</b>			
<p>Specific fan power meets limits on right for all ducted air handling systems</p> <p><b>OR</b></p> <p>No mechanical ventilation (apart from where required as part of building regulations; such systems should also comply with the specific fan power criterion above)</p>		1	

Feature	Additional Requirements / Guidance	Credits available	Credits achieved
<b>Lighting</b>			
Energy efficient light source	At least 90% of retail display light fittings are ≤ 5.5w/m <sup>2</sup> /100lux (equivalent to metal halide, or better), and at least 90% of all other light fittings (including any continuously operating security lighting) are ≤ 3.3w/m <sup>2</sup> /100lux (equivalent to T5 (16 mm diameter) triphosphor coated fluorescent tube with high frequency ballast, or better)	1	
Lighting controls (Offices & Industrial)	Either daylight sensing <b>OR</b> Occupancy sensing  Covering at least 90% of building floor area.	1	
Lighting controls (Retail)	Time control for all sales area display lighting, set to reduce to at most 50% normal lux level for cleaning and re-stocking, and off beyond these and customer sales hours. Security lighting should be on separate circuit, controlled by occupancy sensors.  For at least 90% of non-sales areas either; daylight sensing <b>OR</b> Occupancy sensing	1	
<b>Low-Carbon and Renewable Energy Technologies</b>			
At least 5% of total electricity demand is generated on site from Low Carbon or Renewable Energy Sources	Where the building has <b>ANY ONE</b> of the Low-Carbon / Renewable Energy technologies as listed in Ene 5. 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 if in doubt.  Heat pumps should conform to ECO labelling directive ECO label standards.	1	
At least 5% of total space and water heating demand is generated on site from Low Carbon or Renewable Energy Sources		1	
<b>Heat Generator Efficiency</b>			
At least 90% of the space heating and hot water energy is provided from a source (excluding electric resistance heating) with net seasonal efficiency at least 90%(gas)/85%(oil) or measured full load net efficiency at least 95%(gas)/90%(oil)  <b>OR</b> At least 70% of space heating and hot water energy is provided from high efficiency cogeneration or trigeneration.	The implication is that coal will not get credits here as it cannot achieve these efficiencies – but in any case coal (and other solid fuels) have unwanted environmental impacts. For heat pump or biofuel heating see low carbon credits above.  High efficiency cogeneration should meet minimum standards defined in EU CHP directive or according to national standards implementing this directive.	1	

Feature	Additional Requirements / Guidance	Credits available	Credits achieved
<b>Air infiltration</b>			
<p><b>For all nominally enclosed buildings</b></p> <p>Pressure test shows air permeability <math>\leq 50\%</math> of leakage value of current national standards. If national standards are not available, <math>5\text{m}^3/\text{h}/\text{m}^2 @ 50\text{Pa}</math> should be taken as the value to achieve for compliance.</p>	<p>This credit is not assessed for open malls or shops with open door trading, where it gets the credit by default, but is assessed for all other buildings.</p>	1	
<b>Totals</b>		<b>10</b>	



## 14.7 Technical Checklist A9: NOx emissions grid electricity

Country	Average NOx emissions (mg/kWh) grid electricity
Austria	140
Belarus	2720
Belgium	295
Bulgaria	2100
Croatia	535
Czech Republic	1315
Denmark	570
Estonia	1510
Finland	405
France	355
Germany	435
Greece	2570
Hungary	675
Iceland	10
Ireland	1045
Italy	220
Latvia	295
Liechtenstein	Same as Switzerland
Lithuania	545
Luxembourg	No data available yet. Please refer to the Luxembourg reference sheet for further guidance.
Monaco	Same as France
Netherlands	255
Norway	10
Poland	1550
Portugal	855
Romania	2430
Russian Federation	2300
Slovakia	345
Slovenia	860
Spain	1205
Sweden	70
Switzerland	300
Turkey	1320
Ukraine	2040
UK	1050

**Source:**

- *Common Reporting Format for the provision of inventory information by Annex I Parties to the UNFCCC 2007*, available at [http://unfccc.int/national\\_reports/annex\\_i\\_ghg\\_inventories/national\\_inventories\\_submissions/items/4771.php](http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/4771.php)
- *Eurostat - Energy yearly statistics 2007*, available at [http://epp.eurostat.ec.europa.eu/cache/ITY\\_OFFPUB/KS-PC-09-001/EN/KS-PC-09-001-EN.PDF](http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-PC-09-001/EN/KS-PC-09-001-EN.PDF)

## 14.8 Technical Checklist A10: Standards equivalence

Checklist A10 is only accessible to BREEAM International assessors on the BREEAM Extranet in an Excel format.

## 14.9 Technical Checklist A15: Site Waste Management Plan

<b>Checklist A15a - SWMP procedures for monitoring site waste and target setting to promote resource efficiency</b>		
<b>Criteria</b>	<b>Evidence demonstrating how criteria will be met</b>	<b>Reference</b>
SWMP implementation of design phase decision(s) taken to minimise on-site waste produced.		
Identification of individual responsible for planning and preparing the SWMP and ensuring that it is followed. This must either be the client or the principal contractor, according to the stage of the project.		
Identification of the waste groups (according to Checklist A15b) and estimated quantities of waste expected at every stages of the work programme/plan.		
Identification of waste management options, for each waste group, including reference to the waste hierarchy (reduce, re-use, recycle), on and off-site options. Highlight arrangements to identify and manage any hazardous waste.		
Identify and record waste management sites, transactions and contractors for all wastes that require them. Ensure that the contracts are in place and that wastes are handled efficiently, in compliance with legal requirements such as the Duty of Care.		
Set targets and procedures for monitoring progress.		
Provide suitable site induction, information and training both for in-house and sub-contracted staff, guaranteeing that everyone knows the requirements of the SWMP and what it is expected of them.		
Confirmation that the site construction waste is being monitored.		
Measure and record the amount of waste per type produced on a weekly basis. Where possible, use of an established system such as SMARTWaste.		
Continuously update the SWMP during the construction phase (according to best practice).		
After the project completion, revise the SWMP, noting all deviations from initial targets, including resource and estimate cost changes.		

<b>Checklist A15b – Construction waste groups</b>					
<b>EWG Codes</b>	<b>Key Group</b>	<b>Examples</b>	<b>Materials to be monitored (as per Checklist A15a)</b>	<b>As specified in the SMWP</b>	
				<b>Materials to be reduced (2<sup>nd</sup> credit)</b>	<b>Materials to be diverted from landfill (3<sup>rd</sup> credit)</b>
170102	Bricks	Bricks			
170101	Concrete	Pipes, kerb stones, paving slabs, concrete rubble, precast and in situ			
170604	Insulation	Glass fibre, mineral wool, foamed plastic			
15018	Packaging	Paint pots, pallets, cardboard, cable drums, wrapping bands, polythene sheets			
170201	Timber	Softwood, hardwood, boards products such as plywood, chipboard, medium density fibreboard (MDF)			
1602	Electrical and electronic equipment	Electrical & electronic TVs, fridges, air-conditioning units, lamps equipment			
200301	Canteen/office	Office waste, canteen waste, vegetation			
1301	Oils	Hydraulic oil, engine oil, lubricating oil			
1703	Asphalt and tar	Bitumen, coal tars, asphalt			
170103	Tiles and ceramics	Ceramic tiles, clay roof tiles, ceramic, sanitaryware			
1705	Inert	Mixed rubble/excavation material, glass			
1704	Metals	Radiators, cables, wires, bars, sheet			
170802	Gypsum	Plasterboard, render, plaster, cement, fibre cement sheets, mortar			
170203	Plastics	Pipes, cladding, frames, non-packaging sheet			
200307	Furniture	Tables, chairs, desks, sofas			
1705	Soils	Soils, clays, sand; gravel, natural stone			
	Liquids	Non-hazardous paints, thinners, timber treatments			
	Hazardous	Defined in the Hazardous Waste List (HWL) of the European Waste Catalogue (EWC)			
	Floor coverings (soft)	Carpets, vinyl flooring			
	Architectural Features	Roof tiles, reclaimed bricks, fireplaces			
170904 (Mixed)	Mixed/ other	Efforts should be made to categorise waste into the			

		above categories wherever possible			
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**Note:** where national/regional waste management regulation/policy/practice specify key waste groups to be grouped together for the purposes of being recovered (e.g concrete and bricks), please highlight this into your report, and check that the adequate number of waste groups as defined by the issue requirements have been identified for diversion from landfill with distinct end recovery products.

## 14.10 Technical Checklist A16: Contaminated land

NOTE: This checklist provides an indication of the likelihood of there being significant contamination problems on a site for the purposes of a BREEAM assessment only and sets out the scope of any site investigation and remedial strategy. It does not seek to evaluate types, levels or risks of contamination present on the site.

<b>Checklist A16a: Likelihood of significant contamination on site</b>		
<p><b>Instruction:</b> criteria 1-5 can be used to determine the likelihood of significant contamination to be present in or on the ground across the total site for the purposes of a rapid evaluation against the BREEAM LUE2 credit requirements in BREEAM Europe.</p> <p>1. If the <i>construction zone</i> records a YES against <b>any</b> 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 Checklist A16b as a minimum..</p> <p>2. If NO is recorded against <b>all</b> questions for the <i>construction zone</i>, then the site may be defined as not <i>significantly contaminated without further review</i> and 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 Checklist A16b where the client wishes to do so</p>		
1	Is the site registered by the local authority or any other appropriate national land body as contaminated?	YES <input type="checkbox"/> NO <input type="checkbox"/>
2	Does the site have any previous uses that fall in the table 40 below? Where this cannot be answered because of a lack of information available, the worst case scenario should be assumed.	YES <input type="checkbox"/> NO <input type="checkbox"/>
3	Is the site within 250m of landfill?	YES <input type="checkbox"/> NO <input type="checkbox"/>
4	Is the site known or suspected to be contaminated (e.g. have studies already been undertaken on the site)?	YES <input type="checkbox"/> NO <input type="checkbox"/>
5	Does the local authority possess any information on the site that may give suspicions of contamination? Where this cannot be answered because of a lack of information available, the worst case scenario should be assumed.	YES <input type="checkbox"/> NO <input type="checkbox"/>

### Checklist A16b: Scope of site investigation, risk assessment and appraisal report

#### Section 1: Desk top study

**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 initial desktop study investigation gives cause to believe there maybe a problem with contamination

then further more detailed investigations will be required (section 2 & 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 Technical Guidance Document and should cover the following as a minimum:

1.1	Purpose and aim of study	YES <input type="checkbox"/> NO <input type="checkbox"/>
1.2	Site location and layout plans	YES <input type="checkbox"/> NO <input type="checkbox"/>
1.3	Appraisal of site history	YES <input type="checkbox"/> NO <input type="checkbox"/>
1.4	Assessment of environmental setting, covering: <ul style="list-style-type: none"> <li>• Geology, hydrogeology, hydrology</li> <li>• Industrial activity</li> <li>• Location of controlled waters (canals, estuaries, lakes, ponds, rivers, springs, aquifers)</li> <li>• Pollution incidents, landfill sites within 250m etc.</li> </ul>	YES <input type="checkbox"/> NO <input type="checkbox"/>
1.5	Assessment of current/proposed site use and surrounding land uses	YES <input type="checkbox"/> NO <input type="checkbox"/>
1.6	Review of any previous site contamination studies (desk-based or intrusive) or remediation works	YES <input type="checkbox"/> NO <input type="checkbox"/>
1.7	Preliminary (qualitative) assessment of risks: <ul style="list-style-type: none"> <li>• Appraisal of potential contaminant sources, pathways and receptors</li> <li>• Conceptual site model</li> <li>• Identification of <i>significant pollution linkages</i></li> </ul>	YES <input type="checkbox"/> NO <input type="checkbox"/>
1.8	Recommendations for intrusive contamination investigation if necessary	YES <input type="checkbox"/> NO <input type="checkbox"/>

## 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. The report must cover the following as a minimum:

2.1	Site investigation methodology <ul style="list-style-type: none"> <li>• Methods of investigation (see BS 10175: 2001 for further info)</li> <li>• Plan showing exploration locations</li> <li>• Justification of exploration locations</li> <li>• Sampling and analytical strategies</li> </ul>	YES <input type="checkbox"/> NO <input type="checkbox"/>
2.2	Results and findings of investigation: <ul style="list-style-type: none"> <li>• Ground conditions (soil and groundwater)</li> <li>• Discussion of soil/groundwater/surface water contamination</li> </ul>	YES <input type="checkbox"/> NO <input type="checkbox"/>
2.3	Risk assessment: <ul style="list-style-type: none"> <li>• As a minimum, based on contaminant pathway receptor model</li> <li>• Takes account of severity of consequences and likelihood of occurrence.</li> </ul>	YES <input type="checkbox"/> NO <input type="checkbox"/>

2.4	Where applicable, recommendations for remediation based on: <ul style="list-style-type: none"> <li>• Proposed site use</li> <li>• Risk assessment findings</li> <li>• Technical and financial appraisal.</li> </ul>	YES <input type="checkbox"/> NO <input type="checkbox"/>
<b>Section 3: Options for remediation</b>		
<b>Instruction:</b> If remediation is deemed necessary following the site investigation, then a site specific remediation methodology must be produced. 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 <ul style="list-style-type: none"> <li>• Type, form and scale of contamination to be remediated</li> <li>• Remediation methodology</li> <li>• Site plans/drawings</li> <li>• Phasing of works and approximate timescales</li> </ul>	YES <input type="checkbox"/> NO <input type="checkbox"/>
3.2	Consents, agreements and licences (discharge consents, waste management licence etc)	YES <input type="checkbox"/> NO <input type="checkbox"/>
3.3	Site management procedures to protect site neighbours, environment and amenity during works: <ul style="list-style-type: none"> <li>• Health and Safety procedures</li> <li>• Dust, noise and odour controls</li> <li>• Control of surface run-off</li> </ul>	YES <input type="checkbox"/> NO <input type="checkbox"/>
3.4	Details of how the works will be validated to ensure the remediation objectives have been met; <ul style="list-style-type: none"> <li>• Sampling strategy</li> <li>• Use of on-site observations, visual/olfactory evidence</li> <li>• Chemical analysis</li> <li>• Proposed clean-up standards (i.e. contaminant concentrations)</li> </ul>	YES <input type="checkbox"/> NO <input type="checkbox"/>



#### Table 40 List of Site Uses

*Chemicals are extensively used in industrial, domestic and agricultural applications. They may be introduced to the land during their manufacture, use or disposal and may be deposited from the atmosphere, accidental spills, migration, leaks and legal or illegal disposal. There are also natural sources of contamination, whereby concentrations of certain substances in the soil are elevated and may pose a threat to people or the environment. There is a risk of significant contamination where land has been used for activities including but not limited to:*

- Agricultural uses
- Chemical works
- Energy Industry - Power stations
- Engineering and manufacturing processes
- Extractive Industry & Mineral processing
- Food processing industry
- Gas works
- Glass making and ceramics
- Hospitals & Cemeteries
- Infrastructure
- Laboratories
- Landfill
- Manufacturing of asbestos
- Metal processing
- Mills
- Oil refineries
- Paper, pulp and printing industries
- Petrol stations
- Premises for dry cleaning
- Production of metal
- Production of non-metals and their products
- Railway Land
- Road Vehicle maintenance
- Rubber industry
- Sewerage treatment
- Textile industry
- Timber and timber products industry
- Use as a scrap metal store
- Waste Disposal
- Waste management facility
- Wood preserving yards
- Works non-specified
- Demolition of buildings for any of the above uses
- Mining
- Waste management

## 15.0 Schedule of Changes to the Standard

This document details the changes made to the 2008 version of this BRE Environmental and Sustainability Standard, the table also outlines the issue no. (and therefore date) that the change came into affect.

Issue number	Date of issue
1.1	27/10/2009

Key (Type of Change)	
<b>A</b>	Administrative change e.g. typo, re-wording of text, minor addition to the text.
<b>C</b>	An addition/insertion, deletion or alteration to the scope, assessment criteria, Compliance Notes, evidence required or relevant definitions.
<b>AG</b>	An addition/insertion, alteration or deletion to the additional guidance and supporting information/references.

Issue ID / Section	Type	Summary of key changes and new requirements
Scope	A	The list of applicable shell and core issues has been <b>completed</b> with Wat2 in line with the technical content of the manual. However, please note that this list is not exhaustive and where the BREEAM International assessors believes that other issues should be considered in a particular project, this can be discussed with BRE.
Scoring & Rating	A	The 'BREEAM credits for innovation' section (3.4) has been <b>amended</b> to clarify that only one option is available to gain innovation credits under BREEAM Europe. A typo had been left previously indicating that another option might be available.
<b>Health &amp; Wellbeing</b>		
Hea 8 – industrial only	C	A compliance note has been <b>added</b> to clarify how the issue should be assessed for industrial buildings with a small office space. This was clearly stated under Hea 14, but not within the core of Hea 8.
Hea 10	C	The compliance note 'Buildings with office space <500m2' has been <b>amended</b> to indicate that it applies to industrial buildings only.  Retail developments include internal spaces other than offices, where occupant thermal comfort is important to assess and account for. The Hea 10 issue is therefore assessed as a standalone issue in any case regardless of whether there is office space in the development.  In industrial developments, internal occupant thermal comfort applies mainly to office space, as the operational space is often only serviced to meet basic needs and is not intended for long term human occupation. Therefore, where the office space is less than 500 m2, the issue should be assessed as part of Hea 14.
Hea 14 – industrial only	C	In line with the change above, the list of measures to be assessed under Hea 14 has been <b>amended</b> to include thermal comfort too.
<b>Transport</b>		
Tra 3	C	The compliance note 'No parking on site' applicable to option 5 only has been <b>amended from</b> 'The option 5 remains applicable where there is no

		<i>carparking on site provided that the second and third requirements are met</i> <b>to</b> <i>The option 5 remains applicable where there is no carparking on site provided that the first and second requirements are met.</i>
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## 16.0 References

Information listed by BREEAM issue.

### Man 1

- CEN EN 12599 *Ventilation for buildings Test procedures and measuring methods for handing over installed ventilation and air*
- CEN EN 14336:2004 Heating systems in buildings. Installation and commissioning of water based heating systems conditioning systems.
- CEN EN 50491 *General requirements for Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS)*
- *Model Building Specification for Design, Installation, and Commissioning of Insulated Envelopes and Insulated Floors for Temperature Controlled and Ambient Environments*, International Association for Cold Storage construction (June 2003)
- Good Practice Guide 347: *Installation and commissioning of refrigeration systems*, Carbon Trust, 2003.
- Cold Store Code of Practice Part 1 *Enclosure Construction*, The Institute of Refrigeration, 1996.
- EN 14175-2:2003 Fume cupboards - Part 2: *Safety and performance criteria*, 2003.
- EN 14175-2:2003 Fume cupboards - Part 2: *Safety and performance criteria*, 2003.
- EN 12469 – Biotechnology – Performance criteria for microbiological safety cabinets. 2000.

### Man 3

- *COPERT II Computer programme to Calculate Emissions from Road Transport - Methodology and Emissions Factors*, Technical report No 6. <http://reports.eea.eu.int/TEC06/en>
- <http://www.smartwaste.co.uk>
- *Control of Dust from Construction and Demolition Activities*". V Kukadia, S Upton, D Hall BRE Press, 2003.
- *Controlling particles, vapour and noise pollution from construction sites*" - set of five Pollution Control Guides. V Kukadia, S Upton, C Grimwood, BRE Press, 2003.
- *Construction Site Transport: The Next Big Thing*, 2003, BRE and DTI. Available from: [www.bre.co.uk/pdf/constructiontraffic.pdf](http://www.bre.co.uk/pdf/constructiontraffic.pdf)
- *DTI Construction Industry KPI Pack includes Methods of Measurement, Handbook, KPI Wall Chart*, 2005. [www.constructingexcellence.org.uk](http://www.constructingexcellence.org.uk)

### Man 12

- ISO 15686-5 *Service Life Planning – Life Cycle Costing*.

### Hea 1

- EN12464 *Light and lighting – Lighting of work places – Part 1: Indoor work places*
- Information Paper IP 23/93 "Measuring daylight", BRE, 1993.

### Hea 5

- EN 12464-1 *Light and lighting - Lighting of workspaces*, 2002
- EN 12464-2 *Lighting of work places - Part 2: Outdoor work places*, 2007

### Hea 8

- EN 13779:2007 – *Ventilation for non-residential buildings – Performance requirements for ventilation and room-conditioning systems*.

- EN 15251:2007 – *Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics.*

#### Hea 9

- EN 13986:2002 Wood-based panels for use in construction – Characteristics, evaluation of conformity and marking.
- EN 14080:2005 Timber structures – Glued laminated timber – Criteria.
- EN 14342:2005 Wood flooring – Characteristics, evaluation of conformity and marking.
- EN 14041:2004 Resilient, textile and laminate floor coverings. Essential characteristics.
- EN 13964:2004 Suspended ceilings. Criteria and test methods.
- EN 13999-1:2007 Adhesives – Short term method for measuring the emission properties of low-solvent or solvent-free adhesives after application – Part 1: General procedures.
- EN 233:1999. Wallcoverings in roll form – Specification for finished wallpapers, wall vinyls and plastics wallcoverings.
- EN 234: Specification for wallcoverings for subsequent decoration.
- EN 259-1:2001 Wallcoverings in roll form – Heavy duty wallcoverings – Part 1: Specifications.
- EN 266:1992 Specification for Textile wallcoverings.
- EN 717-1:2004 Wood-based panels Determination of formaldehyde release. Formaldehyde emission by the chamber method.
- EN 13999-2:2007. Part 2: Determination of volatile organic compounds.
- EN 13999-2:2007. Part 3: Determination of volatile aldehydes.
- EN 13999-2:2007. Part 4: Determination of volatile diisocyanates.
- EN 12149:1997 Wallcoverings in roll form – Determination of migration of heavy metals and certain other elements, of vinyl chloride monomer and of formaldehyde release.
- EN 13300:2001 Paints and varnishes – water-borne coating materials and coating systems for interior walls and ceilings – Classification.
- Directive 2004/42/CE of the European Parliament and of the Council of 21 April 2004 on the limitation of emission of volatile organic compounds due to the use of organic solvents in certain paints and varnishes and vehicle refinishing products and amending Directive 1999/13/EC. Official Journal of the European Union L.143/87, 30.4.2004.
- EN ISO 11890-2:2006 Paints and varnishes. *Determination of volatile organic compound (VOC) content. Gas-chromatographic method.*
- BRE Digest 464 VOC Emissions from Building Products - Part 1: "Sources, testing and emission data", Chuck Yu, Derrick Crump, CRC Ltd, 2002
- BRE Digest 464 VOC Emissions from Building Products - Part 2: "Control, evaluation and labelling schemes", Chuck Yu, Derrick Crump, CRC Ltd, 2002.

#### Hea 10

- EN 15251:2007 *Energy performance of buildings – Criteria for the indoor environment including thermal, indoor air quality, light and noise.*
- ISO EN 7730: 2005 *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*
- BRE's Environmental Design Guide for Naturally Ventilated and Daylit Offices. Report 345.
- CIBSE Applications Manual AM11 *Building energy and environmental modelling*, CIBSE, 1998.

#### Hea 13

- EN ISO 717-1 *Acoustics – Rating of sound insulation in buildings and of building elements. Part 1. Airborne sound insulation*, 1997.
- EN ISO 717-2 *Acoustics - Rating of sound insulation in buildings and of building elements. Part 2. Impact sound insulation*, 1997.
- EN ISO 140-7 *Acoustics – Measurement of sound insulation in buildings and of building elements. Part 7. Field measurements of impact sound insulation of floors*, 1998.
- EN ISO 140-4:1998 *Acoustics – Measurement of sound insulation in buildings and of building elements. Part 4. Field measurements of airborne sound insulation between rooms*

**Ene 1**

- “Energy Performance of Buildings Directive (EPBD)” <http://www.diag.org.uk/>
- *ASHRAE Energy Standard 90.1-2007*.
- “Thermal Insulation: Avoiding Risks”, C. Stirling, BRE Press, 2002.
- “U-Values in Europe” <http://www.eurima.org/index.php?page=u-values-in-europe>
- “Ventilation for Non-Residential Buildings – Performance Requirements for Ventilation and Room-Conditioning Systems”.
- [www.aiisa.it/news/norma%20europea%20CEN%20TC%20156%20pr-EN13779.pdf](http://www.aiisa.it/news/norma%20europea%20CEN%20TC%20156%20pr-EN13779.pdf)
- “Ventilation for Buildings – Air Handling Units – Mechanical Performance”.
- <http://www.sistem-klima.com.tr/pdf/standards/prEN1886.pdf>

**Ene 6**

- EN 13187 Thermal performance of buildings, “*Qualitative detection of thermal irregularities in building envelopes. Infrared method*”.

**Ene 7**

- “*Guidelines on Energy Efficiency of Lift & Escalator Installations*”, EMSD, 2007.

**Ene 8**

- “*Energy consumption and efficiency potentials of lifts*”, Jürg Nipkow, Max Schalcher, Swiss agency for efficient energy use S.A.F.E.
- ISO DIS25745-1 *Energy performance of lifts, escalators and moving walks – Part 1 Energy and conformance*

**Ene 9**

- “*Guidelines on Energy Efficiency of Lift & Escalator Installations*”, EMSD, 2007.

**Tra2**

- OECD (1994). *Creating rural indicators for shaping territorial policy*. Organisation for Economic Co-operation and Development.

**Tra 4**

- EN 12464-2 *Lighting of work places - Part 2: Outdoor work places*, 2007
- European Transport Safety Council (ETSC) <http://www.etsc.eu/home.php>
- *Safety of pedestrians and cyclists in urban areas*, ETSC, 1999

**Tra 5 & 6**

- *A travel plan resource pack for employers*, DfT, 2000.
- *A good practice guide to green travel plans* BCO, 2004.
- *The Essential Guide to Travel Planning*, DfT, 2008.
- Transport Energy Best Practice, *A Guide on Travel Plans for Developers*, DfT, 2005.

**Wat 1 & 2**

- CEN EN 997: *WC pans and WC suites with integral trap*, 2003.

**Wat 5**

- EN 752:2008 Drain and sewer systems outside buildings
- EN 12056:2000 Gravity drainage systems inside buildings
- EN 12566:2000 *Small wastewater treatment plants <50PT*
- BRE Digest 365 *Soakaway Design*
- BRE Good Building Guide No 42 *Reed Beds*

**Mat 1/2/6**

- The Green Guide to Specification: [www.thegreenguide.org.uk](http://www.thegreenguide.org.uk)
- Invest – <http://www.bre.co.uk/page.jsp?id=52>
- Green Globes – <http://www.greenglobes.com/>
- Equer from Ecole des Mines – <http://www.cenerg.ensmp.fr/english/logiciel/indexequer.html>
- Eco-Quantum from IVAM – <http://www.ivam.uva.nl/index.php?id=59&L=1>
- ATHENA® Impact Estimator for Buildings - <http://www.athenasmi.ca/tools/impactEstimator>

**Mat5**

- EU Eco-Management and Audit Scheme (EMAS) ([www.emas.org.uk/aboutemas/mainframe.htm](http://www.emas.org.uk/aboutemas/mainframe.htm))  
([http://europa.eu.int/comm/environment/emas/index\\_en.htm](http://europa.eu.int/comm/environment/emas/index_en.htm))
- International Standards for Organisation (ISO) [www.iso.org/iso/en/ISOOnline.frontpage](http://www.iso.org/iso/en/ISOOnline.frontpage)
- Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES)  
(<http://www.cites.org/>)
- EU Forest Law Enforcement, Governance and Trade (FLEGT) Action Plan (<http://europa.eu.int/>)
- SGS timber tracking programme ([http://www.sgs.com/forest\\_services\\_?serviceId=8535&lobId=5548](http://www.sgs.com/forest_services_?serviceId=8535&lobId=5548))
- TFT – Tropical Forest Trust (<http://www.tropicalforesttrust.com/>)
- FERN - European NGO campaigning for forests ([www.fern.org](http://www.fern.org))
- ProForest ([www.ProForest.net](http://www.ProForest.net))
- WWF ([www.panda.org](http://www.panda.org))
- Greenpeace Ancient Forest Campaign ([www.greenpeace.org](http://www.greenpeace.org))
- Forests Forever Campaign ([www.forestsforever.org](http://www.forestsforever.org))
- TFT - Tropical Forest Trust publication “*Good Wood, Good Business*” – ([www.tropicalforesttrust.com](http://www.tropicalforesttrust.com))
- “*Good Wood Guide*”, Friends of the Earth/ Flora and Fauna International, 2002- ([www.goodwoodguide.com](http://www.goodwoodguide.com))
- Wood for Good ([www.woodforgood.com](http://www.woodforgood.com))
- “*Certification of Forest Products*”, BRE, 1999.
- Saving the Wood, Building for a Future (Autumn 2001)

**Wst 1**

- For information and further advice on Site Waste Management Plans and to freely download BRE’s new SMARTWaste Plan tool visit: [www.smartwaste.co.uk](http://www.smartwaste.co.uk)
- Revised European Waste Framework Directive, June 17, 2008  
<http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+TA+P6-TA-2008-0282+0+DOC+XML+V0//EN>
- European Environment Agency <http://www.eea.europa.eu/>
- European Demolition Association <http://www.eda-demolition.com/>
- European Waste Catalogue for definition of hazardous waste:  
<http://www.envirowise.gov.uk/page.aspx?o=166037>

**Wst 2**

- AggRegain website (managed by WRAP) has many case studies, guidance and specifications for using recycled and secondary aggregates: [www.aggregain.org.uk](http://www.aggregain.org.uk)
- MINRES website has technical information and case studies relating to the use of recycled and secondary aggregates in a number of high value applications e.g. bricks, concrete etc., and can also help users to locate sources of secondary aggregates: [www.minres.co.uk](http://www.minres.co.uk)

**Wst 3**

- *Metric handbook – Planning and design data*, Adler, Architectural Press, 2nd Ed., 1999.

**LE2**

- CLEA Overview Documents (These and other documents relating to CLEA are available from the Environment Agency's website: [www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)):
  - § CLR 7: Assessment of risks to human health from land contamination; an overview of the development of Soil Guideline Values and related research.
  - § CLR 8: Potential contaminants for the assessment of land.
  - § CLR 9: Contaminants in soil: collation of toxicological data and intake values for humans.
  - § CLR 10: The Contaminated Land Exposure Assessment (CLEA) model: technical basis and algorithms.
- Further advice and technical publications are available for download from the Environment Agency's website: [www.environment-agency.gov.uk](http://www.environment-agency.gov.uk), including;
  - § Remedial methods for contaminated groundwater.
  - § Verification of treatment performance – How sure can you be?
  - § Issues for the selection of remedial strategies, good practice guidance.
  - § Process-based remediation of land contamination.
- BS 10175: 2001, *Investigation of potentially contaminated sites – code of practice*

**LE6**

- Earthwatch Europe: [www.businessandbiodiversity.org](http://www.businessandbiodiversity.org)
- European Environment Agency <http://www.eea.europa.eu/themes/biodiversity>
- European Bioforum <http://www.nbu.ac.uk/bioforum/>

**Pol 1**

- Guidance note 01 *New CFC's, HCFCs, HFC's and halons, Professional and practical guidance on substances that deplete the ozone layer*, CIBSE, 2000.
- *Code of practice for the minimisation of refrigerant emissions from refrigerating systems*, Institute of Refrigeration, Institute of Refrigeration, 1995.
- "Thermal Guidelines for Data Processing Environments", ASHRAE, 2004.
- EC F-gas Regulation 842/2006: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:161:0001:0011:EN:PDF>
- EN 378-1:2000, *Specification for refrigerating systems and heat pumps. Safety and environmental requirements. Part 1 - Basic requirements, definitions, classification and selection criteria*

**Pol 2**

- *Code of practice for the minimisation of refrigerant emissions from refrigerating systems*, Institute of Refrigeration, 1995.
- Guidance Note 01 – *New CFC's, HCFC's, HFC's and halons, Professional and practical guidance on substances that deplete the ozone layer*, CIBSE, 2000.
- EC F-gas Regulation 842/2006: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:161:0001:0011:EN:PDF>



- EC F-gas Regulation 842/2006: <http://europa.eu.int/eur-lex/lex/JOHtml.do?uri=OJ:L:2006:161:SOM:EN:HTML>
- EC Regulation 2037/2000 <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32000R2037:EN:NOT>
- EN 378-1-4, *Specification for refrigerating systems and heat pumps. Safety and environmental requirements*, 2000.

**Pol 4**

- EN 297:1994, A1:1995, A2:1996, A3:1996, A5:1998 and A6:2003 *Gas-fired central heating boilers*, page 42, table 14, section 3.6.2
- EN 676:2003, A2:2008 – *Automatic forced draught burners for gaseous fuels*

**Pol 5**

- EU Floods Directive 2007/60/EC on the assessment and management of flood risks, [http://ec.europa.eu/environment/water/flood\\_risk/key\\_docs.htm](http://ec.europa.eu/environment/water/flood_risk/key_docs.htm)
- EN 12056-3, *Gravity drainage systems inside buildings — Part 3: Roof drainage, layout and calculation*.
- EN 752: 2008, *Drain and sewer systems outside buildings*
- [http://ec.europa.eu/environment/water/index\\_en.htm](http://ec.europa.eu/environment/water/index_en.htm)
- <http://www.floodsite.net>
- <http://www.worldweather.org>.
- C623 *Standards for the repair of buildings following flooding*, CIRIA, 2005.
- C523 *Sustainable urban drainage systems – best practice manual for England, Scotland, Wales and Northern Ireland*, CIRIA, 2001.
- C697 *The SUDS Manual*, CIRIA, 2007.
- *Flood estimation handbook*, Centre for ecology and hydrology, National Environmental Research Council, 1999.
- *Flood estimation for small catchments*, Marshall DCW and Bayliss AC. IOH Report No.124. Institute of hydrology, Wallingford, 1994.
- BRE Good Repair Guide 11 *Repairing Flood Damage*, Part 1-4, BRE Press, 1997.
- BRE Digest 365 *Soakaway design*, BRE, 1991.
- BRESOAK Soakaway design software (2007) <http://www.brebookshop.com/details.jsp?id=376>

**Pol 6**

- EN 858-2:2003 *Separator systems for light liquids (e.g. oil and petrol)*
- EN 1825-2:2002 *Grease separators*
- EN 1253-5:2003 *Gullies for buildings. Gullies with light liquids closure*.
- EN 12056-3, *Gravity drainage systems inside buildings — Part 3: Roof drainage, layout and calculation*.
- EN 752-4: 1997, *Drain and sewer systems outside buildings — Part 4: Hydraulic design and environmental considerations*
- BRE Digest 365 *Soakaway design*, BRE, 1991.
- BRESOAK Soakaway design software (2007) <http://www.brebookshop.com/details.jsp?id=376>
- Figures for rainfall are available from <http://www.worldweather.org>.

**Pol 7**

- *Guide on the Limitation of the effects of obtrusive light from outdoor lighting installation*, Commission Internationale D'éclairage (CIE), Publication 150, 2003.
- *Guidelines for minimising sky glow*, Commission Internationale D'éclairage (CIE), Publication 126, 1997.

- EN 12464-2:2007 *Light and lighting – Lighting of work places – part 2: Outdoor work places*

**Pol 8**

- ISO 1996-1:2003 *Acoustics -- Description, measurement and assessment of environmental noise -- Part 1: Basic quantities and assessment procedures*
  - ISO 1996-2:2007 *Acoustics — Description, measurement and assessment of environmental noise — Part 2: Determination of environmental noise levels*
  - ISO 1996-3:1987 *Acoustics -- Description and measurement of environmental noise -- Part 3: Application to noise limits*
  - European Directive 2002/49/EC relating to the assessment and management of environmental noise
  - European Directive 2000/14/EC on the approximation of the laws of the Member States relating to the noise emission in the environment by equipment for use outdoors.
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