THORNE & DERRICK UK

Tel: +44 (0)191 490 1547
Fax: +44 (0)191 477 5371
Email: northernsales@thorneandderrick.co.uk
Website: www.heattracing.co.uk
www.thorneanderrick.co.uk

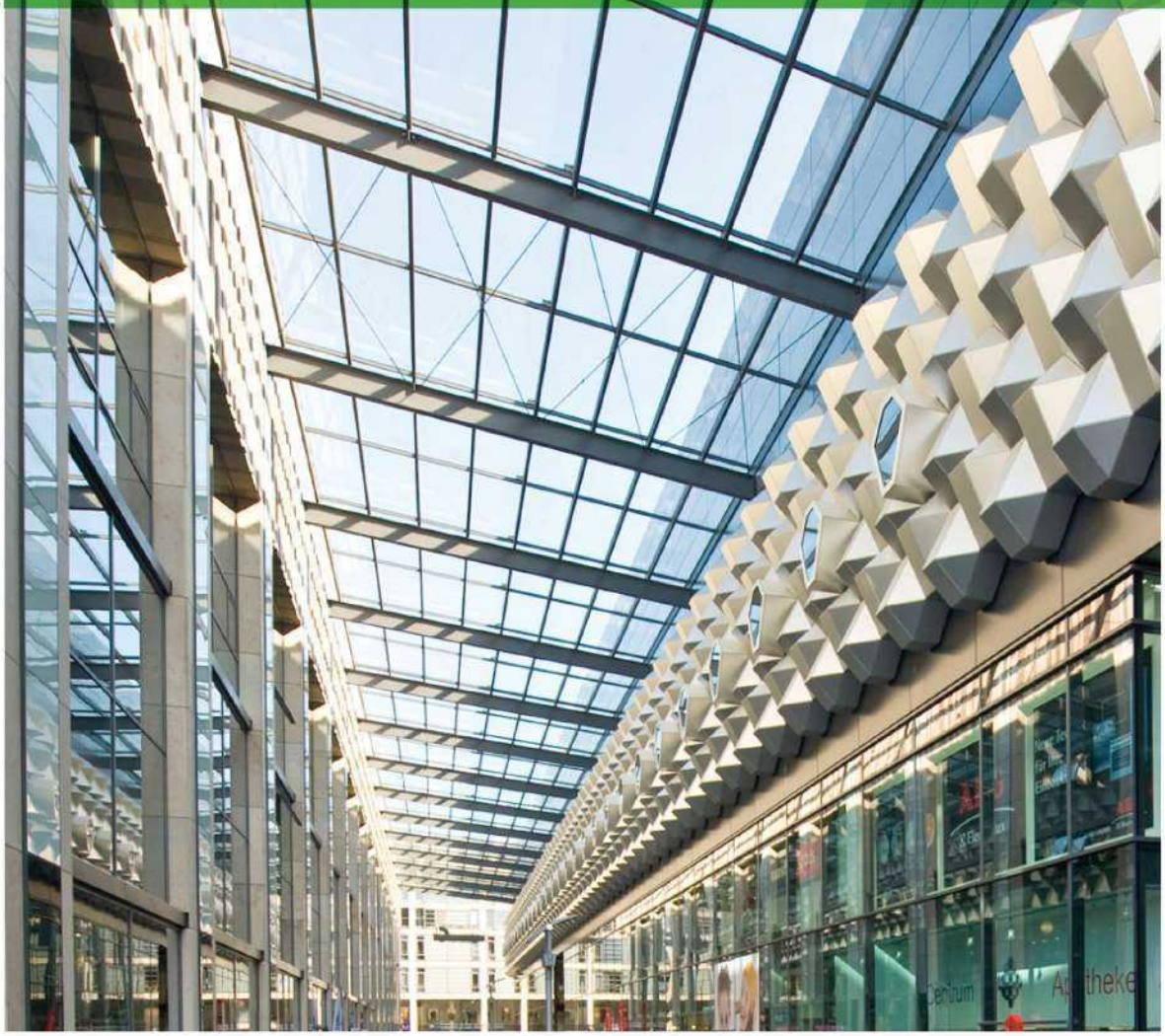
BREEAM®

Code for a Sustainable Built Environment
www.breeam.org

BREEAM New Construction

Non-Domestic Buildings

Technical Manual
SD5073 - 3.1:2011



bre

blank page

Disclaimer

This Scheme Document is the property of BRE Global Ltd and is made publicly available for information purposes only. Its use for testing, assessment, certification or approval must be in accordance with BRE Global Ltd internal procedures and requires interpretation by BRE Global Ltd and BRE experts. Any party wishing to use or reproduce this Scheme Document to offer testing, assessment, certification or approval must apply to BRE Global Ltd for training, assessment and a licence; a fee will normally be charged. BRE Global Ltd will not unreasonably refuse such applications. BRE Global Ltd accepts no responsibility for any un-authorised use or distribution by others of this Scheme Document and may take legal action to prevent such unauthorised use or distribution.

Copyright

Trade Marks

Table of Contents

Table of Contents ... ii

List of Tables ... vi

List of Figures ... viii

About BRE Global Limited ... ix

About this Scheme Document ... xii

Affiliation with the Code for a Sustainable Built Environment ... xiii

Introduction ... 1

Scope of BREEAM 2011 New Construction ... 11

Scoring and Rating BREEAM assessed buildings ... 19

Management ... 27

Man 01 Sustainable procurement ... 28

Man 02 Responsible construction practices ... 40

Man 03 Construction site impacts ... 44

Man 04 Stakeholder participation ... 50

Man 05 Life cycle cost and service life planning ... 59

Health and Wellbeing ... 64

Hea 01 Visual comfort ... 65

Hea 02 Indoor air quality ... 83

Hea 03 Thermal comfort ... 97

Hea 04 Water quality ... 102

Hea 05 Acoustic performance ... 106

Hea 06 Safety and security ... 122

Energy ... 128

Ene 01 Reduction of emissions ... 129

Ene 02 Energy monitoring ... 148

Ene 03 External lighting ... 153

Ene 04 Low and zero carbon technologies ... 157

Ene 05 Energy efficient cold storage ... 167

Ene 06 Energy efficient transportation systems ... 172

Ene 07 Energy efficient laboratory systems ... 176

Ene 08 Energy efficient equipment ... 187

Ene 09 Drying space ... 192

Transport **195**

Tra 01 Public transport accessibility 196

Tra 02 Proximity to amenities 204

Tra 03 Cyclist facilities 207

Tra 04 Maximum car parking capacity 219

Tra 05 Travel plan 226

Water **229**

Wat 01 Water consumption 230

Wat 02 Water monitoring 243

Wat 03 Water leak detection and prevention 246

Wat 04 Water efficient equipment 250

Materials **253**

Mat 01 Life cycle impacts 254

Mat 02 Hard landscaping and boundary protection 271

Mat 03 Responsible sourcing of materials 274

Mat 04 Insulation 292

Mat 05 Designing for robustness 298

Waste **301**

Wst 01 Construction waste management 302

Wst 02 Recycled aggregates 309

Wst 03 Operational waste 313

Wst 04 Speculative floor and ceiling finishes 320

Land Use and Ecology **322**

LE 01 Site selection 323

LE 02 Ecological value of site and protection of ecological features 328

LE 03 Mitigating ecological impact 335

LE 04 Enhancing site ecology 344

LE 05 Long term impact on biodiversity 348

Pollution **355**

Pol 01 Impact of refrigerants 356

Pol 02 NOx emissions 366

Pol 03 Surface water run off 374

Pol 04 Reduction of night time light pollution 391

Pol 05 Noise attenuation 395

Innovation **399**

Inn 01 Innovation 400

Appendices **403**

Appendix A – BREEAM New Construction scope and healthcare building types 404

Appendix B – BREEAM New Construction scope and education buildings 406

Appendix C – BREEAM New Construction scope and multi-residential buildings 408

Appendix D – BREEAM New Construction and shell and core/speculative assessments 409

Appendix E – Organisational, Local or National Considerate Constructor Scheme requirements: guidance for scheme administrators 416

Appendix F – Guidance for relating ecologist's report to BREEAM 419

Appendix G - The BREEAM evidential requirements 432

Appendix H – BREEAM assessment issues by building type and their percentage contribution to BREEAM performance 435

Index **446**

Acknowledgments

BREEAM 2011 for New Construction has been made possible through the continued efforts of many dedicated BRE Group staff members, the BRE Global Limited Governing Board, BREEAM Assessors and those who have responded to our consultation calls and meetings or provided feedback in other ways. BRE also reserve a special thank you to those who support BREEAM by continuing to specify and apply the method and contribute toward a sustainable built environment.

List of Tables

Table - 1: BREEAM 2011 New Construction environmental sections and assessment issues 3

Table - 2: BREEAM rating benchmarks 19

Table - 3: Minimum BREEAM standards by rating level 21

Table - 4: BREEAM Environmental section weightings 23

Table - 5: Example BREEAM score and rating calculation 25

Table - 6: minimum standards for a BREEAM 'Very Good' rating 26

Table - 7: Reflectance for maximum room depths and window head heightsThe table below gives maximum room depths in metres for different room widths and window head heights of sidelit rooms: 81

Table - 8: VOC criteria by product type 84

Table - 9: A selection of good practice indoor ambient noise levels from table 5 and 6 of BS8233:1999 118

Table - 10: Ene 01 EPRNC benchmark scale 130

Table - 11: Contribution to the EPRNCfor differing levels of building performance 144

Table - 12: External lighting requirements by location 153

Table - 13: Best Practice Energy Practices in Laboratories 180

Table - 14: Best Practice Specific Fan Power 182

Table - 15: Default hours of operation for a typical day 202

Table - 16: Building types and applicable amenities 204

Table - 17: Default occupancy rates by building type 223

Table - 18: Water efficient consumption levels by component type 238

Table - 19: Elements assessed by building type 254

Table - 20: Allocation of credits by building type and Mat 01 points 255

Table - 21: The Environmental Product Declaration (EPD) type and tier ranking 265

Table - 22: Green Guide points uplift by EPD type 265

Table - 23: Building type and the use of appropriate Green Guide ratings 267

Table - 24: Applicable building elements and materials 282

Table - 25: Responsible Sourcing Certification Schemes and their tier levels 283

Table - 26: EMS scope by material type 284

Table - 27: Green Guide rating points/element 293

Table - 28: EMS criteria for insulation products 293

Table - 29: Construction waste groups 306

Table - 30: BREEAM checklist for defining land of low ecological value 333

Table - 31: Broad habitat types 338

Table - 32: Inclusive analysis of Average Total Taxon Richness by broad habitat in 'Fields and Other Main Land Cover Parcels plots' in Great Britain. 340

Table - 33: List of some common refrigerant types with low GWP 361

Table - 34: Average annual leakage rates for the UK 362

Table - 35: Ozone depleting potential of refrigerants 363

Table - 36: Definition of flood zones by country 388

Table - 37: Site details before and after development1 424

Table - 38: Calculation of the Ecological Value of the Site Before Development 426

Table - 39: Calculation of the Ecological Value of the Site After Development 427

Table - 40: Management issues by building type and their percentage contribution to BREEAM performance 436

Table - 41: Health and wellbeing issues by building type and their percentage contribution to BREEAM performance 437

Table - 42: Energy issues by building type and their percentage contribution to BREEAM performance 438

Table - 43: Transport issues by building type and their percentage contribution to BREEAM performance 439

Table - 44: Water issues by building type and their percentage contribution to BREEAM performance 440

Table - 45: Material issues by building type and their percentage contribution to BREEAM performance 441

Table - 46: Waste issues by building type and their percentage contribution to BREEAM performance 442

Table - 47: Land Use and Ecology issues by building type and their percentage contribution to BREEAM performance 443

Table - 48: Pollution issues by building type and their percentage contribution to BREEAM performance 444

Table - 49: Innovaion issues by building type and their percentage contribution to BREEAM performance 445

List of Figures

Figure 1: BREEAM assessment and certification stages and the RIBA Outline Plan of Works 5

Figure 2: the BREEAM Certification mark 9

Figure 3: Example Ene01 building performance translator 141

Figure 4: Conventional vertical-sash fume cupboard 183

About BRE Global Limited

BRE Global Limited (part of the BRE Group) is an independent third party approvals body offering certification of fire, security and sustainability products and services to an international market.

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

We aim to achieve this by:

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

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

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

1. BREEAM the world's leading environmental assessment method for buildings
2. LPCB for approval of fire and security products and services

BRE Global Limited is a trading subsidiary of the BRE Trust, the registered research and education charity which owns the BRE Group.

BRE Global Limited
Bucknalls Lane
Watford
Hertfordshire
WD25 9XX

T +44 (0)1923 664100
F +44 (0)1923 664910

E enquiries@breglobal.com

www.breglobal.com
www.greenbooklive.com

Quality Standards

To ensure our independence, competence and impartiality, BRE Global Limited is accredited by the United Kingdom Accreditation Service (UKAS) to:

1. BS EN ISO 17024 (Conformity assessment - General requirements for bodies operating certification of persons) for BREEAM assessors. This is to ensure that BREEAM assessors are technically competent, accurate and professional when offering BREEAM assessment services to their clients.
2. BS EN 45011 (General requirements for bodies operating product certification systems) for the complete BREEAM assessment process.

Furthermore BRE Global Limited is formally certified to ISO 9001 for all its BREEAM related activities.

Governance

As a certification body accredited by the UK Accreditation Service (UKAS) BRE Global Limited maintains an open and accountable governance structure. The operation of BREEAM (and indeed all our assurance activities) is overseen by an independent Governing Body and a Standing Panel for Peer & Market Review.

The Governing Body represents stakeholder interests to ensure, amongst other things, that BRE Global Limited are acting independently and impartially, that we are operating our processes correctly, and that we are treating our customers fairly.

The Standing Panel provides BRE Global with access to a range of experts that can review BRE Global Limited's standards and schemes to ensure their robustness from a scientific, technical and market perspective as well as ensuring the development of the standards and schemes is open to greater external and independent scrutiny.

About this Scheme Document

This technical guide is the BREEAM Scheme Document for New Construction (SD5073), it describes an environmental performance standard against which new, non-domestic buildings in the UK can be assessed, rated and certified.

Please note that this BREEAM Scheme Document and the information detailed therein has been designed for, and to be used by trained, qualified and licensed BREEAM Assessors in accordance with the procedural and operational requirements of BREEAM (as described in SD5070) under the terms and conditions of a relevant BREEAM licence. This document should be used by non BREEAM Assessors for reference purposes only.

Affiliation with the Code for a Sustainable Built Environment

The 2011 version of the BREEAM UK New Construction Scheme is affiliated to the BRE Global international Code for A Sustainable Built Environment.

The BRE Global Code for a Sustainable Built Environment is a set of strategic principles and requirements which define an integrated approach to the design, management, evaluation and certification of the environmental, social and economic impacts of the built environment.

The Code is interpreted through the BREEAM Core Process and Technical Standards. These linked documents set out the requirements that a compliant scheme must meet in order to be affiliated with the Code. The Standards ensure that a common scientific and performance basis is used by all compliant schemes operated by National Scheme Operators whilst ensuring that these can be adapted to suit local demands, standards and practices. BRE Global own and operate a number of affiliated schemes for use in the UK and internationally.

Alignment with European Standards for the Sustainability of Construction Works

CEN, the European Committee for Standardisation is developing a set of framework standards to meet the requirements of Mandate M350. The CEN/TC350 (Sustainability of Construction Works) has already published a general framework for the sustainability assessment of buildings (EN 15643-1; 2010). Within this framework, the environmental performance assessment standards are due to be finalised in 2011. These will establish a framework for environmental assessment of buildings (PR EN15643-2), core rules for the environmental assessment of the construction products (prEN15804) and calculation methods for the environmental performance assessment of buildings (prEN15978). Frameworks for social performance assessment (prEN 15643-3) and economic performance assessment (preen-4) are also in preparation as precursors to the long term goal of a set of European standards to support sustainability performance assessment of buildings.

BREEAM 2011 incorporates the majority of environmental performance measures proposed for evaluation in CEN/ATC 350 standards, together with a significant number of the social performance and some economic measures. Obvious examples include using Life Cycle Assessment (LCA) based data through the application of the Green Guide; Energy consumption in use through the application of SBEM, the UK's PD compliant National Calculation Methodology, and water consumption through the BREEAM water calculator tools. Outputs give KPIs on Energy and Water in compliance with the draft standards and BRE Global will be introducing others following the final release of the CEN/TC 350 Standards.

Changes to this BREEAM Scheme Document

This BREEAM New Construction 2011 Scheme Document is revised and re-issued from time to time. A schedule of the publication dates for each re-issue is provided in the following table. Most additions to the Technical Manual are highlighted throughout the Technical Manual (note: deletions are not identified in the updated issue. A detailed list of changes made to issue 3.0 onwards, including all additions and deletions, is available separately. BREEAM Assessors can download the list of changes from the BREEAM Assessor's Extranet. The list of changes is also available to other parties on request, email the BREEAM office at breeam@bre.co.uk.

Scheme document	Issue number	Date of Issue
SD5073	3.1	12/12/2012
SD5073	3.0	18/10/2012
SD5073	2.0	01/07/2011
SD5073	1.0	29/03/2011

blank page

Introduction

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. At the time of writing, BREEAM has certified over 200,000 buildings since it was first launched in 1990.

Aims of BREEAM

1. To mitigate the life cycle impacts of buildings on the environment
2. To enable buildings to be recognised according to their environmental benefits
3. To provide a credible, environmental label for buildings
4. To stimulate demand for sustainable buildings

Objectives of BREEAM

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

BREEAM has been developed to meet the following underlying principles:

1. Ensure **environmental quality** through an accessible, holistic and balanced measure of environmental impacts.
2. Use **quantified measures** for determining environmental quality.
3. Adopt a **flexible approach**, avoiding prescriptive specification and design solutions.
4. Use **best available science** and **best practice** as the basis for quantifying and calibrating a cost effective performance standard for defining environmental quality.
5. Reflect the **social and economic benefits** of meeting the environmental objectives covered.
6. Provide a **common framework** of assessment that is tailored to meet the 'local' context including regulation, climate and sector.
7. **Integrate construction professionals** in the development and operational processes to ensure wide understanding and accessibility.
8. Adopts **third party certification** to ensure independence, credibility and consistency of the label.
9. Adopts **existing industry** tools, practices and other standards wherever possible to support developments in policy and technology, build on existing skills and understanding and minimise costs.
10. **Stakeholder consultation** to inform ongoing development in accordance with the underlying principles and the pace of change in performance standards (accounting for policy, regulation and market capability).

What is BREEAM New Construction

BREEAM New Construction is a performance based assessment method and certification scheme for new buildings. The primary aim of BREEAM New Construction is to mitigate the life cycle impacts of new buildings on the environment in a robust and cost effective manner. This is achieved through integration and use of the scheme by clients and their project teams at key stages in the design and procurement process. This enables the client, through the BREEAM Assessor and the BRE Global certification process, to measure, evaluate and reflect the performance of their building against best practice in an independent and robust manner. This performance is quantified by a number of individual measures and associated criteria stretching across a range of environmental issues see Table - 1, which is ultimately expressed as a single certified BREEAM rating, i.e. the label (section 3 describes how a BREEAM rating is calculated).

Table - 1: BREEAM 2011 New Construction environmental sections and assessment issues

Section	Assessment issues
Energy	Water
Reduction of CO_2 emissions	Water consumption
Energy monitoring	Water monitoring
Energy efficient external lighting	Water leak detection and prevention
Low or zero carbon technologies	Water efficient equipment (process)
Energy efficient cold storage	Waste
Energy efficient transportation systems	Construction waste management
Energy efficient laboratory systems	Recycled aggregates
Energy efficient equipment (process)	Operational waste
Drying space	Speculative floor and ceiling finishes
Transport	Materials
Public transport accessibility	Life cycle impacts
Proximity to amenities	Hard landscaping and boundary protection
Cyclist amenities	Responsible sourcing of materials
Maximum car parking capacity	Insulation

Section	Assessment issues
Travel plan	Designing for robustness
Land use and ecology	**Pollution**
Site selection	Impact of refrigerants
Ecological value of site/protection of ecological features	NO_x emissions
Mitigating ecological impact	Surface water run-off
Enhancing site ecology	Reduction of night time light pollution
Long term impact on biodiversity	Noise attenuation
Health and wellbeing	**Management**
Visual comfort	Sustainable procurement
Indoor air quality	Responsible construction practices
Thermal comfort	Construction site impacts
Water quality	Stakeholder participation
Acoustic performance	Service life planning and costing
Safety and security	**Innovation**
	New technology, process and practices

When to engage with the BREEAM NC scheme

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

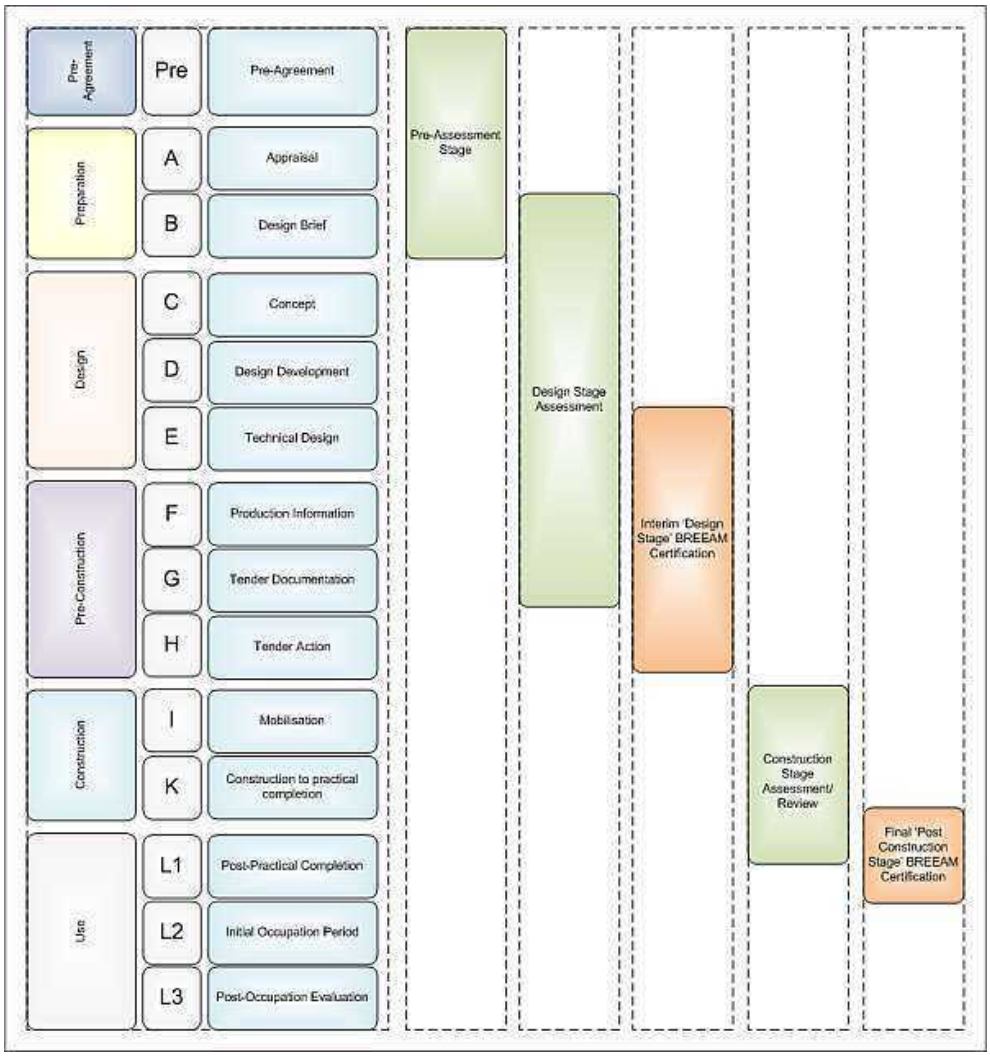


Figure 1 : BREEAM assessment and certification stages and the RIBA Outline Plan of Works

Figure 1 serves to highlight the link between the BREEAM New Construction assessment and certification stages and the RIBA Outline Plan of Works.

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

sustainability needs to come first and foremost from the client. To facilitate this BRE Global recommends that clients and their project teams engage with a BREEAM Assessor and/or BREEAM Accredited Professional no later than RIBA stage B and ideally sooner. This will ensure that realistic targets are set and can be met, appropriate responsibilities can be defined and understood and low or no cost solutions to environmental impacts can be sought and applied wherever possible.

Further detailed guidance and recommendations on the effective use and integration of BREEAM in the design and construction process can be found in the publication 'Integrating BREEAM throughout the Design Process'[1]

[1] Integrating BREEAM throughout the Design Process. V Cinquemani, J Prior. 2010. IHS BRE PRESS.

How to use the BREEAM NC scheme document

This BREEAM Scheme Documents is a technical document which has been created:

1. To enable qualified and licensed BREEAM Assessors to complete BREEAM assessments
2. As an aid for BREEAM Accredited Professionals (AP) to undertake project team facilitation, in terms of defining, monitoring and successfully achieving the desired BREEAM rating.
3. As a reference for clients and members of the project team whose proposed building is being BREEAM assessed.

The scheme document is split in to five parts:

1. Introduction to BREEAM New Construction (section 1)
2. Scope of BREEAM 2011 New Construction (section 2)
3. Scoring and Rating assessed buildings (section 3)
4. Assessment criteria (sections 4-13)
5. Appendices (A-H)

The **Scope** section describes the types of building and stages of assessment that this version of the BREEAM New Construction scheme can be applied to. Appendices A to E provide additional guidance on the schemes scope for specific building and project types. The scope section can be used by clients and BREEAM Assessors to check whether this is the correct BREEAM scheme to use for their project.

The **Scoring and Rating** section outlines the BREEAM rating level benchmarks, the BREEAM environmental weightings and minimum standards. It also describes the individual BREEAM assessment issues and BREEAM 'credits', including BREEAM 'Innovation credits', and how performance against these is calculated and expressed as a BREEAM rating. This section is provided to illustrate how a building's assessed performance is measured and rated. Please note that, for the purpose of formal assessment and certification, actual building performance must be determined by the BREEAM Assessor using the relevant BREEAM calculation tools.

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

The majority of BREEAM issues are tradable, meaning that a client/design team can pick and choose which to target in order to build their BREEAM performance score and achieve the desired BREEAM rating. Several BREEAM issues have minimum standards meaning that to achieve a particular BREEAM rating certain credits or criteria must be achieved (BREEAM's minimum standards are outlined in section 3.0 Scoring and Rating).

Each BREEAM issue is structured as follows:

1. **Issue Information**: This contains the assessment issue reference, title, number of credits available[1] for meeting the defined level of performance and whether the issue forms part of BREEAM's minimum standards.
2. **Aim**: This broadly outlines the objective of the issue and the impact it intends to mitigate.

[1] For some assessment issue the number of credits available will vary by building type. Furthermore, some issues may not be applicable to certain building types or buildings which do not contain a particular function or area e.g. laboratory

3. **Assessment Criteria**: outlines the good/best practice performance level benchmark(s) and criteria. Where the building complies with the assessment criteria, as determined by the BREEAM Assessor, the relevant number of BREEAM credits can be awarded. Some issues have Exemplary Level Criteria; where a building demonstrates that it meets Exemplary Level Criteria a BREEAM Innovation credit can be awarded (refer to section 13 Innovation for more detail).
4. **Compliance notes**: These notes provide additional guidance that supports the application and interpretation of the main assessment criteria, including how to assess compliance in particular situations or for particular building or project types.
5. **Schedule of Evidence**: outlines typical examples of the type of information that must be provided by the design team/client and given to the BREEAM assessor. This enables the assessor to verify the building's performance against the assessment criteria and award the relevant number of BREEAM credits (Appendix G - The BREEAM evidential requirementsfor further information on BREEAM's evidential requirements).,
6. **Additional Information**: This section contains information that supports the application of the assessment criteria, including; definitions, calculation procedures, checklists and tables and any other relevant information.

The **Appendices** provide supporting information relevant to either the scope of the BREEAM 2011 scheme or its assessment criteria.

Verifying a building's certified BREEAM rating

The BREEAM assessment process is one of evaluating a building's performance against the scheme and its criteria using an independent third party auditor (the BREEAM Assessor). The BREEAM certificate, issued by the National Scheme Operator (NSO - BRE Global in the UK), provides formal verification that the Assessor has completed an assessment of a building in accordance with the requirements of the scheme and its quality standards and procedures. A BREEAM certificate therefore provides assurance to any interested party that a building's BREEAM rating, at the time of certification, accurately reflects its performance against the BREEAM standard.

All BREEAM assessed and certified buildings are listed on Green Book Live www.greenbooklive.com (along with directory of licensed BREEAM Assessors). Green Book Live is a free to use, publicly available online database designed to help specifiers and end users identify products and services that can help to reduce their impact on the environment.

Anyone wishing to verify the BREEAM rating of a building can do so by either checking a building's BREEAM certificate, which will contain the certification mark, (see below) or by searching Green Book Live for a specific listing.

Figure 2: the BREEAM Certification mark

Note
Green Book Live lists only buildings certified against BREEAM 2008 version onwards and the above certification mark does not appear on BREEAM certificates issued prior to mid-2011.

Maintaining a certified building's performance in use

The BREEAM New Construction final certificate and rating confirms that a new building's 'as built' environmental performance meets the requirements of the BREEAM Standard and therefore represents best practice in the design and construction of new buildings in the UK. Building projects that achieve a BREEAM rating can therefore serve as practical demonstrations to the market of what can be achieved and how to achieve it. In addition, it is important that these buildings are able to demonstrate that their environmental performance is maintained in to the operational in-use phase, so delivering the intended environmental life cycle benefits.

In order to maintain the building's performance into and throughout the operation and use stages of its life cycle, and to help building managers and users reduce the running costs of their building, regular assessment, auditing and certification against the BREEAM In-Use Part 1 (Assets) scheme within the first three years of the building's occupation is recommended (with regular formal reviews in accordance with that scheme in order to maintain the 'In-Use' rating).

In support of this objective BRE Global lists the certified performance of all BREEAM assessed buildings by life cycle stage on the Green Book Live listing website. Through public listing of BREEAM certified buildings by life cycle stage the intention is to provide evidence and assurance to the market of the business benefits of building, operating and maintaining buildings to high environmental standards and, it is envisaged, support the drivers for transformational change in the way we procure and operate our buildings. This in turn will help meet the UK's legal obligation on climate change (as defined in the Climate Change Act 2008).

Details of the BREEAM In-Use scheme can be found at www.breeam.org and a list of BREEAM In-Use Auditors is available from www.greenbooklive.com.

Production of a case study for BREEAM Outstanding rated buildings

One of the most important aspects of the BREEAM Outstanding rating is that projects certified to this level act as exemplars for the industry. In order to do this a good-quality case study must be produced that other design teams and clients can refer to.

Prior to Final Certification the design team and client for the BREEAM Outstanding rated project will be asked, to agree to provide either a case study of the assessed building or the relevant building/project information to allow BRE Global to produce a case study. This information will be requested at the final post construction stage of certification and should be provided with the BREEAM Assessors Final Certification Report.

BRE Global will publish the case study on the BREEAM website, Green Book live website and other BRE/BREEAM-related publications (as appropriate). The building will be certified to a BREEAM Excellent rating level where case study information is not provided (without good reason). Where a building is security sensitive BRE Global will, in discussion and agreement with the client, exercise flexibility in terms of the production of a case study, its content and dissemination.

Scope of BREEAM 2011 New Construction

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

This BREEAM 2011 New Construction scheme is applicable to new non-domestic buildings in the United Kingdom only.

Type of buildings that can be assessed using the BREEAM 2011 New Construction scheme

The non-domestic building types which can be assessed and rated using this scheme are outlined based on sector, building type and descriptions in the following table and pages. Additional guidance for some building types is also provided in the appendices (refer to the footnotes for the relevant building types).

Sector	Building type	Description
Commercial	Offices	— General office buildings — Offices with research and development areas (i.e. category 1 labs only)
	Industrial	— Industrial unit – warehouse storage/distribution — Industrial unit – process/manufacturing/vehicle servicing
	Retail	— Shop/shopping centre — Retail park/warehouse — 'Over the counter' service provider e.g. financial, estate and employment agencies and betting offices — Showroom — Restaurant, cafe & drinking establishment — Hot food takeaway
Public (non housing)	Education[1]	— Pre-School — Schools and Sixth Form Colleges — Further Education/Vocational Colleges — Higher Education Institutions

[1] For schools, further and higher educational building types, see also Appendix B – BREEAM New Construction scope and education buildings for further detail of scope

Sector	Building type	Description
	Healthcare[1]	— Teaching/specialist hospitals — General acute hospitals — Community and mental health hospitals — GP surgeries — Health centres and clinics
	Prisons[2]	— High security prison — Standard secured prison — Young offender institution and juvenile prisons — Local prison — Holding centre
	Law Courts	— Crown & criminal courts — County courts — Magistrates' courts — Civil justice centres — Family courts — Youth courts — Combined courts
Multi-residential accommodation/Supported living facility[3]	Residential institutions	— Residential care home — Sheltered accommodation — Residential college/school (halls of residence) — Local authority secure residential accommodation — Military barrack
Other	Residential Institutions	— Hotel, hostel, boarding and guest house — Secure training centre — Residential training centre
	Non residential institutions	— Art gallery, museum — Library — Day centre, hall/civic/community centre — Place of worship
	Assembly and leisure	— Cinema — Theatre/music/concert hall — Exhibition/conference hall

[1] For healthcare building types, see also Appendix A – BREEAM New Construction scope and healthcare building types for further detail of scope

[2] Category includes any building type part of a prison establishment, including residential blocks or a hybrid of building types

[3] For multi-residential building types, see also Appendix C – BREEAM New Construction scope and multi-residential buildings for further detail of scope

Sector	Building type	Description
		— Indoor or outdoor sports/fitness and recreation (with/without pool)
	Other	— Transport hub (coach/bus station and above ground rail station) — Research and development (cat 2 or 3 labs - Non Higher Education) — Crèche

In terms of the application of the New Construction scheme, non-domestic buildings are defined in BREEAM as either standard or non-standard types. The standard type category includes buildings listed above against the commercial, public (non-housing) and multi-residential sectors. These are building types which BREEAM New Construction is specifically designed to assess and the assessment criteria tailored for. This standard category includes building types that in the past would have had their own stand-alone BREEAM scheme document, such as Offices, Retail, Industrial, Education, Healthcare, Multi-residential and so on.

Non-standard building types are those listed above against the 'other buildings' sector and includes many types of building that, under previous version of BREEAM, would have been classified and assessed using the BREEAM Bespoke scheme. The non-standard building types listed against the 'other buildings' category now fall within the scope of the BREEAM 2011 New Construction scheme and therefore do not require separate tailored assessment criteria.

Mixed use developments/building types

Typically, developments which consist of a number of separate buildings of differing functional types, e.g. office, retail, leisure, will require an assessment and therefore BREEAM rating and certificate for each individual building.

A single building with a dominant use but containing a number of different functional areas can have a single BREEAM assessment, rating and certificate. Examples of such buildings include:

- An office or industrial unit with some category 1 labs, workshop space, restaurant/canteen and/or staff gym
- A retail development with restaurants and /or cinema
- A higher education learning resource centre with a café, bookshop and/or offices.
- A transport hub with retail units

A single building that has a number of dominant functions, i.e. mixed-use, will require separate assessments, ratings and certificates for each dominant function, as the scheme and/or assessment criteria for such building uses/users differs markedly. Examples of such buildings include:

- A building with one or more floors of offices space and retail units
- A building with one or more floors of retail and residential units
- A building with a GP surgery and retail units

The above examples are not an exhaustive list. They are used to highlight the types of scenarios where a single BREEAM assessment or multiple assessments is required. Clients are advised to consult a licensed assessor for advice on applying BREEAM to mixed-use developments. The BREEAM assessor will ensure that the building(s)/development is registered correctly, seeking advice from BRE Global on classification where needed.

Simple building developments

At the time of writing (Sept 2012) BRE Global is finalising revised criteria for the assessment of less complex building types. Once available BREEAM for Simple Buildings will form a sub-set of this scheme. The types of buildings that can use the simple buildings criteria will be defined in the scope section of the simple buildings Guidance document. Until such time as the criteria for simple buildings is available, the BREEAM 2011 New Construction criteria detailed within this technical manual can be used to complete an assessment of any building type listed above.

Buildings not covered by the scope of the BREEAM 2011 New Construction scheme

Building types not listed above will fall into one of two categories, those where a current but separate BREEAM New Construction scheme document exists and those which currently do not have an existing, up-to-date scheme document.

Other current BREEAM New Construction schemes

Data centres: 2010 version

There is a separate BREEAM New Construction 2010 scheme document for Data Centres (SD5068); the 2010 version should be used for the assessment and certification of data centres.

Tailored BREEAM criteria: 2008 version

BRE Global has developed a number of tailored criteria sets for specific clients and repeatable building types, including:

1. Forestry Commission: Visitor Centres
2. UK Fire Service: Fire Stations

Assessments of the above building types can be carried out using the BREEAM Bespoke 2008 scheme document and the appropriate appendix document for the above building types, which can be found on the BREEAM Assessors Extranet.

Other building types not defined

If a particular building type is not listed above and it cannot be defined as a mixture of standard and non-standard building types then it cannot be assessed using this BREEAM scheme. Such building types can still be assessed using BREEAM, but they require the development of bespoke assessment criteria. Contact BRE Global for further advice and information.

Building life cycle stages covered by the BREEAM 2011 New Construction scheme

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

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

Design Stage

The DS assessment and interim certified BREEAM rating confirms the building's performance at the design stage of the life cycle. Assessment and certification will ideally occur prior to the beginning of operations on site. The certified BREEAM rating at this stage is labelled as 'interim' because it does not represent the building's final, new construction BREEAM performance.

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

Post-Construction Stage

The PCS assessment and BREEAM rating confirms the final 'as-built' performance of the building at the new construction stage of the life cycle. A final PCS assessment is completed and certified after practical completion of the building works.

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

1. A post-construction review of an interim design-stage assessment
2. A post-construction assessment

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

Further information about BREEAM's evidential requirements for each of the above assessment stages can be found in Appendix G.

BREEAM New Construction and assessment of shell and core/speculative buildings

Non fitted-out 'speculative' new buildings, often referred to as shell and core buildings, can be assessed using the BREEAM New Construction scheme. Further details on the application of the scheme to these types of new building can be found in Appendix D.

Building life cycle stages not covered by the BREEAM 2011 New Construction scheme

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

1. Existing building refurbishment and fit-out (see guidance below)
2. Existing building in operation or existing unoccupied building
3. Existing building de-construction
4. Infrastructure projects

Existing buildings (occupied/unoccupied) can be assessed and certified using the BREEAM In-Use scheme.

Existing building refurbishment and fit out projects

The scope of this BREEAM scheme and version is the quantification and mitigation of environmental impacts of new building projects only. This version therefore is not specifically designed to cater for the assessment of refurbishment and fit-out projects. At the time of writing, BRE Global are developing a standalone BREEAM scheme to cover the refurbishment and fit out stages of the life cycle for non domestic buildings, following a similar approach to that taken in BREEAM Domestic Refurbishment.

Prior to the launch of a refurbishment scheme for non-domestic buildings, clients may continue to apply BREEAM and certify refurbishment and fit out projects using the BREEAM method. There are two options available in terms of which BREEAM version to use for these types of project, as follows:

1. Major refurbishment projects only assess and certify using the BREEAM 2008 version or assess and certify using the BREEAM 2011 version i.e. assess performance against the New Construction criteria, if criteria are deemed appropriate to the scale of the refurbishment works.
2. Other refurbishment and fit out projects could be assessed and certified using the BREEAM 2008 version. Please check the scope of the relevant BREEAM 2008 scheme for further details.

Major refurbishment is defined as construction that results in the fundamental remodelling or adaptation of existing elements of the building envelope, structure and renewal of key building services. And where, on completion of the works, such remodelling/renewal will materially impact on the performance of the building. The term 'elements' includes:

a. Structural/building envelope elements including walls (including glazing), roofs (including rooflights) and floors.
b. Building services elements including lighting (artificial and daylighting), heating, mechanical ventilation/cooling plant and ductwork, water/drainage systems.

For the purposes of this definition, works to both (a) and (b) above must be taking place for the project to be classed as a major refurbishment. Where only individual elements of the structural/building envelope element (e.g. windows or doors), or individual services elements (e.g. a boiler, heating system or lighting installation) are being replaced, remodelled or upgraded, then, the project should not be classed a major refurbishment. It should be noted that all major refurbishment projects will reuse the majority of the buildings existing supporting sub and superstructure and it is likely that in many cases the building façade will be retained, albeit with some remediation or renovation. Refer to a relevant BREEAM 2008 scheme document for a description of fit-out projects.

Part new-build, Part refurbishment projects

BREEAM 2011 New Construction can be used to assess new build extensions to existing buildings. Where the existing building is also undergoing major refurbishment and requires assessment, the following options, in terms of this scheme's application, are available to the client:

1. Apply the New Construction scheme and its assessment criteria to the whole building development/project i.e. the new construction and major refurbished elements.
2. Apply the New Construction scheme and its assessment criteria to the new-build element only.
3. Where the project is predominantly a refurbishment, albeit with some new elements, follow the guidance and options above for existing building refurbishments projects.

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

Scoring and Rating BREEAM assessed buildings

There are a number of elements that determine the overall performance of a new construction project assessed using BREEAM, these are as follows:

1. The BREEAM rating level benchmarks
2. The minimum BREEAM standards
3. The environmental section weightings
4. The BREEAM assessment issues and credits

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

BREEAM rating benchmarks

The BREEAM rating benchmarks for new construction projects assessed using the 2011 version of BREEAM are as follows:

Table - 2: BREEAM rating benchmarks

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

The BREEAM rating benchmark levels enable a client or other stakeholder to compare an individual building's performance with other BREEAM rated buildings and the typical sustainability performance of new non-domestic buildings in the UK.

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

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

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

Minimum standards

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

However, to ensure that performance against fundamental environmental issues is not over-looked in pursuit of a particular rating, BREEAM sets minimum standards of performance in key areas e.g. energy, water, waste etc. It is important to bear in mind that these are minimum acceptable levels of performance and, in that respect they should not necessarily be viewed as levels that are representative of best practice for a BREEAM rating level.

To achieve a particular BREEAM rating, the minimum overall percentage score must be achieved and the minimum standards, detailed in Table - 3 below, applicable to that rating level complied with.

Table - 3: Minimum BREEAM standards by rating level

	Minimum standards by BREEAM rating level				
BREEAM issue	PASS	GOOD	VERY GOOD	EXCELLENT	OUTSTANDING
Man 01: Sustainable procurement	One credit	One credit	One credit	One credit	Two credits
Man 02: Responsible construction practices	None	None	None	One credit	Two credits
Man 04: Stakeholder participation	None	None	None	One credit (Building user information)	One credit (Building user information)
Hea 01: Visual comfort	Criterion 1 only	Criterion 1 only	Criterion 1 only	Criterion 1 only	Criterion 1 only
Hea 04: Water quality	Criterion 1 only	Criterion 1 only	Criterion 1 only	Criterion 1 only	Criterion 1 only
Ene 01: Reduction of CO_2 emissions	None	None	None	Six credits	Ten credits
Ene 02: Energy monitoring	None	None	One credit (First sub-metering credit)	One credit (First sub-metering credit)	One credit (First sub-metering credit)

	Minimum standards by BREEAM rating level				
BREEAM issue	PASS	GOOD	VERY GOOD	EXCELLENT	OUTSTANDING
Ene 04: Low or zero carbon technologies	None	None	None	One credit	One credit
Wat 01: Water consumption	None	One credit	One credit	One credit	Two credits
Wat 02: Water monitoring	None	Criterion 1 only	Criterion 1 only	Criterion 1 only	Criterion 1 only
Mat 03: Responsible Sourcing	Criterion 3 only	Criterion 3 only	Criterion 3 only	Criterion 3 only	Criterion 3 only
Wst 01: Construction waste management	None	None	None	None	One credit
Wst 03: Operational waste	None	None	None	One credit	One credit
LE 03: Mitigating ecological impact	None	None	One credit	One credit	One credit

Environmental section weightings

Environmental weightings are fundamental to any building environmental assessment method as they provide a means of defining, and therefore ranking, the relative impact of environmental issues. BREEAM uses an explicit weighting system derived from a combination of consensus based weightings and ranking by a panel of experts. The outputs from this exercise are then used to determine the relative value of the environmental sections used in BREEAM and their contribution to the overall BREEAM score.

Table - 4 below outlines the weightings for each of the nine environmental sections included in the BREEAM New Construction scheme:

Table - 4: BREEAM Environmental section weightings

Environmental section	Weighting
Management	12%
Health & Wellbeing	15%
Energy	19%
Transport	8%
Water	6%
Materials	12.5%
Waste	7.5%
Land Use & Ecology	10%
Pollution	10%
Total	100%
Innovation (additional)	10%

Each of the above environmental sections consists of a differing number of assessment issues and BREEAM credits (as described below and defined in detail in the technical sections of this Scheme Document). As a result, each individual assessment issue and credit varies in terms of its contribution to a building's overall score. For reference, Appendix H contains a breakdown of individual assessment issues by building type for this BREEAM scheme, and lists the maximum percentage available under each issue to contribute towards the overall BREEAM score.

BREEAM assessment issues and credits

BREEAM New Construction consists of forty nine individual assessment issues spanning the nine environmental categories, plus a tenth category called 'innovation' (described below). Each issue addresses a specific building related environmental impact or issue and has a number of 'credits' assigned to it. 'BREEAM credits' are awarded where a building demonstrates that it meets the best practice performance levels defined for that issue i.e. it has mitigated an impact or, in the case of the health and wellbeing section, addressed a specific building occupant-related issue e.g. good thermal comfort, daylight or acoustics.

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

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

Awarding 'credits' for innovation

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

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

There are two ways in which BREEAM awards 'innovation credits' to recognise innovation in building design and procurement. The first is by meeting exemplary performance criteria defined within an existing BREEAM issue i.e. going beyond the standard BREEAM assessment criteria and therefore best practice. Note, not all assessment issues have exemplary performance criteria. The second route is where an application is made to BRE Global by the BREEAM Assessor in connection with a project registered for BREEAM assessment to have a particular building technology or feature, design or construction method or process recognised as 'innovative'. If the application is successful and subsequently building compliance is verified, an 'innovation credit' can be awarded.

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

Calculating a building's BREEAM rating

A BREEAM Assessor must determine the BREEAM rating using the appropriate assessment tools and calculators. An indication of performance against the BREEAM scheme can also be determined using a BREEAM Pre-Assessment Estimator. The Pre-Assessment Estimator is available from the BREEAM website www.breeam.org.

The process of determining a BREEAM rating is outlined below and an example calculation included in Table - 5

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

Table - 5: Example BREEAM score and rating calculation

BREEAM Section	Credits Achieved	Credits Available	% of Credits Achieved	Section Weighting	Section score
Management	10	22	45%	0.12	5.45%
Health & Wellbeing	8	10	80.00%	0.15	12.00%
Energy	16	30	53.33%	0.19	10.13%
Transport	5	9	55.56%	0.08	4.44%
Water	5	9	55.56	0.06	3.33%
Materials	6	12	50.00%	0.125	6.25%
Waste	3	7	42.86%	0.075	3.21%
Land Use & Ecology	5	10	50.00%	0.10	5.00%
Pollution	5	13	38.50%	0.10	3.85%
Innovation	2	10	20%	0.10	2%
Final BREEAM score				55.66%	
BREEAM Rating				VERY GOOD	

Table - 6: minimum standards for a BREEAM 'Very Good' rating

Minimum Standards for BREEAM 'Very Good' rating	Achieved?
Man 01: Sustainable procurement	Y
Hea 01: Visual comfort	Y
Hea 04: Water quality	Y
Ene 02: Energy monitoring	Y
Wat 01 - Water consumption	Y
Wat 02: Water monitoring	Y
Mat 03: Responsible sourcing	Y
LE 03: Mitigating ecological impact	Y

Management

Man 01 Sustainable procurement

Number of credits available	Minimum standards
8	No

Aim

To ensure delivery of a functional and sustainable asset designed and built in accordance with performance expectations.

Assessment Criteria

This issue is split into three parts:

- Project brief and design (4 credits)
- Construction and handover (2 credits)
- Aftercare (2 credits)

The following is required to demonstrate compliance for:

Project brief and design

One credit

1. From RIBA stage B (Design Brief) or equivalent the client, building occupier, design team and contractor are involved in contributing to the decision making process for the project. As a minimum this includes meeting to identify and define their roles, responsibilities and contributions during the following phases:
    a. Design
    b. Construction
    c. Commissioning and handover
    d. Occupation i.e. up to and including Stage L (Post practical completion) or equivalent.
2. The roles and responsibilities outlined above include consideration of:
    a. End user requirements
    b. Aims of the design and design strategy
    c. Particular installation and construction requirements
    d. Occupiers budget and technical expertise in maintaining any proposed systems
    e. Usability and manageability of any proposals
    f. Production of documentation
    g. Commissioning, training and aftercare support
3. There is a schedule of training identified for relevant building occupiers/premises managers (based appropriately around handover and proposed occupation plans) which includes the following as a minimum:
    a. Contents of the Building User Guide(s) (BUG) as specified in Man 04 Stakeholder Participation (note it is not necessary to have achieved the BUG credit within Man 04, however the training must cover the BUG issues BREEAM specifies in Man 04 to achieve this requirement)
    b. Design strategy
    c. Installed systems and key features (maintenance, operation, replacement, repair)
    d. Documentation to be provided (e.g. user guide, log book etc.)
    e. Training responsibilities

One credit

4. A BREEAM Accredited Professional (AP) is appointed to facilitate the setting of BREEAM related performance targets for the project. The AP is appointed to perform this role no later than the conclusion of RIBA StageB (Design brief)or equivalent (see also compliance note CN15 : BREEAM performance targets).
5. The defined BREEAM performance targets have been contractually agreed between the client and design/project team no later than RIBA Stage C (or equivalent).
6. To achieve this credit at the interim design stage of certification, the defined BREEAM targets (See CN9) must be demonstrably achieved by the project. This is demonstrated via the BREEAM assessor's design stage certification report.

One credit

7. The BREEAM AP criteria 4, 5 and 6 have been achieved.
8. The appointed AP is engaged to monitor and report progress against the BREEAM targets by attending key project/design team meetings during the feasibility and design stages (RIBA Stage B up to and including RIBA Stage E, or equivalent).
9. The AP prepares regular written reports for the client and project team detailing progress against the defined BREEAM performance targets (as a minimum for each full design team meeting).

Onecredit

10. The appointed AP is engaged to monitor and report progress against the established BREEAM targets by attending key project team meetings during the pre-construction and construction stages up to and including RIBA Stage L Post-Practical Completion or equivalent).
11. The defined BREEAM performance targets form a requirement of the principal contractors contract (See compliance note: BREEAM Performance targets).
12. The AP prepares regular written reports for the client and project team detailing progress against the defined BREEAM performance targets (as a minimum for each full project team meeting).
13. To achieve all three credits at the final 'post-construction' stage of assessment, the BREEAM related performance targets for the project (as agreed at RIBA Stage C, or early) must be demonstrably achieved by the project. This is demonstrated via the BREEAM assessor's final post-construction stage certification report.

Construction and handover

One credit

14. The principal contractor accounts for a thermographic survey within the project budget and programme of works.
15. Once construction is complete a thermographic survey of the building fabric is undertaken in accordance with the appropriate standard and by a professional holding a valid Level 2 certificate in thermography (as defined by the UKTA website http://www.ukta.org
16. The survey confirms:
    a. Continuity of insulation in accordance with the construction drawings
    b. Avoidance of excessive thermal bridging
    c. Avoidance of air leakage paths through the fabric (except through intentional openings)
17. Any defects identified via the post construction inspections are rectified.

One credit

18. An appropriate project team member(s) is appointed to monitor and programme pre-commissioning, commissioning and, where necessary, re-commissioning on behalf of the client.

19. All building services are included in the commissioning schedule and commissioning is to be carried out in line with current Building Regulations, BSRIA[1] and CIBSE[1] guidelines and/or other appropriate standard, where applicable (where a BMS is specified see also relevant Compliance note BMS commissioning procedures).
20. The principal contractor accounts for the commissioning programme, responsibilities and criteria within the main programme of works.
21. A specialist commissioning manager is appointed during the design stage (by either client or contractor) for complex systems and the scope of their responsibility includes:
    a. Design input: commissionability design reviews
    b. Commissioning management input to construction programming
    c. Commissioning management input during installation stages
    d. Management of commissioning, performance testing and handover/post handover stages.

Aftercare

One credit

22. The following seasonal commissioning responsibilities will be completed 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

Simple systems (naturally ventilated) - external consultant/facilities manager

a. Review thermal comfort, ventilation, and lighting, at three, six and nine month intervals after initial occupation, either by measurement or occupant feedback.
b. Take all reasonable steps to re-commission systems following the review to take account of deficiencies identified and incorporate any relevant 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.

One credit

23. Criterion 22 is achieved and there is a mechanism to:
    a. Collect the energy and water consumption data for at least 12 months after occupation,
    b. Compare this with what was expected and

---

[1] BSRIA Commissioning Guides:

Application Guide 1/91 - Commissioning of VAV systems in Buildings
Application Guide 20/95 - Commissioning of Pipework Systems
Technical Memoranda 1/88.1 - Commissioning HVAC Systems
Application Guide 3/89.3 - Commissioning of Air Systems in Buildings
Application Guide 1/2001.1 - Pre-commission Cleaning of Pipework Systems
Application Guide 2/89.3 - Commissioning of Water Systems in Buildings
Application Guide 2/89.3 – Commissioning water systems application principles
Application Guide 5/2002 - Commissioning Management

c. Analyse any discrepancies with a view of adjusting systems if they are not operating as expected/designed.

24. There is a contract or commitment to provide aftercare support to all the building occupiers which includes the following as a minimum:
    a. A meeting (programmed to occur as soon as possible after occupation) to introduce the aftercare team (or individual) and Building User Guide (where existing), present key information about how the building operates and answer questions.
    b. Initial aftercare e.g. on site attendance on a weekly basis (this could be more or less frequent depending on the complexity of the building) for at least 4 weeks after handover
    c. On site FM training to include a walkabout of the building
    d. Longer term after care e.g. a helpline, nominated individual or other appropriate system to support building users for at least the first 12 months of occupation

Exemplary performance requirements

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

25. There is commitment or contract for the facilities manager or equivalent to undertake the following at quarterly intervals for the first 3 years after occupation:
    a. Collect the occupant satisfaction, energy consumption and water consumption data
    b. Utilise the data to check the building is performing as expected and make any necessary adjustments
    c. Set targets for reducing water and energy consumption and monitor progress towards these
    d. Feedback any 'lessons learned' to the design team and developer for use in future projects
    e. Provision of the actual annual building energy, water consumption and occupant satisfaction data to BRE Global.

Compliance Notes

Ref	Terms	Description
CN1	Shell only	**Project brief and design** For speculative developments whilst the actual building occupier can be omitted for this type of project (as they are likely to be unknown) the general end user requirements should be considered. With respect to the schedule of training requirement, if the future occupier is unknown and therefore cannot be trained in the specifics of the building, training documentation should be produced to fulfil this requirement. Where services/systems are not installed because they will be installed at a later date by another organisation/contractor, a space indicating the system/service omission is left within the documentation so that these can be completed by the relevant fit out contractor/organisation. This documentation should then be handed over to the relevant person on completion of the works. **Construction and handover** Commissioning credits - An assumption has to be made that the shell only spaces of the building will contain heating, ventilation and

Ref	Terms	Description
		air conditioning systems (HVAC), domestic hot water systems (DHWS) and/or Lighting and therefore the commissioning credit must be assessed. Compliance with this BREEAM issue can be demonstrated via any one of the three shell only compliance options There are no additional notes for the Thermographic survey credit. **Aftercare and exemplary credits** Compliance with these issues can be demonstrated via one of the options below in shell only buildings/areas: 1. Option 1 – Use of a tenancy lease agreement between the developer and tenant/s (full value of available credits) 2. Option 2 – N/A 3. Option 3 – Developer/Tenant collaboration (full value of available credits) Refer to Appendix D – BREEAM New Construction and shell and core/speculative assessments of this Scheme Document for further description of the above options.
CN2	Overlap with Man 04 - Stakeholder participation. See criteria 3 & 24	Man 01 - Sustainable procurement and Man 04 - Stakeholder participation, both consider the building user requirements. Please note; 1. The focus of Man 01 is to optimise the building performance, i.e. to ensure that the building and its systems are easy to maintain, operate efficiently and compliant with the design intent. 2. The focus of Man 04 is the function(s) of the building i.e. to ensure that the building and its layout are flexible and meet the needs of all potential users.
CN3	Commissioning monitor (simple systems) See criteria 18 & 22	The commissioning monitor can be a person from within the contractor or sub-contractor organisation, provided they are not involved in the general installation works.
CN4	Specialist commissioning manager. See criteria 21 & 22	The commissioning manager for complex systems must be a specialist contractor rather than a general sub-contractor.
CN5	Appropriate standards See criterion 19 (where appli-	**Building fabric** 1. BS EN 13187 Qualitative detection of thermal irregularities in building envelopes. Infrared method[2] 2. BS EN 13829:2001 Thermal performance of buildings -

Ref	Terms	Description
	cable)	Determination of air permeability of buildings - Fan pressurization method[1] **Commercial refrigeration** 1. Guide to Good Commercial Refrigeration Practice, Part 5 Commissioning[3] 2. GPG 347 Installation and commissioning of refrigeration systems[4] **Fume cupboards** 1. BS EN 14175-2[5] 2. DD CEN/TS 14175-5[6] - Education only 3. Labs21 programme: A Design Guide for Energy Efficient Research Laboratories: Commissioning section- Education only **Microbiological safety cabinets** 1. BS EN 12469 (2000)[7] 2. HEEPI Labs21 programme Commissioning theme section[8] - Education only 3. Labs21 programme: A Design Guide for Energy Efficient Research Laboratories: Commissioning section- Education only
CN6	Naturally ventilated buildings. See criterion 22	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 comply with the relevant commissioning criteria. 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.
CN7	Process related equipment. See criteria 19 & 22	Any process or manufacture-related equipment specified as part of the building fit-out may be excluded from the requirements of these credits, except where they form an integral part of the building HVAC services, such as some heat recovery systems.
CN8	Key design team meetings. See criterion 1,8 &10	Key design team meetings can be defined as those where key decisions that influence/affect the building's proposed design, and its construction in accordance with the design (and therefore the building's sustainability impacts and BREEAM performance), are discussed/made. These meetings may be site or office based

[1] BS EN 13829:2001 Thermal performance of buildings - Determination of air permeability of buildings - Fan pressurization method, BSI, 2001.

Ref	Terms	Description
		and would typically include representatives from at least three of the parties (below). 1. Representatives of the Client / Developer 2. The principal contractor 3. The Architect 4. Structural Engineers 5. Building Services Engineers 6. Cost Consultants 7. Environmental Consultants 8. Project Management Consultants Team meetings must be related to the building under assessment.
CN9	BREEAM related performance targets. See criteria 4 & 11	BREEAM related performance targets refer specifically to the BREEAM rating and by default, the minimum standards required to achieve that rating. It does not necessarily include individual targetted BREEAM issues/credits, which may be traded over the course of the project as it evolves. However, in agreeing a BREEAM target it is recommended that individual BREEAM issues, credits and criteria are targetted/prioritised to ensure that a contractually agreed target is achievable, and achieved without potentially costly alterations to the design/project at a later stage to ensure the target can be met. If, at Post Construction, the BREEAM performance targets set at the end of the Concept Stage have not been achieved, the credits awarded at the interim 'design' certification stage for appointing the BREEAM Accredited Professional must be withheld in the final assessment.
CN10	Soft Landings Framework[9] See 22,23 & 24	A framework written and produced by UBT and BSRIA that seeks to promote improved briefing, design, handover and building performance in use. Embedding the principles of this framework within a project should ensure that the evidence is available to demonstrate compliance with criteria under this BREEAM issue. Please also note that BSRIA has produced a BREEAM 2011 / Soft landings interpretation note[10] for clients and design teams.
CN11	Provision of annual energy and water consumption and occupant satisfaction data. See criterion 25	One way of demonstrating compliance with this criterion is for the client/end user to register and therefore commit the building for assessment under the BREEAM in Use scheme.
CN12	BMS commissioning procedures. See criterion 19	Where a BMS is specified, the following commissioning procedures must be carried out: 1. Commissioning of air and water systems is carried out when all control devices are installed, wired and functional 2. In addition to air and water flow results, commissioning results include physical measurements of room tem-

Ref	Terms	Description
		peratures, off coil temperatures and other key parameters as appropriate 3. The BMS/controls installation should be running in auto with satisfactory internal conditions prior to handover 4. All BMS schematics and graphics (if BMS is present) are fully installed and functional to user interface before handover 5. The occupier will be fully trained in the operation of the system.
CN13	Scope of the thermographic survey and remedial work. See criterion 15	The thermographic survey must ensure that all elements of the building fabric that enclose an internal heated and/or conditioned (treated) zone of the building, including internal walls separating treated and untreated zones, will be tested. Any remediation work undertaken resulting from a thermographic survey of the building should be robust and durable, i.e. the remedial work must have the same performance characteristics and life expectancy of the surrounding element(s)
CN14	Assessing and awarding the available credits for a BREEAM Accredited Professional.See criteria 4 to 13	To award the second AP credit (criteria 7 to 9) the first BREEAM AP credit must be achieved (criteria 4 to 6), as per criteria 7 listed under the second AP credit. The third AP credit (criteria 10-13) can be awarded independently of the first and second credit. The first and second credits focus on the appointment and use of the Accredited Professional during the design stage of a project. They aim to ensure appropriate consideration and use of BREEAM in establishing and agreeing the desired level of performance, and defining responsibilities within the team and on the client to achieve that level. This, coupled with regular reviews of the design as it evolves, is intended to make sure the BREEAM target rating is achieved cost effectively and without disruption to project delivery. The focus of the third AP credit is the appointment and use of an Accredited Professional during the construction phase of the project. The key aim of this credit is much the same as above, however, whilst BREEAM will always advocate the use of an AP throughout the entire design and build process, we also wish to encourage and reward contractors and project teams that appoint an AP to help them ensure the constructed building meets the client's target BREEAM rating. This is the case even where an Accredited Professional has not been appointed and involved during the early design stages of a project, yet the project has still been set or is working toward a target BREEAM rating from the concept design stage.
CN15	Criteria 1, contractor involvement in decision making during design brief.	The purpose of criteria 1 is to reflect the need to consider the input of all the major project stakeholders from the earliest practical stage. With regards to contractors' involvement, it ensures their input in terms of formulating sustainable design solutions, commenting/inputting on the practicality and build ability of (one or more) design solutions and their impact on programming, cost

Ref	Terms	Description
		etc. BREEAM does recognise that traditionally for some projects the contractor for the works might not be appointed at the early stages of the project and therefore compliance with criteria 1 would not be possible. In these instances, to ensure the aim of the criteria is upheld, provided that a suitably experienced person is involved prior to appointment of the contractor, criterion 1 will be met. A suitably experienced person must have substantial construction/contracting experience in projects similar to the proposed works and could for example be a contractor appointed as a consultant for this stage or a construction project manager.

Schedule of Evidence

Ref	Design stage	Post-construction stage
Project brief and design		
1&2	Documentation indicating when the collaboration began and the roles and responsibilities of the project team for the required phases. This could be either: 1. Meeting minutes 2. Construction programme 3. Responsibilities schedule 4. Relevant section/clauses of the building specification or contract	As design stage
3	The training schedule	As design stage
4-13	The AP appointment letter. Relevant section/clauses of the building specification or contract. Project programme indicating the dates by which the key work stages (Preparation and Design) are to be completed. Meeting notes/minutes, recorded correspondence or schedules that can demonstrate BREEAM issues are a regular agenda item and AP attendance. The AP progress report (for each work stage). Design stage BREEAM assessment report.	As design stage, plus the final post construction assessment report.

Ref	Design stage	Post-construction stage
Construction and handover		
14-17	Project budget Programme of works Relevant section/clauses of the building specification or contract and/or letter of appointment.	Thermographic survey Level 2 thermography certificate Confirmation of remedied defects
18-21	Appointment letter or commissioning responsibilities schedule. Relevant section/clauses of the building specification or contract. principal contractors programme Commissioning schedule	Commissioning records/reports principal contractors programme Commissioning schedule
Aftercare		
22	Appointment letter(s) and/or commissioning responsibilities schedule.	Seasonal commissioning records / reports AND/OR letter of appointment and commissioning responsibilities schedule
23	As for criteria 22 above Evidence of either existing procedures or a commitment/ contract to put in place a mechanism to: 1. Collect, compare and analyse relevant data. 2. Undertake suitable adjustments if necessary.	As for criteria 22 above As design stage plus evidence that the relevant mechanism(s) and procedures are in place and there is a commitment to use them.
	Evidence of a commitment/contract to provide compliant aftercare support and training.	Evidence of a contract to provide compliant aftercare support and training.
Exemplary level requirements		
	Evidence as above (for data collection and aftercare support credit), but from the end user.	Evidence as above (for data collection and aftercare support credit), but from the end user.

Additional Information

Relevant definitions

BREEAM Accredited Professional

An individual qualified and accredited by BRE as a specialist in built environment sustainability, environmental design and assessment. The role of the BREEAM AP is to facilitate the project team's efforts to successfully schedule activities, set priorities and negotiate the trade-offs required to achieve a target BREEAM rating when the design is formally assessed. For a list and contact details of BREEAM Accredited Professionals visit www.greenbooklive.com

Complex systems

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

Thermographic survey

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.

Treated

A term describing a building area that is heated and/or mechanically cooled by plant integral to the building.

Checklists and Tables

None

Calculation procedures

None

Other information

None

---

[1] CIBSE Commissioning Codes: Set of Seven Codes (2003)

- CIBSE Commissioning Code A: Air Distribution Systems
- CIBSE Commissioning Code B: Boilers
- CIBSE Commissioning Code C: Automatic Controls
- CIBSE Commissioning Code L: Lighting
- CIBSE Commissioning Code M: Management
- CIBSE Commissioning Code R: Refrigeration
- CIBSE Commissioning Code W: Water Distribution Systems

[2] BS EN 13187 Thermal performance of buildings, Qualitative detection of thermal irregularities in building envelopes. Infrared method, BSI, 1999.

[3] Guide to Good Commercial Refrigeration Practice, Part 5 Commissioning. British Refrigeration Association, Institute of Refrigeration, Issue 1 October 2008.

[4] Good Practice Guide 347: Installation and commissioning of refrigeration systems, Carbon Trust, 2003.

[5]BS EN 14175-2:2003 Fume cupboards - Part 2: Safety and performance criteria, BSI, 2003.
[6]DD CEN/TS 14175-5:2006. Fume cupboards. Recommendations for installation and maintenance, BSI, 2007.
[7]BS EN 12469 – Biotechnology – Performance criteria for microbiological safety cabinets. BSI, 2000.
[8]Labs21 Commissioning section: http://www.labs21.org.uk/commissioning.htm
[9]The SOFT LANDINGS FRAMEWORK, for better briefing, design, handover and building performance in use, published by BSRIA and authored by the Usable Buildings Trust (UBT), 2009 .
[10]BG 28/2011 BREEAM 2011 / Soft Landings Interpretation Note, BISRIA.

Man 02 Responsible construction practices

Number of credits available	Minimum standards
2	Yes

Aim

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

Assessment Criteria

The following is required to demonstrate compliance for:

Up to two credits

1. Where the principal contractor has used a 'compliant' organisational, local or national considerate construction scheme.
2. Where the principal contractor's performance against the compliant scheme has been confirmed by independent assessment and verification, the BREEAM credits can be awarded as follows:
    a. One credit where the contractor achieves 'compliance' with the criteria of a compliant scheme.
    b. Two credits where the contractor significantly exceeds 'compliance' with the criteria of the scheme.

Refer to the Additional Information section for a list of compliant schemes and therefore how performance, as determined by a compliant scheme, translates into BREEAM credits.

Exemplary level criteria

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

3. Where the principal contractor's performance against the compliant scheme has been confirmed by independent assessment and verification and the contractor achieves compliance with the criteria of the compliant scheme to an exemplary level of practice.

Refer to the Additional Information section for a list of compliant schemes and therefore how performance, as determined by a compliant scheme, translates in to BREEAM credits for exemplary performance.

Compliance Notes

Ref	Terms	Description
CN1	Compliant	See the Additional Information section of this issue for a current list of compliant schemes.

Ref	Terms	Description
	organisational, local or national con-siderate con-struction schemes. See criterion 1	Where a considerate construction/constructors scheme exists and is not listed as a BREEAM compliant scheme, the scheme administrator/operator can apply to BRE Global for recognition as a compliant scheme. Prior to any application the operator should first review their scheme against the requirements of Appendix E – Organisational, Local or National Considerate Constructor Scheme requirements: guidance for scheme administrators. If they believe their scheme demonstrates equivalence with Appendix E – Organisational, Local or National Considerate Constructor Scheme requirements: guidance for scheme administrators, they should contact BRE Global. BRE Global will review the scheme and, if appropriate, add to the list of compliant schemes and define appropriate benchmarks of performance for achieving BREEAM credits using the scheme.
CN2	Contractor not yet appointed	At the interim design stage of assessment, where a 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 one of the above criteria. Alternatively the credits can be withheld until final post construction stage assessment when actual contractor performance can be confirmed.
CN3	Site clearance	The scope of this issue applies to the principal contractor and their scope of works. If the scope of their works includes demolition and site clearance then this stage of work falls within the scope of the issue criteria.
CN4	CSH assessed dwellings part of multi-res-idential assessed development	For buildings with self-contained dwellings also being assessed under the Code for Sustainable Homes (CSH), the following applies: Credits achieved under issue Man 2 of the CSH assessment can also be applied to issue Man 02 of a BREEAM assessment of a multi-residential building, provided the scheme used in the CSH assessment is included under the BREEAM list of compliant schemes.

Schedule of Evidence

Ref	Design Stage (Third party certification only)	Post-refurbishment Stage (Third party and self declaration certification)
All	Relevant section/clauses of the building specification or contract. OR A formal letter of commitment from the client/developer. Where relevant for multi residential	Scheme certificate and/or compliance report. Where relevant for multi residential buildings: Evidence in line with the Post

Ref	Design Stage (Third party certification only)	Post-refurbishment Stage (Third party and self declaration certification)
	buildings: Evidence in line with the Design Stage evidence requirements of the CSH issue Man 2. Or a copy of the Design Stage CSH certificate and report from the CSH online reporting system.	Construction Stage evidence requirements of the CSH issue Man 2. Or a copy of the Post Construction Stage CSH certificate and report from the CSH online reporting system confirming the number of credits achieved for CSH issue Man 2.

Additional Information

Relevant definitions

None

Checklists and Tables

None

Calculation procedures

None

Other information

Compliant Schemes

Considerate Constructors Scheme Ltd

Considerate Constructors Scheme (CCS) is a national initiative set up by the UK construction industry to improve its image. The Scheme is a self-financing, independent organisation owned by the Construction Umbrella Bodies (Holdings) Ltd (made up of the Construction Products Association and the Construction Industry Council). Sites and companies that register with the Scheme sign up and are monitored against a Code of Considerate Practice, designed to encourage best practice beyond statutory requirements.

As of January 2013, the Considerate Constructors Scheme launched a new Code of Considerate Practice (CCP) to replace the previous code.

The Man 02 CCS credits benchmarks were updated at this time to reflect the new CCS scoring method.

To achieve BREEAM credits using the 2013 Code of Considerate Practice, the principal contractor must achieve Scheme certification and a CCS score as follows:

1. One credit: a CCS score between 25 and 34*
2. Two credits: a CCS score between 35 and 39**
3. Exemplary level performance: a CCS score of 40 or more***.

* score of 5 in each of the 5 sections must be achieved

** score of 7 in each of the 5 sections must be achieved

*** score of 7 in each of the 5 sections must be achieved

A site can be visited by a CCS Monitor more than once and the CCS Certificate will be awarded based on the results of the Monitor's final visit. At the final stage of the BREEAM assessment the number of BREEAM credits awarded should therefore be based on the final visit and the subsequent Monitor's report and certified CCS score.

Previous Considerate Constructors Scheme

To achieve BREEAM credits using the previous Code of Practice and scoring system , the principal contractor must achieve Scheme certification and a CCS score as follows:

1. One credit: a CCS score between 24 and 31.5
2. Two credits: a CCS score between 32 and 35.5.
3. Exemplary level performance: a CCS score of 36 or more.

Site performance is assessed against eight environmental sections. To achieve certification under the Considerate Constructors Scheme a score of at least twenty four is required, with a minimum score of three required under each of the eight sections.

These benchmarks should be used for sites visited and rated prior to the 1st of January 2013 change over to the new CCS scoring system. After this date, the new CCS scheme scoring system should be used.

Further information concerning the scheme and its scoring structure is available at www.ccscheme.org.uk

Man 03 Construction site impacts

Number of credits available	Minimum standards
5	No

Aim

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

Assessment Criteria

The following demonstrates compliance:

1. Responsibility has been assigned to an individual(s) for monitoring, recording and reporting energy, water and transport consumption data resulting from all construction processes. To ensure the robust collection of information, this individual(s) has the appropriate authority, responsibility and access to the data required.

Energy consumption

One credit

2. Monitor and record data on energy consumption (kWh) from the use of construction plant, equipment (mobile and fixed) and site accommodation necessary for completion of all construction processes.
3. Using the collated data report the energy consumption (total kWh and kWh/£100k of project value) and carbon dioxide emissions (total $kgCO_2$eq and $kgCO_2$eq/£100k of project value) from the construction process via the BREEAM scoring and reporting tool.

Water consumption

One credit

4. Monitor and record data on potable water consumption (m^3) from the use of construction plant, equipment (mobile and fixed) and site accommodation necessary for completion of all construction processes.
5. Using the collated data report the total net water consumption (m^3), i.e. consumption minus any recycled water use, from the construction process via the BREEAM scoring and reporting tool.

Transport of construction materials and waste

One credit

6. Monitor and record data on transport resulting from delivery of the majority of construction materials to site and construction waste from site. As a minimum this must cover:
    a. Transport of materials from the factory gate to the building site, including any transport, intermediate storage and distribution. Scope of this monitoring must cover the following as a minimum:
        i. Materials used in major building elements (i.e. those defined in BREEAM issue Mat 01), including insulation materials,
        ii. Ground works and landscaping materials

   b. Transport of construction waste from the construction gate to waste disposal processing/recovery centre gate. Scope of this monitoring must cover the construction waste groups outlined in the project's site waste management plan (SWMP)
7. Using the collated data, report separately for materials and waste, the total fuel consumption (litres) and total carbon dioxide emissions ($kgCO_2$ eq), plus total distance travelled (km) via the BREEAM scoring and reporting tool.

Timber procurement

One credit

8. Confirmation that all site timber used on the project is sourced in accordance with the UK Government's Timber Procurement Policy.

Construction site management

One credit

9. The principal contractor for the project operates an Environmental Management System covering their main operations. The EMS must be either:
   a. Third party certified, to ISO14001/EMAS or equivalent standard. OR
   b. The structure of the EMS is in compliance with BS8555 2003[1] and has reached phase four of the implementation stage, 'implementation and operation of the environmental management system', and completed phase audits one to four, as defined in BS8555.
10. Implement best practice pollution prevention policies and procedures on site, demonstrated through compliance with the items in the Environmental Checklist section 2.5 Preventing Pollution in the England and Wales Environment Agency's 'Building a Better Environment[2], a guide for developers'

Compliance Notes

Ref	Terms	Description
CN1	Factory gate. See criterion 6a	See Relevant definitions
CN2	Site timber. See criterion 8	For the purpose of assessing this issue, site timber is considered to be timber used to facilitate the construction process, this includes (but is not limited to) formwork, site hoardings and other temporary site timber. It does not cover timber materials installed within the building elements (this is addressed in BREEAM issue Mat 03 Responsible sourcing of materials).
CN3	Site timber and re-usable formwork.See criterion 8	Re-usable timber formwork itself does not automatically comply unless the timber was initially reclaimed, or it is sourced in accordance with the UK Government's Timber Procurement Policy.
CN4	EA's Environmental checklist. See	The Environmental Checklist has been produced by the England and Wales Environment Agency as part of their publication 'Building a Better Environment, a guide for developers'. The pollution prevention

Ref	Terms	Description
	criterion 10	guidance contained therein is of relevance to sites in Scotland and Northern Ireland. In lieu of specific guidance from the Scottish Environmental Protection Agency and Northern Ireland Environment Agency, sites assessed in these countries must follow and demonstrate compliance with the E&W Environment Agency checklist.
CN5	Reporting protocols (energy). See criteria 2 & 3	At present BREEAM sets no requirement on the use of a particular method or protocol for reporting energy/carbon from construction sites as there are currently no uniformly accepted protocols for the collection of data and assessment of emissions from construction sites (source: 'Carbon: Reducing the footprint of the construction process, An Action Plan to reduce carbon' (Strategic Forum and Carbon Trust, 2010). A number of organisational carbon reporting protocols do exist and there are a number of initiatives underway to define construction-specific measurement and reporting protocols. Until such time as there is a consistent measurement protocol for reporting CO_2/Energy from construction sites, BREEAM requires, as part of the reporting and certification process, confirmation of the methodology and/or protocol used for monitoring, collating and reporting data on construction site energy consumption.
CN6	Target setting	At present data from construction sites do not generally exist in enough detail to set benchmarks and targets, BREEAM therefore does not set any requirements in terms of specific targets for reducing energy, water and transport consumption resulting from the construction process. Whilst BREEAM does not require them, it is strongly recommended that site specific targets are set and reported against. Following adoption of widespread and consistent measurement and reporting protocols for construction site impacts and collation of construction site data, BREEAM is likely in future to establish consistent and complimentary targets as part of demonstrating compliance with this BREEAM issue (See also Additional Information section).
CN7	Healthcare buildings (NHS sites) See criterion 9	As a prerequisite of awarding any of the available credits for this issue, the principal contractor must achieve the measure requiring operation of 'an Environmental Management System' (as defined above).
CN8	Multi-residential developments with CSH assessed dwellings	For buildings with self-contained dwellings also being assessed under the Code for Sustainable Homes (CSH), the following applies: Credits achieved under issue Man 3 of the CSH cannot be applied directly to issue Man 03 for assessments of multi-residential buildings. This is due to the different number of credits and additional issues assessed in BREEAM. Where specific criteria in this BREEAM issue, identical to that of the CSH, have been demonstrably achieved under a CSH assessment, then the CSH assessment and evidence of compliance can be used to assess and demonstrate compliance with the relevant corresponding criteria in this BREEAM issue.

Schedule of Evidence

Ref	Design stage	Post-construction stage
All	Relevant section/clauses of the building specification or contract. OR A signed and dated letter of commitment to meet the relevant criteria.	Name of the individual(s) responsible for monitoring, recording and reporting data resulting from all construction processes. Summary detail of the monitoring and data gathering mechanism/protocols/system used to collate and process the relevant data. Collated construction phase data/information as follows: 1. Total site energy consumption by fuel type or total carbon dioxide emissions 2. Total site net water consumption (m^3) 3. For both materials and waste, the total fuel consumption by type and total carbon dioxide emissions plus total distance travelled (km). For certified and non-certified site timber, evidence as required for BREEAM issue Mat 03. A copy of the principal contractors EMS/EMAS certificate or for BS8555, evidence of their status e.g. a copy of their phase 4 audit. A completed copy of section 2.2.5 of the EA's Environmental Checklist, signed by the principal contractor to confirm site/project compliance.

Additional Information

Relevant definitions

Construction processes

The construction process includes the enabling works, assembly, installation and disassembly activities necessary for servicing the construction and completion of a new building[3].

Factory gate

For the purposes of this issue, the factory gate is defined as being the product manufacturer gate (i.e. where manufacture and pre-assembly finishes and the material is in its final product form). Examples might include

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

Checklists and Tables

None

Calculation procedures

None

Other information

Construction Excellence and reporting of construction site impacts

Constructing Excellence publish the construction industry KPIs based on data collected by the Department for Business, Innovation and Skills via a voluntary quarterly survey returns by contractors throughout the UK. The Office of National Statistics also reports the annual results in the Construction Statistics Annual. One of the key performance indicators is the 'amount of CO_2 emissions caused by the energy used during the construction process per £100,000 of project value (kg CO_2/£100k).

Information collated by contractors as part of their voluntary submissions to Constructing Excellence may also serve to help demonstrate compliance with this BREEAM issue.

The Strategic Forum for Construction 2012 Sustainability commitments

The Strategic Forum for Construction has set up a task group to establish 2012 construction commitments aimed at achieving the following sustainability targets:

1. Carbon: By 2012, a 15% reduction in carbon emissions from construction processes and associated transport compared to 2008 levels.
2. Water: Water usage in the manufacturing and construction phase reduced by 20% compared to 2008 usage
3. Responsible Sourcing: 25% of products used in construction projects to be from schemes recognised for responsible sourcing.
4. Waste: By 2012, a 50% reduction of construction, demolition and excavation waste to landfill compared to 2008.
5. Biodiversity: All construction projects over £1m to have biodiversity surveys carried out and necessary actions instigated

In July 2010 the Strategic Forum and the Carbon Trust published an action plan to reduce Carbon Emissions resulting form the construction process[4]. Specifically the plan identified the following actions/next steps:

1. Work with stakeholders to produce a protocol for assessing greenhouse gas emissions from construction processes and associated transport.
2. Develop good and best practice benchmarks for construction site energy consumption (e.g. thresholds for tonnes CO_2 per m^2 gross floor area or £100,000 project value).
3. Provide BREEAM and CEEQUAL credits for demonstrated good and best practice based on the defined benchmarks.

Once established, BREEAM is likely to require monitoring and reporting of energy consumption in accordance to the proposed new protocol and set targets for meeting or exceeding good and/or best practice benchmarks for energy and transport use.

Further information on the Strategic Forum for Construction's action plan and sustainability commitments can be found at: www.strategicforum.org.uk

Tools for monitoring and targeting construction site impacts

'smartER' is a new add-on to BRE's online site waste management planning tool SMARTWaste Plan. 'smartER' enables existing and new SMARTWaste users to capture, monitor and target a project's onsite energy consumption, and therefore CO_2 footprint, water consumption and responsible sourcing of timber. The system can be used as a tool to help meet the criteria of this issue and as a source of evidence for demonstrating compliance. www.smartwaste.co.uk/

---

[1]The British Standard BS8555; Guide to the phased implementation of an environmental management system including the use of environmental performance evaluation, April 2003
[2]Building a better environment, A guide for developers, Environment Agency, 2006
[3]Carbon: Reducing the footprint of the construction process, An Action Plan to reduce carbon emissions, Joan Ko on behalf of the Strategic Forum and the Carbon Trust, July 2010
[4]Carbon: Reducing the footprint of the construction process, An Action Plan to reduce carbon emissions, Joan Ko on behalf of the Strategic Forum and the Carbon Trust, July 2010

Man 04 Stakeholder participation

Number of credits available	Minimum standards
4	Yes (criteria 10 to 12 only)

Aim

To design, plan and deliver accessible functional and inclusive buildings in consultation with current and future building users and other stakeholders.

Assessment Criteria

This issue is split into four parts:

- Consultation (1 credit)
- Inclusive and accessible design (1 credit)
- Building user information (1 credit)
- Post Occupancy Evaluation (POE) and information dissemination (1 credit)

The following is required to demonstrate compliance for:

Consultation

One credit

1. During the preparation of the brief, all relevant parties and relevant bodies (see Compliance notes) are identified and consulted with by the design team. The findings of the consultation influences the design and therefore must have been held before key and final design decisions were made.
2. A consultation plan has been prepared and includes a timescale and methods of consultation for all relevant parties/bodies and how the relevant parties will be kept informed about progress on the project.
3. The minimum consultation content has been covered (see Compliance notes).
4. During the design stage, consultation feedback (see Compliance notes) has been given to and received by all relevant parties regarding suggestions made, including how the results of the consultation process have influenced, or resulted in modifications to, the proposed design and building operation/use.
5. The project team ensures that through consultation and the resulting measures taken (as agreed with the relevant bodies) any areas or features of historic/heritage value are protected.

Additionally for Education, Healthcare, Law Courts and Major Transport Node buildings only (criterion 6.)

6. The consultation process employs a method carried out by an independent third party at the preparation of the brief and design stages. This can include the appropriate version of the Design Quality Indicator[1] (DQI or DQI for Schools), AEDET in Healthcare buildings, or another compliant method.

Inclusive and accessible design

One credit

7. The building is designed to be fit for purpose, appropriate and accessible by all potential users.
8. An access statement is developed in line with the CABE publication Design & Access Statements, How to write, read and use them[2], based on the principles of inclusive design. The access statement results in a strategy that must address, as a minimum, access to and throughout the development for all users, with particular emphasis on the following:
    a. Disabled users; addressing and proposing design solutions that remove obstacles that define disability.
    b. People of different age groups, genders, ethnicity and stamina/fitness levels
    c. Parents with children (where appropriate to building use/type)
9. Provision of facilities (see Compliance notes) is made for future building occupants and users including, where relevant, facilities that can be shared and are accessible to members of the public/community without gaining uncontrolled access to other parts of the building.

Building user information

One credit

10. Building User Guides are provided and are appropriate to all users of the building (general users including staff and if applicable residents, as well as the non technical facilities management team/building manager).
11. The Guides cover all functions and uses of the building, ensuring building users are able to use the building effectively. Where relevant, the documents must describe the facilities to be shared and how access to them will be arranged for potential users.
12. Building and site related information is made readily available to all future building users, enabling them to access and use the building, site and local transport infrastructure/amenities effectively.

Post Occupancy Evaluation (POE) and information dissemination

One credit

13. The client makes a commitment to carry out a Post Occupancy Evaluation (POE) one year after building occupation, to gain building performance feedback. The POE should be carried out by an independent third party and should cover:
    a. A review of the design and construction process (review of design, procurement, construction and handover processes)
    b. Feedback from a wide range of building users including Facilities Management on the design and environmental conditions of the building covering:
        i. Internal environmental conditions (light, noise, temperature, air quality)
        ii. Control, operation and maintenance
        iii. Facilities and amenities
        iv. Access and layout
        v. Other relevant issues
    c. Sustainability performance (energy/water consumption, performance of any sustainable features or technologies e.g. materials, renewable energy, rainwater harvesting etc,)
14. The client makes a commitment to carry out the appropriate dissemination of information on the building's post occupancy performance in order to share any good practice and lessons learned.

    Refer to the Compliance notes for a definition of appropriate dissemination, this also provides advice on appropriate dissemination where the building or building information is commercially or security sensitive.

Compliance Notes

Ref	Terms	Description
CN1	Shell only	**Building User Guide** For speculative developments it may not be possible to include all relevant information in the Building User Guide. As a minimum the Guide includes all relevant sections with each completed as far as is possible given the services and fabric installed. The Guide must then be handed on to the fit-out team who can then complete the relevant sections based on the fit-out strategy before handing the completed Guide over to the tenant/building owner. In such cases, to ensure completion of the Guide, the developer/client must demonstrate compliance via one of the following means: 1. Option 1 – Use of a tenancy lease agreement between the developer and tenant/s (full value of available credits) 2. Option 2 – N/A 3. Option 3 – Developer/Tenant collaboration (full value of available credits) Where compliance with the assessment criteria cannot be demonstrated the available credits must be withheld (option 4). **Post Occupancy Evaluation** The client/developer must demonstrate compliance by means of a signed and dated commitment to the relevant undertaking. Alternatively, the client/developer can demonstrate compliance via either shell only option 1 or 3 (see above). Either way the client/developer must be involved in the POE exercise to maximise the relevance and benefit of its findings. Refer to Appendix D – BREEAM New Construction and shell and core/speculative assessments of this Scheme Document for further description of the above options.
CN2	Overlap with Man 01 Sustainable Procurement	Man 01 Sustainable Procurement and Man 04 Stakeholder Participation, both consider the building user requirements. Please note; 1. The focus of Man 01 is to optimise the building performance, i.e. to ensure that the building and its systems are easy to maintain, operate efficiently and are as the design intended. 2. The focus of Man 04 is to ensure that the building and its layout meet the needs of potential users and consider the impact (positive and negative), on others e.g. local community, by involving and consulting with them.
CN3	Relevant parties and relevant bodies. See criterion 1	This includes but is not limited to the following: 1. Actual/intended building users (if known) including FM staff/those responsible for the day to day operation of the building and grounds 2. Representative consultation group from the existing community (if the building is a new development in an existing

Ref	Terms	Description
		community) or for a community still under construction. 3. Existing partnerships and networks that have knowledge and experience from existing buildings of the same type. 4. Potential users of any shared facilities e.g. operators of clubs and community groups AND the following where relevant: 5. In educational buildings, representatives of Local Education Authority, Board of Governors etc. 6. Local or national historic/heritage groups (over and above any requirements relating to statutory consultees). 7. Specialist service and maintenance contractors/representatives where the building function has particular technical requirements in complex environments (e.g. buildings containing laboratories).
CN4	Minimum consultation content. See criterion 3	Minimum consultation content includes the following: 1. Functionality, Build Quality and Impact (including aesthetics) 2. Provision of appropriate internal and external facilities (for future building occupants and visitors/users) 3. Management and operational implications 4. Maintenance resources implications 5. Impacts on the local community e.g. Local traffic/transport impact 6. Opportunities for shared use of facilities and infrastructure with the community/appropriate stakeholders, if relevant/appropriate to building type. 7. Compliance with statuary (national/local) consultation requirements In the case of educational building types, minimum content also includes: 8. How the building/grounds could best be designed to facilitate learning and provide a range of social spaces appropriate to pupils'/students' and other users' needs. In the case of building types containing technical areas e.g. laboratories and/or workshops minimum content also includes: 9. The client's broad requirements with concern to laboratory/workshop facilities, including appropriate sizing, optimisation and integration of equipment and systems. 10. A risk assessment approach taken by the design team and, where possible, supported by the use of 3D modelling for pipework and duct planning of laboratory facilities where present.
CN5	Facilities. See criterion 9	No criteria have been set in this respect as the types of space/facilities will vary according to the building size, type, use and consultation feedback. Typical facilities may include: 1. Sports facilities 2. Meeting and conference rooms 3. Drama and theatre space 4. Amenity space for staff/visitors, (internal or external) 5. Home office (in the case of a building with residential areas)

Ref	Terms	Description
CN6	Existing facilities See criterion 9	Where existing facilities are present on site that comply with the above assessment criteria (including the involvement of users and community in the consultation stage), the credits can be awarded. These facilities could be within an existing building that does not form part of the assessment, provided the building is accessible to all relevant building users.
CN7	Consultation feedback. See criterion 4	Feedback must cover: 1. What was proposed during the consultation exercise 2. How each of these proposals were considered 3. The outcome, e.g. implementation of suggestions or description of why options have not been deemed feasible 4. Implications for management and operation of the building The consultation feedback must be summarised within a design intent document, which has been approved by each of the main parties/stakeholders. This document may then serve for subsequent monitoring and quality control throughout the design and procurement of the building.
CN8	Potential users of shared facilities. See criteria 7 & 9	Potential users of shared facilities are identified as appropriate and can include all or any of the following (if relevant to the building type and use): 1. Extra-curricular users/uses 2. Local Authority or other provider of local community services. 3. Local residents 4. Adult education 5. Volunteer groups 6. Local businesses 7. Operators/members of clubs and community groups
CN9	Building User Guide scope/content. See criteria 10, 11 & 12	The aim the Building User Guide is to ensure the appropriate provision of guidance for the non technical building user, so they can access, understand and operate the building efficiently and in a manner in keeping with the original design intent. The guide should provide information relevant to the following stakeholders: 1. The building's staff (or where relevant residents) 2. The non technical facilities management team/building manager 3. Other building users e.g. visitors/community users The content of the guide will be specific to the building type, but should broadly include information on the following: 1. Overview of the building and its environmental strategy e.g. energy/water/waste efficiency policy/strategy and how users should engage with/deliver the policy/strategy. 2. Building services overview and access to controls (where to find them, what they control, how to operate effectively and efficiently etc.) 3. Pre-arrival information for visitors e.g. access and security procedures/provisions 4. Provision of and access to shared facilities

Ref	Terms	Description
		5. Safety and emergency information/instructions 6. Building related operational procedures specific to building type/operation e.g. labs. 7. Building related incident reporting/feedback arrangements 8. Building related training information/links 9. Provision of and access to transport facilities e.g. public transport, cyclist facilities, pedestrian routes etc. 10. Provision of and access to local amenities 11. Re-fit, refurbishment and maintenance arrangements/considerations 12. Links, references and relevant contact details There is no requirement on what media format the Building User Guide should take.
CN10	Appropriate dissemination of Post Occupancy Evaluation information. See criterion 14	Appropriate dissemination in most cases will be the production and publication of a building case study through one of the following means: 1. Client's/building owner's own website, publicly available literature or press release 2. Industry/sector or Government/Local Authority sponsored website or information portals. Where there is a demonstrably justifiable reason why public dissemination is not possible, for example the information is commercially or security sensitive, compliance can be demonstrated by a commitment to produce and disseminate the relevant information at an organisational level or to appropriate internal/external stakeholders. Or alternatively, the sensitive parts of the relevant information for dissemination can be omitted from publication.
CN11	Relevant information for dissemination See criterion 14	This includes the following information about the building and its performance: 1. A basic description of the project and building 2. BREEAM Rating and score 3. The key innovative and low-impact design features of the building 4. Project cost 5. Project size: Floor area, site area 6. Facilities to be used by community (where relevant) 7. Any steps taken during the construction process to reduce environmental impacts, i.e. innovative construction management techniques 8. Predicted and actual carbon dioxide emissions and/or EPC rating 9. Outcomes of the Post Occupancy Evaluation study, to share the lessons learned from the project including a. Occupant feedback b. Energy and water consumption including renewable energy generation, level of rainwater/grey water provision

Ref	Terms	Description
CN12	Independent third party (in relation to criterion no.6)	With respect to compliance with the criterion relating to using an 'independent third party', the client/design team needs to demonstrates that either: 1) They have used a third party independent of the design process to conduct the necessary consultation exercise using a compliant method. Or alternatively; 2) If the consultation is to be carried out by an organisation involved with the design of the building e.g. the project architect, then they must present the assessor with evidence that demonstrates the independence of the consultation process from the design process. BREEAM has not attempted to define what form this evidence must take, the onus is on the design team/relevant individual to clearly demonstrate to the BREEAM assessor a credible level of independence.

Schedule of Evidence

Ref	Design stage	Post-construction stage
Consultation credit		
1-6	A list of the stakeholders consulted. A consultation plan setting out the process and the scope of the consultation. Agenda/minutes from consultation meetings. Documentation demonstrating consultation feedback and subsequent actions.	As design stage
Inclusive and accessible design credit		
7-9	The access statement and/or access strategy. Design drawings AND/OR relevant section/clauses of the building specification or contract.	BREEAM Assessor's site inspection report and photographic evidence
Building user information credit		
10-12	Relevant section/clauses of the building specification or contract. OR Letter of commitment from the client/developer.	A copy of the Building User Guide Written confirmation from the design team/client that the guide has been or will be distributed to the building's owner, tenant(s) or fit out

Ref	Design stage	Post-construction stage
		contractor (for completion), as appropriate Details of how building, site and local amenity related information is to be made accessible to building users
POE and information dissemination credit		
13-14	Signed and dated commitment by the client/developer or future building occupier.	As design stage

Additional Information

Relevant definitions

Accessible

The Building Regulations Approved Document M (Access to and Use of Buildings) defines Accessible as: "with respect to buildings or parts of buildings, means that people, regardless of disability, age or gender are able to gain access [approach, entry or exit]".
In some environments it may not be appropriate to provide some types of facilities. A balance must be struck in terms of what is reasonable to provide to ensure Access for all types of building user, with a particular focus on the types of user identified within the criteria.

Checklists and Tables

None

Calculation procedures

None

Other information

The Equality Act and inclusive design/access

The Equality Act (and Public Sector Equality Duty) was implemented from 1st October 2010 and replaces major parts of the provisions of the Disability Discrimination Act. The commissioning client needs to be aware of their responsibilities for decision making and consideration of the management implications of the project once complete with respect to the Equality Act.

Expert advice is recommended if commissioning clients are to properly consider the implications of their decisions on the management of inclusion once premises are complete and occupied. The use of expert consultation, review and impact assessment could be one route to facilitating and substantiating the quality of advice in connection with decision making and therefore better enable access and inclusion.

The National Register of Access Consultants provides a quality standard for those advising on the accessibility of the built environment for disabled people and has a register of appropriately qualified and experienced access consultants and auditors www.nrac.org.uk

[1]The Design Quality Indicator is a method to assess the design quality of buildings. www.dqi.org.uk
[2]Design & Access Statements, How to write read and use them, CABE, 2006

Man 05 Life cycle cost and service life planning

Number of credits available	Minimum standards
3	No

Aim

To recognise and encourage life cycle costing and service life planning in order to improve design, specification and through-life maintenance and operation.

Assessment Criteria

The following is required to demonstrate compliance for:

One credit

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 Cost analysis is:
    a. Conducted in accordance with the process outlined in PD 156865:2008[1] (a supplement to BS ISO 15686-5:2008)
    b. Based on the concept design/design development proposals
    c. Completed for the following stages and uses a study period of 60 years, shown in real and discounted cash flow terms:
        i. Construction
        ii. Operation - includes as a minimum, utilities, cleaning, management costs
        iii. Maintenance - includes as a minimum, planned maintenance, replacements and repairs costs
3. A critical appraisal has been completed at the feasibility stage of building procurement, covering the service life estimations and maintenance implications for specified design performance requirements options. This appraisal must comply with Service life planning in accordance with ISO 15686 Buildings and constructed assets - Service life planning Part 1.See also the compliance note 'Critical appraisal for service life planning' for further guidance.

One credit

4. Criteria 1 to 3 are achieved.
5. The analysis demonstrates that elements in at least two of the following building components 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. Envelope: e.g. cladding, windows, and/or roofing
    b. Services: e.g. heat source cooling source, and/or controls
    c. Finishes: e.g. walls, floors and/or ceilings
    d. External spaces: e.g. alternative hard landscaping, boundary protection
6. The option(s) meet the performance criteria for the building (i.e. realistic options are used for the comparison) and the lowest discounted LCC over the period is preferred, assuming that their selection results in at least one of the following:

a. Lower 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. Extended service lives of services infrastructure/systems and/or building fabric resulting in fewer replacement intervals
d. Dismantling and recycling or reuse of building components.

7. The selected option is of critical value within the project

One credit

8. Criteria 1 to 7 are achieved.
9. The model outlined in the first LCC credit is updated during RIBA Work Stages D/E (design development/technical design) or equivalent.
10. The results of the study have been implemented in the specification, design and final construction of the assessed building.
11. A maintenance strategy has been developed, informed by the LCC analysis and includes:
    a. The extent to which maintenance has been designed out and how support and/or access systems have been included in the specification to facilitate safe, efficient and cost-effective operation and maintenance.
    b. How the removal and replacement of major plant and equipment, within the design life of the building, has been facilitated by the building design and specification (layout/access etc.).
    c. A management plan for the landscaping (for example, as defined in BREEAM issue LE 05 Long term impact on biodiversity) if appropriate.

Compliance Notes

Ref	Terms	Description
CN1	Critical value. See criteria 3 & 7	The project team must demonstrate that the option selected to justify compliance is significant in terms of either cost, maintenance burden, volume or area.
CN2	Shell only	For shell only developments the issue is still relevant but can exclude services and finishes where none are provided. Where no services, finishes or external spaces are present, elements within the envelope must demonstrate compliance in order to achieve the second credit.
CN3	Schools and other education buildings	Storage space must also be provided for cleaning and general maintenance equipment in line with Building Bulletin's $98^2/99^3$, as appropriate. This must be evenly distributed throughout the site/building and as a minimum, storage space is provided on each floor of the building.
CN4	Court buildings - responsibility for compliance	When considering this issue, the term project team includes the Department of Constitutional Affairs. Responsibility for complying with the criteria of this issue may fall with any or all of the project team members and it is likely that this will vary depending on the procurement route used for the project.

Ref	Terms	Description
CN5	Critical appraisal for service life planning	Critical appraisal for service life planning at the feasibility stage requires the environment of the building and other local conditions to be identified, and the fundamental requirements to be met in planning the service life of the building. Decisions should be made on; — the design life of the building — minimum functional performance criteria for each component over the building's design life — components that must be repairable, maintainable or replaceable within the design life of the building.

Schedule of Evidence

Ref	Design stage	Post-construction stage
1-3	Relevant sections of the feasibility stage life cycle cost analysis report/documentation. Relevant sections of the feasibility stage appraisal documentation.	As design stage
4-7	As for criteria 1-3 above. Details of alternative options considered including benefits of selected options (in terms of criteria 6) and evidence that the element is of critical value.	As design stage Evidence that preferred options selected at the design stage (based on the latest LCC analysis) have been implemented.
8-11	As for criteria 1-7 above updated for the detail design. Design drawings or relevant section/clauses of the building specification or contract demonstrating implementation of the preferred option(s) from the latest LCC analysis. A copy of the maintenance strategy AND/OR a letter of commitment from the client/developer to provide one. Evidence of how the maintenance strategy was/will be informed by the LCC analysis above.	As design stage Post construction drawings or BREEAM Assessor's site inspection report and photographic evidence

Additional Information

Relevant definitions

Life cycle cost (LCC)

The cost of an asset, or its parts throughout its life cycle, while fulfilling the performance requirements.

Life cycle costing

A methodology for systematic economic evaluation of life cycle costs over a period of analysis, as defined in the agreed scope.

Real and discounted cost

ISO 15686 defines real cost as the cost expressed as a value at the base date, including estimated changes in price due to forecast changes in efficiency and technology, but excluding general price inflation or deflation. Discounted cost is the resulting cost when the real cost is discounted by the real discount rate, or when the nominal cost is discounted by the nominal discount rate. ISO15686 defines nominal cost as the expected price that will be paid when a cost is due to be paid, including estimated changes in price due to, for example, forecast change in efficiency, inflation or deflation and technology.

Checklists and Tables

None

Calculation procedures

None

Other information

The assessor should note that BREEAM places fixed criteria on the time at which the Life Cycle Cost 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.

60 year study period

BREEAM requires a 60 year study period for the purpose of compliance with this assessment issue to align with the BRE Green Guide to Specification, which uses a 60 year period for quantifying the environmental impacts of building specifications and their replacement components. Therefore, using a 60 year study period allows longer life components to be compared to shorter life components on a cost versus environmental impact basis.

---

[1] PD 156865:2008 Standardized method of life cycle costing for construction procurement: a supplement to BS ISO 15686-5 Buildings and constructed assets - Service life planning - Part 5: Life cycle costing

[2] Building Bulletin 98, Briefing Framework for Secondary School Projects, DfES

[3]Building Bulletin 99, Briefing Framework for Primary School Projects, DfES

Health and Wellbeing

Hea 01 Visual comfort

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

Aim

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

Assessment criteria

This issue is split into five parts:

- Pre-requisite
- Daylighting (1-2 credits) - building type dependent
- Glare control and view out (1-2 credits) – (1 credit except for a healthcare building with inpatient areas, which has two credits available)
- Internal and external lighting (1 credit)

The following is required to demonstrate compliance:

Pre-requisite

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

Daylighting

2. Relevant building areas meet good practice daylighting criteria as follows:

Area type	Credits	Daylight factor required	Area (m^2) to comply	Other requirements
Pre-schools, schools, further education- Occupied spaces	1	2%	80%	EITHER (a) OR {(b) and (c)} in the table below
Higher education- Occupied spaces	1	2%	60%	
Higher education- Occupied spaces	2	2%	80%	
Healthcare buildings- Staff and public areas	2	2%	80%	N/A
Healthcare buildings -Occupied patient's areas (day-		3%	80%	N/A

Area type	Credits	Daylight factor required	Area (m^2) to comply	Other requirements
rooms, wards) and consulting rooms				
Multi-residential buildings- Kitchen	1	2%	80%	N/A
Multi-residential buildings- Living rooms, dining rooms, studies (inc home office)		1.5%	80%	N/A
Multi-residential buildings- Non residential/communal occupied spaces		2%	80%	EITHER (a) OR {(b) and (c)} in the table below
Multi-residential buildings		80% of the working plane in each kitchen, living room, dining room and study (including any room designated as a home office under HEA 20-Home Office – Code for Sustainable Homes) must have a view of the sky.		
Retail buildings (sales areas)	1	-	35%	Point daylight factors of 2% or more
Retail buildings (other occupied areas)	1	2%	80%	EITHER (a) OR {(b) and (c)} in the table below
Court, Industrial, Office, Prison buildings and all other building types				
All Occupied spaces, unless indicated below	1	2%	80%	EITHER (a) OR {(b) and (c)} in the table below
Cells and custody cells		1.5%	80%	None
Internal association/atrium area (prison buildings only)		3%	80%	EITHER a uniformity ratio of at least 0.7 OR a minimum point daylight factor of 2.1%
Patient care spaces		3%	80%	N/A
Teaching, lecture and seminar spaces		2%	80%	EITHER (a) OR {(b) and (c)} in the table

Area type	Credits	Daylight factor required	Area (m^2) to comply	Other requirements
				below
Retail spaces		-	35%	Point daylight factors of 2% or more

Ref	Criteria
(a)	A uniformity ratio of at least 0.4 or a minimum point daylight factor of at least 0.8% (spaces with glazed roofs, such as atria, must achieve a uniformity ratio of at least 0.7 or a minimum point daylight factor of at least 1.4%) Due to particular lighting issues in teaching spaces the uniformity ratio can be reduced to 0.3 as defined in BB 87 Environmental Design Standard [1] (this deviation from the criteria can only be considered in circumstances where BB 87 is applicable). A uniformity ratio of at least 0.4 or a minimum point daylight factor of at least 0.4 times the relevant average daylight factor value in Table 5.1 (spaces with glazed roofs, such as atria, must have a minimum point daylight factor of at least 0.7 times the relevant average daylight factor value in Table 5.1) Spaces with glazed roofs, such as atria, must achieve a uniformity ratio of at least 0.7 or a minimum point daylight factor of at least 1.4%.
(b)	A view of sky from desk height (0.7m) is achieved
(c)	The room depth criterion d/w +d/HW < 2/(1-RB) is satisfied. Where: d = room depth, w = room width, HW = window head height from floor level, RB = average reflectance of surfaces in the rear half of the room, Note: Table - 7 (see Additional Information) gives maximum room depths in metres for different room widths and window head heights of sidelit rooms

Good practice daylighting criteria

Glare control, view out and internal and external lighting

Building type	Glare control and view out requirements – 1 credit (except healthcare, up to 2 credits)	Internal and external lighting – 1 credit
Relevant areas in all buildings	Glare control The potential for disabling glare	Internal lighting Illuminance (lux) levels in all internal relevant building areas of the building

Building type	Glare control and view out requirements – 1 credit (except healthcare, up to 2 credits)	Internal and external lighting – 1 credit
	has been designed out of all relevant building areas either through building layout (e.g. low eaves) and/or building design (e.g. blinds, brise soleil, bioclimatic design that provides shading from high level summer and low level winter sun). The glare control strategy should be developed in tandem with the lighting strategy to ensure that glare is minimised whilst avoiding potential conflict with the lighting control systems, therefore avoiding higher than expected energy consumption. AND **View out** All positions within relevant building areas are within 7m of a wall which has a window or permanent opening that provides an adequate view out. The window/opening must be ≥ 20% of the surrounding wall area. Where the room depth is greater than the 7m requirement, compliance is only possible where the percentage of window/opening is the same as or greater than the values in table 1.0 of BS 8206[2].	are specified in accordance with the CIBSE Code for Lighting 2009[3] and any other relevant industry standard. For areas where computer screens are regularly used, the lighting design complies with CIBSE Lighting Guide 7[4] sections 3.3, 4.6, 4.7, 4.8 and 4.9. This gives recommendations highlighting: 1. Limits to the luminance of the luminaires to avoid screen reflections. (Manufacturers' data for the luminaires should be sought to confirm this). 2. For up-lighting, the recommendations refer to the luminance of the lit ceiling rather than the luminaire; a design team calculation is usually required to demonstrate this. 3. Recommendations for direct lighting, ceiling illuminance, and average wall illuminance. AND **Internal lighting: zoning and occupant controls** The zoning of and occupant controls for internal lighting are in accordance with the criteria below for relevant areas present within the building. 1. In office areas, zones of no more than four workplaces (see also Compliance note), 2. Workstations adjacent to windows/atria and other building areas separately zoned and controlled, 3. Seminar and lecture rooms: zoned for presentation and audience areas, 4. Library spaces: separate zoning of stacks, reading and counter areas, 5. Teaching space/demonstration area, 6. Whiteboard/display screen 7. Auditoria: zoning of seating areas, circulation space and lectern area, 8. Dining, restaurant, café areas:

Building type	Glare control and view out requirements – 1 credit (except healthcare, up to 2 credits)	Internal and external lighting – 1 credit
		separate zoning of servery and seating/dining areas, 9. Retail: separate zoning of display and counter areas, 10. Bar areas: separate zoning of bar and seating areas, 11. Wards/bedded areas: zoned lighting control for individual bed spaces and control for staff over groups of bed spaces, 12. Treatment areas, dayrooms, waiting areas: zoning of seating and activity areas and circulation space with controls accessible to staff. Areas used for teaching, seminar or lecture purposes have lighting controls provided in accordance with CIBSE Lighting Guide 5[5]. Note, the requirements for zoning of lighting control can be excluded for prison buildings. The controls specified will depend on the size and use of the space but a typical auditorium or lecture theatre with stepped seating and a formal lectern/demonstration/performance area would typically be expected to have lighting controls as follows: 1. Full normal lighting (to allow for entry/exit, cleaning etc.), 2. Demonstration area lighting off and audience area lighting reduced to a low level (for the purpose of line slide projection, but allowing enough light for the audience to take notes), 3. All lighting off (for the projection of tone slides, colour slides, and for the purposes of visual demonstrations/performances), 4. Separate localised lectern lighting. For rooms/spaces not listed above, the assessor can exercise an element of judgement when determining whether thespecification is appropriate for the space given its end use and the aim and criteria of this BREEAM issue.

Building type	Glare control and view out requirements – 1 credit (except healthcare, up to 2 credits)	Internal and external lighting – 1 credit
		AND **External lighting** Illuminance levels for lighting in all external areas within the construction zone are specified in accordance with BS 5489-1:2003+A2:2008 Lighting of roads and public amenity areas[6].
In addition the following is required where applicable;		
Education buildings	No additional requirement to those outlined above.	Manual lighting controls should be easily accessible for the teacher whilst teaching and on entering/leaving the teaching space.
Prison buildings	**Cells** An adequate view out from a normal standing or sitting position and the distance between each window and nearest external solid object (i.e. buildings, screens, walls/fences) is ≥ 10m. Where existing features prevent compliance with this requirement in less than 20% of the cells within the building, the credit can still be awarded. **Patient occupied spaces** See Healthcare requirements for these spaces.	**Cells** Lit to a maintained illuminance of 200 lux at table-top level. In addition there must be the facility (using, for example, dimming, step switching or separate task and general lighting) for the cell's occupant to select a lower level of general lighting if required. **Exercise yards** Lit to a maintained illuminance of at least 10 lux. However, if such spaces are, or will be, used as sports facilities they must be lit to a maintained illuminance of 100 lux.
Court buildings	No additional requirement to those outlined above.	Separate zoning is also provided for the following areas (as a minimum): 1. Judge's/magistrate's bench, 2. Dock, 3. Jury area, 4. Public seating area. Lighting control of the zones in the above spaces, and the courtroom as a whole, cater for the following settings: 1. Full lighting (to allow cleaning etc.), 2. Normal lighting (for court sessions), 3. Dimmed (for the purpose of

Building type	Glare control and view out requirements – 1 credit (except healthcare, up to 2 credits)	Internal and external lighting – 1 credit
		showing audio visual evidence, but allowing enough light for note taking).
Multi-residential buildings	Living rooms - (self contained flats), communal lounges, individual bedrooms and bedsits - (sheltered housing) All positions within relevant areas are to be within 5m of a wall which has a window or permanent opening providing an adequate view out. The window/opening must be ≥ 20% of the surrounding wall area.	No additional requirement to those outlined above.
Healthcare buildings with inpatient areas	Patient occupied spaces e.g. wards and dayrooms As criteria above for the relevant building areas PLUS the distance between the wall with the window/opening and nearest external solid object (e.g. buildings, screens, walls/fences) is ≥ 10m. Note: for healthcare buildings with inpatient areas, two credits are available and can be awarded (fully, not in part) for compliance with the glare control and view out criteria outlined above. Where a healthcare building does not have inpatient areas, one credit is available and awarded for compliance with the glare control and view criteria for 'relevant areas in all buildings'.	No additional requirement to those outlined above.

Visual Arts - Healthcare buildings and residential type buildings providing supported living only

One credit

3. An art coordinator has been appointed for the specific project

OR

4. An art policy and an art strategy have been prepared for the development at the feasibility/design brief stage i.e. RIBA stage B (or equivalent) and endorsed by the senior management level. The policy and strategy addresses the following:
    a. Enhancing the healthcare environment
    b. Building relationships with the local community
    c. Building relationships with patients and their families

d. Relieving patient and family anxiety by contributing to treatment or recovery areas, e.g. post-operative areas, paediatric units, etc.
e. Greening the healthcare environment with inclusion of living plants (where appropriate)
f. Training generating creative opportunities for staff

Exemplary level criteria

The following outlines the exemplary level criteria to achieve an innovation credit for daylighting:

Area type	Credits	Daylight factor required	Area (m^2) to comply	Other requirements
All building types	The criteria outlined above concerning uniformity ratio, view of sky or room depth criterion are met where they are used to demonstrate compliance.			
All building types (excluding Retail – see below)				
Functions as identified in the standard criteria (multi storey buildings)	1	3%	80%	Where used, a minimum point daylight factor of 1.2% OR 2.1% for spaces with glazed roofs, such as atria
Functions as identified in the standard criteria (single storey buildings)		4%	80%	Where used, a minimum point daylight factor of 1.6% OR 2.8% for spaces with glazed roofs, such as atria
Prisons and court cells		2%	80%	-
Prison internal association/atrium area		5%	80%	A uniformity ratio of at least 0.7 or a minimum point daylight factor of 3.5%.
Retail				
Sales areas	1	N/A	50%	Point daylight factor 2%
Common areas and offices (multi storey buildings)		3%	80%	Where used, a minimum point daylight factor of 1.2% OR 2.1% for spaces with glazed roofs, such as atria

Area type	Credits	Daylight factor required	Area (m^2) to comply	Other requirements
Common areas and offices (single storey buildings)		4%	80%	Where used, a minimum point daylight factor of 1.6% OR 2.8% for spaces with glazed roofs, such as atria

Compliance Notes

Ref	Terms	Description
CN1	Shell only	Daylighting - No additional notes. View out - 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 designed for and/or likely to be occupied by workstations/benches or desks must comply with the relevant criteria (excluding ancillary areas). Glare control and artificial lighting - Compliance with these aspects of this BREEAM issue can be demonstrated via one of the following means in shell only buildings/areas; 1. Option 1 – Use of a tenancy lease agreement between the developer and tenant/s (full value of available credits) 2. Option 2 – A Green Building Guide for tenant fit outs (half the value of the available credits) 3. Option 3 – Developer/Tenant collaboration (full value of available credits) Refer to Appendix D – BREEAM New Construction and shell and core/speculative assessments of this Scheme Document for further description of the above options. Lighting controls - The lighting control system must have the capacity to be zoned, as required, once the final tenant is known and occupancy patterns/layout are agreed.
CN2	Relevant building areas: Daylighting See criterion 2	Generally this refers to areas within the building where good daylighting is considered to be of benefit to the building users (typically those areas occupied continuously for 30 minutes or more). Any exclusion will need to be fully justified by the Assessor in their certification report. This includes the following (where occupied continuously for 30 minutes or more) specifically stated because they are often omitted; 1. Sports hall exercise spaces 2. Laboratory areas unless the type of research that will

Ref	Terms	Description
		be carried out requires strictly controlled environmental conditions, such as the exclusion of natural light at all times. 3. Self contained flats 4. Kitchen and catering areas 5. General communal areas 6. Small offices (including those within multi-residential buildings) 7. Meeting rooms (including those within multi-residential buildings) 8. Leisure areas 9. Any area that may involve close up work. But excludes (where present); 1. Media, arts production, SEN sensory spaces, x-ray rooms and other areas requiring strictly controlled acoustic or lighting conditions 2. Clinical areas with controlled environmental conditions, e.g. operating theatres, delivery rooms or pathology. However, BREEAM strongly advise that the benefits from daylighting and view out are seriously considered when designing areas of critical and intensive care in healthcare buildings. 3. Holding areas and custody cells where security issues conflict with the BREEAM daylighting requirements. 4. Custody cells in courts, where privacy is a client functional/operational requirement.
CN3	Relevant building areas: Glare control and view out	For a view out include areas of the building where; 1. There are or will be workstations/benches or desks for building users 2. Close work will be undertaken or where visual aids will be used. 3. A view out is deemed to be of benefit to the building occupants e.g. in spaces where occupants are likely to spend a significant amount of time. For glare control include areas of the building where lighting and resultant glare could be problematic for users e.g. workstations, projector screens, sports halls. Excluded areas for each of these might include; 1. Nurse bases where they are located centrally in a ward/patient area in order to enable patient observation. 2. Courtrooms and interview rooms where compliance is not possible due to security/privacy criteria. 3. Prison staff areas that contain workstations that for security or observational purposes must be located centrally within the building. 4. Any clinical areas where the control of environmental/operational conditions prevents such spaces from providing a view out. 5. Workstations in nurseries (children's desks only), con-

Ref	Terms	Description
		ference rooms, lecture theatres, sports halls, acute SEN and also any spaces where the exclusion/limitation of natural light is a functional requirement e.g. labs, media etc.
CN4	Relevant building areas: Internal and external lighting	Where no external light fittings are specified (either separate from or mounted on the external building façade/roof), the criteria relating to external lighting do not apply and the credit can be awarded on the basis of compliance with the internal lighting criteria. The following internal areas are excluded from the lighting zone requirements: 1. Media and arts production spaces 2. Sports facilities (exercise spaces only, including hydrotherapy and physiotherapy areas)
CN5	Percentage of assessed area See criterion 2	Where the compliance requirement specifies that a percentage of floor area must be adequately daylit, it refers to the percentage of the total floor area of all the rooms that must be assessed i.e. the compliant area. If for example a development has 6 rooms that must be assessed, each 150m^2 (total area 900m^2) and 80% of this floor area must meet the criteria, then 720m^2 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.
CN6	View of sky requirement See criterion 2	To comply with the view of sky criteria ref (b) in at least 80% of the room that complies with the average daylight factor requirement must receive direct light from the sky; i.e. it is permissible for up to 20% of the room not to meet the view of sky requirement and still achieve a compliant room.
CN7	Adequate view out	The view out is of a landscape or buildings (rather than just the sky) at seated eye level (1.2 – 1.3m) within the relevant building areas and should ideally be through an external window. A view into an internal courtyard or atrium will comply provided the distance from the opening to the back wall of the courtyard/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.
CN8	Curtains as glare con-	Curtains do not meet the criteria for the glare control

Ref	Terms	Description
	trol	requirement as the control/design needs to allow a degree of flexibility to still allow sunlight in. The use of curtains to control glare would cause occupants to rely on artificial lighting.
CN9	Relevant industry standard for lighting design	Pre-schools, schools and sixth form colleges: Building Bulletin 90: 'Lighting Design for Schools'[7] Please note that for care homes housing people with dementia the following code can be used instead of the CIBSE Code for Lighting: Design Lighting for People with Dementia, University of Stirling, Stirling, 2008[8]. Please note that the illuminance levels specified in the CIBSE Code for Lighting, 2009 are compliant with BS EN 12464-1[9].
CN10	Occupancy/workstation layout unknown	Where occupancy/workstation layout is not known, lighting control can be zoned on the basis of 40m^2 grids i.e. an assumption of 1 person/workspace per 10m^2.
CN11	Small spaces	Buildings consisting entirely of small rooms/spaces (less than 40m^2) which do not require any subdivision of lighting zones/control will meet the zoning criteria by default .
CN12	Zones of four workspaces	The limit of four workspaces is indicative of the required standard but is not a fixed requirement. Where there is justification for this to be increased to fit with the adopted lighting strategy, this may be accepted provided that the assessor is satisfied that the aim of this criterion is upheld, i.e. that there is suitable zoning/control of lighting to enable a reasonable degree of occupant control over lighting in their personable work area. The lighting consultant should set out how this is to be achieved in such an instance.
CN13	Borrowed light	For areas where borrowed light is used to demonstrate compliance, calculations or results from appropriate lighting design software must be provided to demonstrate that such areas meet the BREEAM criteria (if the light from these sources is required in order for the room to comply). Examples of borrowed light include: light shelves, clerestory glazing, sun pipes or internal translucent/transparent partitions (such as those using frosted glass).
CN14	Rooms lit from two opposite sides	For rooms lit by windows on two opposite sides, the maximum room depth that can be satisfactorily daylit is twice the limiting room depth (d) (measured from window wall to window wall; CIBSE Lighting Guide LG10[10] The reflectance of the imaginary internal wall should be taken as 1.

Ref	Terms	Description
CN15	Uniformity with roo-flights	The room depth criteria cannot be used where the lighting strategy relies on rooflights. In such areas either appro-priate 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, Figure 2.36 (p37) within CIBSE Light-ing Guide LG10 can be used to determine the uniformity ratio.
CN16	Point daylight factors and daylight illu-minances	Computer simulations are the most appropriate tools to allow for point daylight factors to be displayed. 2% day-light 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.
CN17	Multi-residential devel-opments with CSH assessed dwellings	For buildings with self-contained dwellings also being assessed under the Code for Sustainable Homes (CSH), the following applies: Where the self-contained dwellings have achieved the credit for CSH issue Hea 1, this contributes toward the daylighting credit within BREEAM. Other residential and non residential areas of the building must comply with the above in order for the relevant visual comfort BREEAM credits to be awarded.
CN18	Existing site features	Where existing site features prevent all self contained dwell-ings and/or individual bedrooms from achieving the credit requirements. The credit can still be achieved if evidence provided demonstrates that 90% of the self contained dwellings and/or individual bedrooms are able to achieve the compliance requirement.
CN19	Arts co-ordinator (Vis-ual arts credit)	The assessed project does not need a dedicated arts co-ordinator, the arts co-ordinator may work on several projects, or with several establishments run by the appropriate Trust. The arts co-ordinator must: 1. Hold a relevant qualification in an arts or a related subject. 2. Have at least two years of relevant experience. Such experience should be related to the application of arts in a social context. Examples could be voluntary or paid work within healthcare or educational envi-ronments, or with ethnic minority, disabled, elderly or young communities.
CN20	Nurseries/acute SEN	Where child care and/or acute SEN spaces are included within the scope of the assessment, controls should be provided for the teacher/member of staff, i.e. it is not a

Ref	Terms	Description
		necessity for the controls to be accessible to the children.
CN21	Crèche	Where nursery spaces are included within the scope of the assessment, controls should be provided for the member of staff, not the nursery school children.

Schedule of Evidence

Ref	Design stage	Post-construction stage
Daylighting		
All	Design drawings Daylight calculations Where relevant for multi-residential buildings: Evidence in line with the Design Stage evidence requirements of the CSH issue Hea 1 OR A copy of the Design Stage CSH certificate and report from the CSH online reporting system confirming the number of credits achieved for CSH Issue Hea 1	BREEAM Assessor's site inspection report and photographic evidence OR 'as built' drawings and calculations Results from on-site measurements (in accordance with methodology detailed in BRE IP 23/9310[11]). Where relevant for Glare control, view out and internal and external lighting, multi-residential buildings: Evidence in line with the Post Construction Stage evidence requirements of the CSH issue Hea 1 OR A copy of the Post Construction Stage CSH certificate and report from the CSH online reporting system confirming the number of credits achieved for CSH Issue Hea 1.
View out and glare requirements		
All	Design drawings Relevant section/clauses of the building specification or contract Window schedule	BREEAM Assessor's site inspection report and photographic evidence And/or 'as built' drawings or a formal letter from the design team
Internal and external lighting		
All	Design drawings and/or room data sheets/schedules Relevant section/clauses of the building specification or contract OR	BREEAM Assessor's site inspection report and photographic evidence 'As-built' drawings Formal confirmation of compliance

Ref	Design stage	Post-construction stage
	a letter of formal confirmation of compliance from the relevant design team member.	from the contractor or design team
Visual arts		
All	Correspondence from the design team or Trust (e.g. letter, email, meeting minutes) OR A copy of the Trust arts policy and strategy.	Documentation demonstrating the work of the appointed arts co-ordinator OR A copy of the Trust arts policy and strategy Confirmation of the arts co-ordinators qualifications and experience.

Additional Information

Relevant definitions

Art

The Arts Council England defines 'Arts' as: "literature and writing, theatre and drama, dance, music, visual arts which include crafts, new media, architecture, design, moving image, and combined arts".

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.

Clinical areas

Areas of the building in which medical functions are carried out that require specific restricted environmental conditions such as humidity, daylighting, temperature, etc. (e.g. X-ray, operating department, delivery room, etc).

Computer simulation

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

Construction zone

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

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 improved by up to 10% when they are running at 30kHz compared to those operating at 50Hz.

Illuminance

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

Occupied space

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

Patient areas

Areas of the building used mainly by inpatients (e.g. wards, dayrooms, etc)

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'.

Public areas

Areas of the building designed for public use where no medical functions are carried out (e.g. reception, retail unit, waiting areas).

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.

Staff areas

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

Uniformity

The uniformity is the ratio between the minimum illuminance (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

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

Checklists and Tables

Table - 7: Reflectance for maximum room depths and window head heights
The table below gives maximum room depths in metres for different room widths and window head heights of sidelit rooms:

	Reflectance (RB)					
	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

Calculation procedures

None

Other information

The following references provide information relating to this issue;

1. CIBSE Lighting Guide 10 Daylighting and window design,

2. BS 8206 Part 22

3. BRE Site Layout Guide[12]

Arts and View out in Health

The implementation of arts in health can have positive effects on patient recovery, staff morale and wellbeing. The benefits include:

1. Improving clinical and therapeutic outcomes
2. Helping users to express, contain and transform distress and disturbance, creating a less stressful environment for patients/residents, service users, staff and visitors
3. Increasing the understanding between clinicians and the people for whom they care
4. Developing and delivering more patient-focused services, and improving the experience for all.

For these reasons arts need to find a bigger place within health environments and should be planned from the early stages of development.

Paintings in Hospitals is a charitable organisation whose objective is to improve the environment of hospitals and other healthcare establishments by providing original works of art on loan. (www.paintingsinhospitals.org.uk)

Roger S. Ulrich

Roger S. Ulrich, professor at Texas A & M University's College of Architecture, has conducted scientific research on the influences of healthcare facilities on patient medical outcomes.

Professor Ulrich's paper 'Effects of Healthcare Environmental Design on Medical Outcomes' describes the benefits on patient wellbeing and recovery from having adequate views, particularly of natural landscapes. Though it is not a requirement for awarding the BREEAM credit, wards, dayrooms and waiting rooms should ideally have a view out of a soft landscaped area, including planting.

---

[1]BB 87 Guidelines for Environmental Design in Schools, 2003, DFES
[2]BS 8206-2:2008 Lighting for buildings.Code of Practice for daylighting
[3]CIBSE Code for Lighting, 2009
[4]CIBSE Lighting Guide 7, 2005
[5]SLL LIGHTING GUIDE 5: Lecture, teaching and conference rooms, 1991
[6]BS 5489-1:2003+A2:2008 Lighting of roads and public amenity areas
[7]Building Bulletin 90: 'Lighting Design for Schools'
[8]Pollock R, McNair D, McGuire B and Cunningham C, Design Lighting for People with Dementia, Dementia Services Development Centre, University of Stirling, Stirling, 2008
[9]BS EN 12464-1:2002 Light and lighting. Lighting of work places. Indoor work places, 2003
[10]CIBSE Lighting Guide LG10 Daylighting and window design, 1999.
[11]BRE Information paper 23/93 measuring daylight
[12]Site layout planning for daylight and sunlight: a guide to good practice. P.Littlefair, 2005

Hea 02 Indoor air quality

Number of credits available	Minimum standards
Building type dependent	No

Aim

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

Assessment Criteria

This issue is split into three parts:

- Minimising sources of air pollution (3 credits)
- Potential for natural ventilation (1 credit)
- Laboratory fume cupboard and containment areas (2 credits)

Please note:

- The laboratory credits are only applicable to buildings which contain such facilities.
- The potential for natural ventilation credit does not apply to buildings on a prison development.`

The following is required to demonstrate compliance for:

Minimising sources of air pollution

One credit

1. An indoor air quality plan has been produced which considers;
    a. Removal of contaminant sources
    b. Dilution and control of contaminant sources
    c. Procedures for pre-occupancy flush out
    d. 3rd party testing and analysis.
2. For air-conditioned and mixed-mode buildings: the building's air intakes and exhausts are over 10m apart to minimise recirculation and intakes are over 20m from sources of external pollution.
3. For naturally-ventilated buildings: openable windows/ventilators are over 10m from sources of external pollution.
4. The building has been designed to provide fresh air and minimise internal pollutants (and ingress of external polluted air into the building) in accordance with the criteria of the relevant standard for ventilation.
5. Areas of the building subject to large and unpredictable or variable occupancy patterns have CO_2 or air quality sensors specified and:
    a. In mechanically ventilated spaces, the sensor(s) are linked to the mechanical ventilation system and provide demand-controlled ventilation to the space.
    b. In naturally ventilated spaces, the sensors either have the ability to alert the building owner/manager when CO_2 levels exceed the recommended set point, or are linked to controls with the ability to adjust the quantity of fresh air, i.e. automatic opening windows/roof vents.

One credit

6. Criterion 1 is achieved.
7. All decorative paints and varnishes have met the requirements listed in Table - 8
8. At least five of the eight remaining product categories listed in Table - 8have met the testing requirements and emission levels for Volatile Organic Compound (VOC) emissions against the relevant standards identified within this table. Where five or less products are specified within the building, all must meet the requirements in order to achieve this credit.

Table - 8: VOC criteria by product type

Product	European Standard	Emission levels for VOCs required
Decorative paints and varnishes	BS EN 13300:2001[1] referred to the criteria of Decorative Paint Directive 2004/42/CE[2]	VOC (organic solvent) content (testing req. 6), requirement for Phase 2. Fungal and algal resistant.
Wood Panels 1. Particleboard, 2. Fibreboard including medium density fibre board (MDF), 3. Oriented strand board (OSB), 4. Cement-bonded particleboard 5. Plywood 6. Solid wood panel and acoustic board	EN 13986:2004[3]	Formaldehyde E1 in accordance with EN 13986:2004 Annex B (See also Compliance notes) Verify that regulated wood preservatives are absent as defined by the standard.
Timber Structures 1. Glued laminated timber	EN 14080:2005[4]	Formaldehyde E1 (Testing req 1)
Wood flooring 1. e.g. parquet flooring	EN 14342:2005[5]	Formaldehyde E1 (Testing req 1) Verify that regulated wood preservatives are absent as defined by the standard.
Resilient, textile and laminated Floor coverings 1. Vinyl/linoleum 2. Cork and rubber 3. Carpet 4. Laminated wood flooring	EN 14041:2004[6]	Formaldehyde E1 (Testing req 1) Verify that regulated preservatives are absent as defined by the standard.
Suspended ceiling tiles	EN 13964:2004[7]	Formaldehyde E1 (Testing req 1) No asbestos.
Flooring adhesives (and if relevant adhesives for	EN 13999-1:2007[8]	Verify that carcinogenic or sensitising volatile substances are absent (Testing

Product	European Standard	Emission levels for VOCs required
rigid wall coverings)		req. 2-4).
Wall-coverings 1. Finished wallpapers 2. Wall vinyl's and plastic wall-coverings 3. Wallpapers for subsequent decoration 4. Heavy duty wall-coverings 5. Textile wall-coverings	EN 233:1999[9] EN 234:1997[10] EN 259:2001[11] EN 266:1992[12]	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 and other toxic substances are within the EN standard for the material.
Adhesives for hanging flexible wall coverings (for rigid wall coverings use flooring adhesives criteria)	BS 3046:1981[13]	No harmful substances and preservatives used should be of minimum toxicity.
Testing requirement: 1. EN 717-1:2004[14] 2. EN 13999-2:2007[15] - Volatile Organic Compounds (VOCs) 3. EN 13999-3:2007[16] - Volatile aldehydes 4. EN 13999-4:2007[17] - Volatile diisocyanates 5. EN 12149:1998[18] 6. BS EN ISO 11890-2:2006[19]		

One credit

9. Criterion 1 is achieved
10. Formaldehyde concentration level is measured post construction (but pre-occupancy) and is found to be less than or equal to 100µg/m^3 averaged over 30 minutes (WHO guidelines, source BRE Digest 464 part 2[20]).
11. The total volatile organic compound (TVOC) concentration is measured post construction (but pre-occupancy) and found to be less than 300µg/m^3 over 8 hours, in line with the Building Regulation requirements.
12. Where levels are found to exceed these limits, the project team confirms the measures that have, or will be undertaken in accordance with the IAQ plan, to reduce the TVOC and formaldehyde levels to within the above limits.
13. The testing and measurement of the above pollutants are in accordance with the following standards where relevant:
    a. BS EN ISO 16000-4: 2004 Diffusive sampling of formaldehyde in air[21]
    b. EN ISO 16000-6 VOCs in air by active sampling[22]
    c. BS EN 16017-2: 2003 VOCs - Indoor, ambient and workplace air by passive sampling[23]
    d. BS EN ISO 16000-3: 2001[24] formaldehyde and other carbonyls in air by pumped sampling.
14. The measured concentration levels of formaldehyde (µg/m^3) and TVOC (µg/m^3) are reported, via the BREEAM scoring and reporting tool, for the purpose of confirming criteria 10 to 12.

Potential for natural ventilation

One credit (credit not applicable to prison buildings)

15. Occupied spaces 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 occupied 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 must be on opposite sides and evenly distributed across the area to promote adequate cross-ventilation OR
b. The design demonstrates that the natural ventilation strategy provides adequate cross flow of air to maintain required thermal comfort conditions and ventilation rates. This is demonstrated using ventilation design tool types recommended by CIBSE AM10[25] (or for education buildings by using the ClassVent tool).

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

16. The natural ventilation strategy is capable of providing at least two levels of user-control on the supply of fresh air to the occupied space, as follows;
    a. Higher level: higher rates of ventilation achievable to remove short-term odours and/or prevent summertime overheating
    b. Lower level: adequate levels of draught-free fresh air to meet the need for good indoor air quality throughout the year, sufficient for the occupancy load and the internal pollution loads of the space.

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

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

Laboratory fume cupboards and Containment areas

One credit (only applicable to buildings containing these facilities)

17. Where fume cupboards are specified, they are manufactured and installed in accordance with the following;
    a. General purpose fume cupboards: BS EN 14175-2:2003[26]
    b. Recirculatory filtration fume cupboards: BS 7989:2001[27]
    c. Microbiological safety cabinets: BS EN 12469:2000[28]

    Or, for Schools, Sixth Form Colleges and Further Education with labs and fume cupboards for subjects up to and including A-level (or equivalent):
    d. Building Bulletin 88[29], Fume cupboards in schools.
18. Where ducted fume cupboards are specified, the discharged velocity from the extract fan stack from a ducted fume cupboard must be ≥ 10m/s as recommended by BS EN 14175-2[30].

Buildings with Containment Level 2 and 3 laboratory facilities

One credit (only applicable to buildings containing these facilities)

19. Ventilation systems are designed in compliance with the best practice guidance set out in The management design and operation of microbiological containment laboratories ACDP, 2001[31].
20. Filters for all areas designated as Containment Level 2 and 3 are located outside the main laboratory space for ease of cleaning/replacement and the filters are easily accessible for maintenance staff/technicians.
21. An emergency button is specified in each Containment Level 2 and 3 laboratory area.
22. The design team demonstrate that the individual fume cupboard location and stack heights have been considered in accordance with HMIP Technical Guidance Note (Dispersion) D1[32]

Compliance Notes

Ref	Terms	Description
CN1	Shell only	VOC criteria: compliance can be demonstrated via one of the following means in shell only buildings/areas: 1. Option 1 – Use of a tenancy lease agreement between the developer and tenant/s (full value of available credits) 2. Option 2 – A Green Building Guide for tenant fit outs (half the value of the available credits) 3. Option 3 – Developer/Tenant collaboration (full value of available credits) Refer to Appendix D – BREEAM New Construction and shell and core/speculative assessments of this Scheme Document for further description of the above options.
CN2	Furnishings See criterion 8	The scope of the VOC credits does not extend to furnishings e.g. desks/shelving, it focuses on the key internal finishes and fittings integral to the building.
CN3	Relevant standards – VOC's. See criterion 13 and Table 1	All standards outlined in Table - 8 above are standards recognised across Europe for VOCs content and testing. In instances where a product is not assessed against the listed European standard it is acceptable to use an alternative, nationally recognised standard provided the following is met as a minimum: 1. The performance level requirements required by the alternative standard are equivalent to or better than those specified in the EN standard. For example, if a material containing formaldehyde has been added to the floor covering product as part of the production process, then the E1 emission measured for formaldehyde must be less than 0.124mg/m^3 (as required by EN 14041:2004). 2. Where an alternative standard omits evaluation of a particular material, it is only acceptable to use the alternative standard in instances where the product does not contain that particular material. BREEAM assessors should seek confirmation from BRE Global prior to awarding credits for compliance with standards not listed in Table - 8 or previously approved as alternative nationally recognised standards.
CN4	Alternative to testing for VOC's	For decorative paints and varnishes, where the product manufacturer states that the method to determine the VOC content in a product is to use a calculation technique rather than testing in accordance with BS EN 13300:2001, this will be acceptable for the purposes of BREEAM compliance provided the manufacturer has confirmed the following:

Ref	Terms	Description
		1. The calculation method is acceptable for the purpose of compliance with the European Regulation on Classification, Labelling and Packaging of Substances and Mixtures (CLP), or where in transition to CLP, the UK Chemicals (Hazard Information and Packaging for Supply) Regulations 2009, and the product complies with the Decorative Paint Directive 2004/42/CE. 2. The manufacturing process i.e the paint/varnish formulation and raw material mixing, is carried out in accordance with a ISO 9001 (or equivalent) certified quality management procedure.
CN5	Products with no formaldehyde containing materials	For some floor coverings and wood based panels, the requirement for formaldehyde testing (referred to in the above criteria) does not apply to "floor coverings to which no formaldehyde-containing materials were added during production or post-production processing", or in the case of EN 13986:2004, wood-based panels. As such, if a product manufacturer confirms that they have made a declaration of Formaldehyde class E1 without testing (in writing or via a company product fact sheet/literature) then the product in question meets the BREEAM requirement relevant to Formaldehyde testing. A declaration of E1 without testing is effectively confirmation from the manufacturer that formaldehyde emissions comply with the emission level requirements of the relevant standard(s) therefore, evidence confirming the actual emission level(s) via testing will not be required by the Assessor to demonstrate compliance with that particular requirement.
CN6	Openable window area See criterion 15	The openable window area is defined as the geometric free ventilation area created when a ventilation opening, e.g. window, is open to its normal operational fully designed extent (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).
CN7	Mechanically ventilated/cooled buildings See criterion 15 & 16	Buildings that employ a mechanically ventilated/cooled strategy are still able to achieve this credit provided it can be demonstrated that compliance with all of the relevant criteria can be made easily available to the building user e.g windows fixed shut for an air conditioned strategy can be modified to be opening windows. The aim of the potential for natural ventilation criteria is to ensure that a building is capable of providing fresh air using a natural ventilation strategy. Where the building is predominantly naturally ventilated, but mechanical ventilation is necessary to boost ventilation during peak conditions, (i.e. maximum occupancy and/or peak temperature conditions) due to the function/specific usage

Ref	Terms	Description
		patterns of the building, the potential for natural ventilation credit can still be awarded provided design team calculations/modelling demonstrate that the mechanical ventilation system will be required for ≤5% of the annual occupied hours in the occupied space(s) for the adopted building design/layout.
CN8	Spaces requiring local exhaust ventilation See criterion 15,16,17 &18	Occupied spaces requiring local exhaust ventilation e.g. labs, workshops, food technology rooms must still demonstrate that they meet the criteria for potential for natural ventilation (unless listed below).
CN9	Excluded occupied spaces for the potential for natural ventilation criteria	The following building areas, where relevant to the building type, can be excluded from the definition of occupied spaces for the potential for natural ventilation criteria: 1. Ancillary building areas e.g. WCs corridors, stairwells, store rooms, plant rooms 2. Swimming/hydrotherapy pools 3. Catering and small staff kitchens 4. Washrooms/changing areas 5. Laboratory or other area where strictly controlled environmental conditions are a functional requirement of the space. 6. Non-communal areas in multi-residential buildings (i.e. bedrooms, self contained flats). 7. Custody cells and holding areas in law courts 8. Operational, shop floor or ancillary areas in industrial buildings 9. Healthcare buildings: Rooms or departments where control of ventilation is required for prevention of cross infection and/or controlled environmental conditions including: a. operating theatres b. laser surgery unit c. operative imaging unit d. intensive treatment unit e. infectious diseases isolation unit f. wards housing immuno-compromised patients g. manufacturing pharmacy h. specialised imaging, X-ray and scanning unit i. pathology containment laboratories j. mortuary and dissection suite k. research laboratories and associated animal houses l. sterilising and disinfecting unit (SDU) m. emerging treatment technologies including gene therapy and stem cell units n. Areas immediately adjacent to the above are excluded if it can be demonstrated that reverse air flow would be likely with natural ventilation o. Any other areas which require mechanical ventilation to satisfy the requirements of Healthcare

Ref	Terms	Description
		Technical Memorandums p. Any other areas that require mechanical ventilation due to specific operational related processes.
CN10	Industrial areas: air pollution/ventilation rate requirements	For industrial buildings the minimising sources of air pollution and potential for natural ventilation requirements and credits apply only to office areas and not operational areas. If the building does not contain any office areas, these credits and their requirements do not require assessing.
CN11	Relevant standards for ventilation See criteria 4 & 15	Education buildings: Building Bulletin 101 Ventilation of School Buildings. Offices spaces: Top of the range recommended in the British Council for Offices Guide to Best Practice in the Specification of Offices[33] i.e. 12 litres per second per person. Clinical areas with controlled environmental conditions: HTM 03-01 Specialised ventilation for healthcare premises[34] Relevant standards are not listed for all areas/building types as the provision of fresh air is adequately covered in Approved Document Part F Ventilation (and the standards referenced there in).
CN12	Measuring the distance. See criteria 2 & 3	The distance requirement for air intakes and extracts 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.
CN13	Sources of external pollution See criterion 4	This includes but is not limited to the following: 1. Highways and the main access roads on the assessed site 2. Car parks and delivery/vehicle waiting bays 3. Other building exhausts, including from building services plant industrial/agricultural processes
CN14	Excluded sources of pollution	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.
CN15	Filters	It should 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.

Ref	Terms	Description
CN16	Areas with a large and unpredictable occupancy See criterion 5	The following are examples of these types of space: 1. Auditoria 2. Gyms 3. Retail stores/malls 4. Cinemas 5. Waiting rooms Where the assessed building does not have any areas deemed to be large with an unpredictable pattern of occupancy, the criterion does not apply.
CN17	Healthcare buildings See criteria 15 & 16	In healthcare buildings some openings in public and patient areas need to be provided with restricted opening areas of not more than 100mm (HTM 55, Windows[35]). This is due to health and safety reasons, especially where windows are within reach of the elderly, mentally ill or children. However, it is felt that good design can overcome these restrictions and provide compliant natural ventilation solutions, even in safety-sensitive areas.
CN18	Fume cupboard requirement for schools and sixth form See criterion 17d	For fume cupboards specified/installed for up to and including A' Level subjects, confirmation of the specification and installation in accordance with Building Bulletin 88 will be acceptable for BREEAM compliance. BS 7989 and parts of BS 14175 may be relevant to some installations; in such cases the person/organisation responsible for producing/installing the lab equipment should be able to confirm if they are relevant given the type of fume cupboard installation.
CN19	Building contains no fume cupboards or safety cabinets	Please note that the laboratory and fume cupboard criteria, and therefore BREEAM credits, in this issue do not apply where laboratory space, fume cupboards or safety cabinets are not being installed within the assessed building.

Schedule of Evidence

Ref	Design stage	Post-construction stage
Minimising indoor air pollution		
1-5	Copy of the indoor air quality plan Relevant section/clauses of the building specification or contract Design drawings	Copy of the indoor air quality plan BREEAM Assessor's site inspection report and photographic evidence AND/OR 'As-built' drawings For a naturally ventilated building, a letter from the design team or principal contractor confirming the

Ref	Design stage	Post-construction stage
		building has been built in accordance with a design compliant with the BREEAM criteria For a mechanically ventilated building, the commissioning manager's performance testing report confirming the required fresh air rates are achieved
6-8	Copy of the indoor air quality plan Relevant section/clauses of the building specification or contract	Letter from or copies of the manufacturer's literature confirming testing standards and emissions achieved
9-14	Copy of the indoor air quality plan Commitment to carry out necessary testing post construction	Copy of the indoor air quality plan Confirmation from the project team that the recommendations are still relevant/have been implemented Testing results for formaldehyde and TVOC's
Potential for natural ventilation		
15-16	Relevant section/clauses of the building specification or contract Formal letter from the design team with details of the ventilation strategy and calculations/results from appropriate software modelling tool(s) Manufacturers'/suppliers' literature	BREEAM Assessor's site inspection report and photographic evidence* AND/OR 'As-built' drawings, specification and calculations OR A formal letter from the design team or principal contractor confirming no changes have occurred since design stage. * A random spot check of a selection of occupied spaces is sufficient. The assessor is not required to check each opening in all spaces/rooms.
Laboratories and containment areas		
17-22	Relevant section/clauses of the building specification or contract AND/OR a formal letter from the design team Design drawings	BREEAM Assessor's site inspection report and photographic evidence AND/OR 'As built' drawings Correspondence from the design team confirming installation of a compliant system(s) A copy of the manufacturers'/suppliers' literature or a letter from these parties confirming their cupboards/cabinets are

Ref	Design stage	Post-construction stage
		manufactured and installed in accordance with the relevant standards.

Additional Information

Relevant definitions

ClassVent

ClassVent is a customised spreadsheet design tool that provides a means of sizing ventilation openings for a natural ventilation strategy for school classrooms. The tool was developed by the Department for Children, Families and Schools (formerly DfES). The tool can be down-loaded from http://www.teachernet.gov.uk/docbank/index.cfm?id=9955

Clinical areas

Hea 01 Visual comfort.

Fume cupboard/safety cabinet

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

Occupied space

Hea 01 Visual comfort.

Volatile Organic Compound

Any organic liquid and/or solid that evaporates spontaneously at the prevailing temperature and pressure of the atmosphere with which it is in contact (Source: BS EN ISO 11890).

Checklists and Tables

None

Calculation procedures

None

Other Information

Indoor air quality and measurement

The testing and measurement of pollutants must be in accordance with the relevant standards (as listed in the criteria). Sample measurements should normally be taken in representative habitable or occupiable rooms, so not every room in a building would need to be sampled (see below for examples of representative room types). For example, in an office, one sample in a cellular/single occupancy office should suffice to assess the VOC concentration of the air for that type of habitable space in the building (assuming the other cellular offices have the same specification). In larger rooms, such as open-plan office area, further sampling locations should be used to understand the homogeneity of the atmosphere. Depending upon the performance of the measurement method in terms of repeatability and the required level of confidence in the value obtained, replicate samples may be taken at one or more sampling locations.

Prior to measurements being taken, the ventilation and heating systems should be operating for a period of time to ensure the relevant spaces in the building reach equilibrium in terms of their internal environmental conditions. Typically this may take between 12-24 hours.

Examples of representative room types include naturally ventilated carpeted office; mechanically ventilated vinyl floored meeting room; workshop; living room or bedroom. Rooms that are not habitable or occupiable may for example include toilets, store room, plant room, stairways or corridors. The definition of "habitable or occupiable rooms" comes from Approved Document F, Means of Ventilation, HM Government, 2010.

In accordance with the criteria, where levels are found to exceed the defined limits, the credit can only be claimed where the project team confirms the measures that have, or will be undertaken in accordance with the IAQ plan, to reduce the TVOC and formaldehyde levels to within the required limits.

This information is provided to assist project teams and BREEAM assessors on the appropriate scope of IAQ testing; therefore it is guidance only and not a requirement of complying with BREEAM. The testing regime should be determined based on the advice of the appropriate person appointed to conduct the testing, in order to determine and report representative values of indoor air quality for the building.

There are a number of publications available on the issue of measuring and improving the indoor air quality in buildings including BR 450, A protocol for the assessment of indoor air quality in homes and office buildings, Crump, Raw, Upton, Scivyer, Hunter, Hartless. BRE (2002).

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. 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).

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. The standards outlined in Table - 8Table - 8however are the only standards recognised by BREEAM for the purposes of assessing this issue.

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

BS EN 14175 and Fume cupboard discharge velocity: BS EN 14175 Part 2 states that the discharge velocity from fume cupboard extracts should be at least 7m/s but that a figure of 10m/s is preferable to ensure that the discharge will not be trapped in the aerodynamic wake of the stack. Higher

discharge velocities may be required, especially in windy locations, but higher rates may cause noise problems.

---

[1]BS EN 13300:2001 Paints and varnishes – water-borne coating materials and coating systems for interior walls and ceilings – Classification
[2]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
[3]BS EN 13986:2004 Wood-based panels for use in construction – Characteristics, evaluation of conformity and marking.
[4]BS EN 14080:2005 Timber structures – Glued laminated timber – Criteria
[5]BS EN 14342:2005 Wood flooring – Characteristics, evaluation of conformity and marking.
[6]BS EN 14041:2004 Resilient, textile and laminate floor coverings. Essential characteristics.
[7]BS EN 13964:2004 Suspended ceilings. Criteria and test methods.
[8]BS 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.
[9]BS EN 233:1999. Wallcoverings in roll form – Specification for finished wallpapers, wall vinyls and plastics wallcoverings.
[10]BS EN 234: Specification for wallcoverings for subsequent decoration.
[11]BS EN 259-1:2001 Wallcoverings in roll form – Heavy duty wallcoverings – Part 1: Specifications.
[12]BS EN 266:1992 Specification for Textile wallcoverings.
[13]BS 3046:1981 Specification for Adhesives for hanging flexible wallcoverings.
[14]BS EN 717-1:2004 Wood-based panels Determination of formaldehyde release. Formaldehyde emission by the chamber method.
[15]BS EN 13999-2:2007. Part 2: Determination of volatile organic compounds.
[16]BS EN 13999-2:2007. Part 3: Determination of volatile aldehydes.
[17]BS EN 13999-2:2007. Part 4: Determination of volatile diisocyanates.
[18]BS 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.
[19]BS EN ISO 11890-2:2006 Paints and varnishes. Determination of volatile organic compound (VOC) content. Gas-chromatographic method.
[20]BRE Digest 464, VOC emissions from building products: control, evaluation and labelling schemes, Yu, C. and Crump. D, 2002
[21]BS EN ISO 16000-4:2004: Determination of formaldehyde -- Diffusive sampling method
[22]EN ISO 16000-6: Determination of volatile organic compounds in indoor and test chamber air by active sampling on Tenax TA sorbent, thermal desorption and gas chromatography using MS/FID
[23]BS EN ISO 16017-2:2003, Indoor, ambient and workplace air. Sampling and analysis of volatile organic compounds by sorbent tube/thermal desorption/capillary gas chromatography. Diffusive sampling
[24]BS EN ISO 16000-3:2001: Determination of formaldehyde and other carbonyl compounds -- Active sampling method
[25]CIBSE AM10, 2005, Natural Ventilation in Non-Domestic Buildings
[26]BS EN 14175-2:2003 Fume Cupboards, Safety and Performance Requirements, BSi.
[27]BS 7989 Specification for recirculatory filtration fume cupboards, BSI, 2003.
[28]BS EN 12469:2000 Biotechnology. Performance criteria for microbiological safety cabinets
[29]Building Bulletin 88: Fume Cupboards in Schools, 1988, Department for Education & Employment
[30]BS EN 14175-2:2003, Fume cupboards. Safety and performance requirements
[31]The Management, Design and Operation of Microbiological Containment Levels, Advisory Committee on Dangerous Pathogens (ACDP), 2001

[32]Guidelines on Discharge Stack Heights for Polluting Emissions, HMIP Technical Guidance Note (Dispersion) D1, 1993.
[33]BCO Guide 2009, Best Practice in the Specification of Offices, BCO, 2009.
[34]HTM 03-01 Specialised ventilation for healthcare premises, Department of Health, 2007.
[35]Health Technical Memorandum 55 Building Components – Windows, NHS Estates, 1998.

Hea 03 Thermal comfort

Number of credits available	Minimum standards
2	No

Aim

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

Assessment Criteria

The following is required to demonstrate compliance for:

One credit

1. Thermal modelling has been carried out using software in accordance with CIBSE AM11 [1] Building Energy and Environmental Modelling.
2. The modelling demonstrates that the building design and services strategy can deliver thermal comfort levels in occupied spaces in accordance with the criteria set out in CIBSE Guide A Environmental Design[2] ; or other appropriate industry standard (where this sets a higher or more appropriate requirement/level for the building type).
3. The software used to carry out the simulation at the detailed design stage provides full dynamic thermal analysis. For smaller and more basic building designs with less complex heating / cooling systems, an alternative less complex means of analysis may be appropriate (such methodologies must still be in accordance with CIBSE AM11).
    a. The building complies with any requirement, in terms of "time out of range" (TOR) metric, from the appropriate industry standard (as above) OR where there is no appropriate industry standard available or TOR recommendation made, the building services engineer confirms that the TOR is acceptable for the purpose and function of the building.
4. The TOR metric (%) is reported, via the BREEAM scoring and reporting tool, based on the modelling above (and therefore specified building servicing strategy) and includes maximum and minimum temperatures for both summer and winter settings.

One credit

5. Criteria 1 to 5 are achieved.
6. The thermal modelling analysis (above) has informed the temperature control strategy for the building and it's users.
7. The strategy for proposed heating / cooling system(s) demonstrates that it has addressed the following:
    a. Zones within the building and how the building services could efficiently and appropriately heat or cool these areas e.g. consider the different requirements for the central core of a building compared with the external perimeter adjacent to the windows.
    b. The amount of occupant control required for these zones, based on discussions with the end user (or alternatively building type/use specific design guidance, case studies, feedback) and considers:

i. User knowledge of building services,
ii. Occupancy type, patterns and room functions (and therefore appropriate level of control required),
iii. How the user is likely to operate/interact with the system(s) e.g. are they likely to open windows, access TRV's on radiators, change air conditioning settings etc.,
iv. The user expectations (e.g. this may differ in the summer and winter; users tend to accept warmer internal conditions in the summer) and degree of individual control (i.e. obtaining the balance between occupant preferences, for example, some occupants like fresh air and others dislike drafts).

c. How the proposed systems will interact with each other (where there is more than one system) and how this may affect the building occupants thermal comfort.
d. The need or otherwise for an accessible building user actuated manual override for any automatic systems.

Compliance Notes

Ref	Terms	Description
CN1	Appropriate industry standard See criterion 2	BREEAM has not attempted to list all possible appropriate industry standards. Any recognised collaborative industry/sector best practice standard or guidance that sets thermal performance levels, in terms of thermal comfort, design temperature and a 'Time Out of Range' metric, can be considered an appropriate industry standard for the purposes of this BREEAM issue. CIBSE Guide A (table 1.5) includes recommended summer and winter comfort criteria (temperature ranges) for a number of specific building applications and this can be used to determine and report the percentage time out of range (ToR) metric (criterion 5).
CN2	Appropriate industry standards and criteria for schools See criterion 2	An appropriate industry standard for schools is Building Bulletin 101, Ventilation of school buildings, 2006. This standard includes the requirement that there should be no more than 120 hours when the air temperature in the classroom rises above 28°C. However, to comply with BREEAM (in relation to criterion no. 2) internal summer temperatures in the classroom must be significantly better than the recommendations of Building Bulletin 101, e.g. there are fewer than 60 hours a year where temperatures rise above 28oC. This additional requirement is set to ensure closer alignment with CIBSE Guide A, which recommends limiting the expected occurrence of operative temperatures above 28 C to 1% of the annual occupied period (e.g. around 25–30 hours). Meeting or improving on this 'significantly better' level would also serve to demonstrate compliance with criterion 4 i.e. time out of range. CIBSE Guide A also recommends summer and winter comfort criteria for teaching spaces and this can be used to determine and report the percentage time out of range (ToR) metric (criterion 5).
CN3	Appropriate industry standards and	The appropriate industry standard for healthcare is Health Technical Memorandum 03-01 Specialised ventilation for healthcare

Ref	Terms	Description
	criteria for healthcare buildings See criterion 2	premises. Thermal comfort levels in patient and clinical areas are in accordance with the temperature ranges set out in HTM 03-01, Appendix 2. Furthermore, internal summer temperatures must not exceed 28 C dry bulb for more than 50 hours per year (as defined in HTM 03-01, paragraph 2.15). Meeting or improving on this level would also serve to demonstrate compliance with criterion 4 i.e. time out of range. The temperature ranges outlined in HTM03-01 Appendix 2 can also be used to help determine and report the percentage time out of range (ToR) metric (criterion 5) for the occupied areas (defined as applications in appendix 2). Other occupied spaces are not covered in HTM03-01 Appendix 2 should be in accordance with CIBSE Guide A Environmental Design.
CN4	Buildings with less complex heating/cooling systems See criterion 3	For buildings with less complex heating/cooling systems the thermal comfort strategy need only consider 8a and b above. Compliance can be demonstrated where zoning allows separate occupant control (within the occupied space) of each perimeter area (i.e. within 7m of each external wall) and the central zone (i.e. over 7m from the external walls) e.g. 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. Note: The distance requirement for smaller buildings 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. Examples of potentially compliant heating control measures can be found in Technology Guide CTG002 Heating control[3].
CN5	Shell only	For all credits within this issue, compliance with this BREEAM issue can be demonstrated via one of the following means in shell only buildings/areas: 1. Option 1 – Use of a tenancy lease agreement between the developer and tenant/s (full value of available credits) 2. Option 2 – A Green Building Guide for tenant fit outs (half the value of the available credits) 3. Option 3 – Developer/Tenant collaboration (full value of available credits) Where compliance with the assessment criteria cannot be demonstrated the available credits must be withheld (option 4). Refer to Appendix D – BREEAM New Construction and shell and core/speculative assessments of this Scheme Document for further description of the above options. Thermal modelling completed on the basis of a notional layout will also be acceptable.
CN6	School buildings - thermal model See criterion 1	For schools with a straightforward servicing strategy, Classcool is considered a suitable alternative to an AM11 full dynamic model.

Ref	Terms	Description
CN7	Education and Prison building occupant controls See criterion 8	In this issue occupant controls are intended to be for staff-use only.
CN8	Industrial unit with no office space	Where an industrial unit contains no office space and only an operational/storage area, this BREEAM issue does not apply.

Schedule of Evidence

Ref	Design Stage (Third party certification only)	Post-refurbishment Stage (Third party and self declaration certification)
1-6	Relevant section/clauses of the building specification or contract or correspondence (e.g. letter, email or meeting minutes) from the design team Thermal modelling results TOR data from the design team	Thermal modelling results reflecting any changes to the design.
7-8	Thermal comfort strategy highlighting the points that have been considered and decisions taken accordingly Relevant section/clauses of the building specification or contract Design drawings	As design stage BREEAM Assessor's site inspection report and photographic evidence* *For large buildings it would not be expected that the assessor check every individual occupied space, but a random selection of spaces that confirm compliance.

Relevant definitions

ClassCool

A tool developed by the Department for Children, Schools and Families (DCSF, formerly DfES) which provides a simplified method of assessing the extent of classroom overheating. ClassCool may not be appropriate for other spaces, such as libraries and halls, and other means of assessing overheating will be required www.teachernet.gov.uk/iaq.

Clinical areas

Refer to BREEAM issue Hea 01 Visual comfort.

Occupied space

Refer to BREEAM issue Hea 01 Visual comfort, however for the purpose of BREEAM issue Hea 03 the definition excludes the following:

1. Atria/concourses

2. Entrance halls/reception areas
3. Ancillary space e.g. circulation areas, storerooms and plantrooms

Patient areas

Hea 01 Visual comfort.

Separate Occupant Control

Responsive 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.

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.

Time Out of Range

This is the amount of time (hrs) the temperature within the relevant building areas, during the hours of occupation, are outside of an acceptable temperature range (as defined in an appropriate industry standard), determined via building simulation/modelling (in accordance with relevant BS, EN, ISO compliant methods) or direct measurement (in the case of an occupied building).

Checklists and Tables

None

Calculation procedures

None

Other information

Thermal comfort is defined in British Standard BS EN ISO 7730[4] as 'that condition of mind which expresses satisfaction with the thermal environment.' The term 'thermal comfort' describes a person's psychological state of mind and is usually referred to in terms of whether someone is feeling too hot or too cold. Thermal comfort is therefore difficult to define because it needs to account for a range of environmental and personal factors in order to establish what makes people feel comfortable. HSE considers 80% of occupants as a reasonable limit for the minimum number of people who should be thermally comfortable in an environment.

The purpose of this issue is to encourage appropriate and robust consideration of thermal comfort issues and specification of appropriate occupant controls to ensure both maximum flexibility of the space and thermal comfort for the majority of building occupants. Reporting the Time Out of Range metric is required to indicate that the aim and criteria of this issue have and will be met, and therefore the risk of building occupant dissatisfaction (during the operational life of the building) is minimised.

---

[1] CIBSE Applications Manual AM11 Building energy and environmental modelling, CIBSE, 1998.
[2] CIBSE Guide A Environmental Design, 7th Edition, Issue 2, CIBSE, 2007
[3] CTG002 Technology Guide, Heating control: maximising comfort, minimising energy consumption, The Carbon Trust, 2006
[4] BS 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.

Hea 04 Water quality

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

Aim

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

Assessment Criteria

The following is required to demonstrate compliance for:

One credit

Building services water systems: minimising risk of contamination

1. All water systems in the building are designed in compliance with the measures outlined in the Health and Safety Executive's "Legionnaires' disease - The control of legionella bacteria in water systems". Approved Code of Practice and Guidance, 2000[1] and, where relevant, other industry/sector best practice guidance (see Compliance notes).
2. Where humidification is required, a failsafe humidification system is provided.

Building occupants: Provision of fresh drinking water

3. A wholesome supply of accessible, clean and fresh drinking water is supplied, as follows:
    a. Educational buildings and community use/centres:
        i. Chilled, mains-fed point-of-use water coolers accessible to pupils/students/users/staff (as applicable) throughout the day.
        ii. Provision in safe and convenient locations e.g. dining/assembly halls, classrooms/common rooms, wide corridors, indoor social areas, changing rooms/gymnasia, concourse.
        iii. One compliant point-of-use water cooler is provided for every 200 building users, subject to a minimum of one water cooler being provided for any building with less than 200 building users.
        iv. All coolers must be attached to both the wall and the floor to prevent vandalism, and contain security covers to protect all water and electrical connections.
    b. Permanently staffed buildings/office areas:
        i. Chilled, mains-fed point-of-use water supply or point-of-use water coolers.
        ii. Provision in each staff kitchenette, or in a suitable location on each floor level, and in a staff canteen (if provided).
    c. Sports/fitness and recreation areas/buildings:
        i. Chilled, mains-fed point-of-use water coolers.
        ii. Provision in each changing area or a public concourse
        iii. Where point-of-use coolers are provided they must be attached to both the wall and the floor to prevent vandalism, and contain security covers to protect all water and electrical connections.

Compliance Notes

Ref	Terms	Description
CN1	Other industry/sector specific legionellosis guidance See criterion 1	HTM 04-01 (Healthcare): Complimentary to the HSE ACoP, the water systems in healthcare buildings must be designed in compliance with the measures outlined in HTM 04-01 The control of legionella, hygiene, "safe" hot water, cold water and drinking water systems[2] CIBSE TM13: Design teams may refer to CIBSE TM13 Minimising the risk of Legionnaires disease, 2002[3] in demonstrating that the design meets the criteria of HSE ACoP.
CN2	Failsafe humidification system See criterion 2	A failsafe humidification system is one where failure of the system that sterilises the water vapour results in the entire humidification system initiating a shut down. This shut down therefore avoids any risk of building users being exposed to untreated and potentially contaminated water until the systems failure is corrected. Steam humidification is an example of a failsafe system.
CN3	New build extensions to existing buildings See criterion 1	If the new build extension and existing building will share the same services/water systems, then the existing systems must be assessed against the criteria regardless of whether the existing building forms a part of the assessment or not. If the extension is served by independent systems, only these need be assessed against the Assessment Criteria. If it is the intention that building users of the new extension will use water systems in the existing building, then it must be confirmed that the existing systems comply with the criteria.
CN4	Shell only and partially fitted buildings	Compliance with this BREEAM issue in shell only buildings can be demonstrated via one of the following means in shell only buildings/areas: 1. Option 1 – Use of a tenancy lease agreement between the developer and tenant/s (full value of available credits) 2. Option 2 – A Green Building Guide for tenant fit outs (half the value of the available credits) 3. Option 3 – Developer/Tenant collaboration (full value of available credits) Refer to Appendix D – BREEAM New Construction and shell and core/speculative assessments of this Scheme Document for further description of the above options. It is permissible for buildings that are not being fully fitted, but not necessarily speculative, to comply where the developer has provided the necessary infrastructure (water/electric supply, dedicated space etc.) for installation, but not necessarily the actual fittings/dispenser (which could be rented/fitted by the end-occupier).
CN5	Microbial contamination and	The BREEAM Assessor is not required to confirm that the design is compliant with the relevant standard(s), this is the responsibility of

Ref	Terms	Description
	the Assessor's reporting responsibility See criterion 1	the design team. The assessor is simply required to record, for the purposes of validation, whether or not the design team confirms it has complied.
CN6	Non compliant point-of-use water dispensers See criterion 3	The following types of water dispensers do not comply with the criteria of this BREEAM issue: 1. Water fountains, as they are difficult to keep in a hygienic condition, do not encourage users to consume adequate fluid intake, or fill a bottle, and are typically not chilled 2. Un-chilled mains fed taps in toilet or kitchen areas. 3. Bottled water from vending machines or over the counter.
CN7	Multi-residential buildings See criteria 1 & 2	For assessments of multi-residential buildings that have no office/staff areas, the criteria relating to the provision of fresh drinking water do not apply. Compliance with this issue should therefore be based on an assessment of criteria 1 and 2 only.

Schedule of Evidence

Ref	Design stage	Post-construction stage
1-2	Relevant section/clauses of the building specification or contract	A formal letter of declaration from the design team, principal contractor or installer of the relevant systems confirming compliance. BREEAM Assessor's site inspection report and photographic evidence AND/OR "As built" drawings
3	Design drawings	BREEAM Assessor's site inspection report and photographic evidence AND/OR "As built" drawings

Additional Information

Relevant definitions

Water systems

For the purpose of this issue, this refers to:

1. Cooling towers
2. Evaporative condenser
3. Domestic hot and cold water systems
4. Other plant and systems containing water which is likely to exceed 20 °C and which may release a spray or aerosol during operation or when being maintained, for example:

a. humidifiers and air washers
b. spa baths and pools
c. car/bus washes
d. wet scrubbers
e. indoor fountains and water features.

Legionnaires disease

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

Point of use water cooler

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

Checklists and Tables

None

Calculation procedures

None

Other information

BS8580 Water quality - risk assessments for Legionella control - Code of practice[4] provides independent risk assessors, regulators, facilities managers and building owners and operators with guidance on the procedures, processes and composition of a suitable Legionella risk assessment for water systems within buildings.

---

[1]Legionnaires' disease - The control of legionella bacteria in water systems. Approved Code of Practice and guidance, 3rd ed. HSE, 2000.
[2]HTM 04-01 "The control of Legionella, hygiene, "safe" hot water, cold water and drinking water systems", Department of Health, 2006.
[3]TM13 'Minimising the risk of Legionnaires disease', CIBSE, 2002.
[4]BS8580 Water quality - risk assessments for Legionella control - Code of practice, BSI, 2010

Hea 05 Acoustic performance

Number of credits available	Minimum standards
Building type dependent	No

Aim

To ensure the buildings' acoustic performance including sound insulation meet the appropriate standards for its purpose.

Assessment Criteria

This issue is split into two parts:

- Pre-requisite
- Acoustic performance standards (number of credits is building type dependent)

The following is required to demonstrate compliance :

Pre-requisite

1. A suitably qualified acoustician (see Relevant definitions) is appointed by the client at the appropriate stage of the project to provide early advice on influencing outline design solutions to :
    a. External sources of noise impacting the chosen site
    b. Site layout and zoning of the building for good acoustics
    c. Acoustic requirements for users with special hearing and communication needs,
    d. Acoustic treatment of different zones and facades.

Acoustic performance standards

2. The building meets the acoustic performance standards and testing requirements for the relevant building type and function areas as detailed below.

Pre-schools, schools and sixth form colleges (Three credits)	
Room function	As required by relevant standard.
Criteria	Achieve the performance standards required by Building Bulletin 93.
Credits	1
Testing Requirement	A programme of pre-completion acoustic testing is carried out by a compliant test body to ensure that the relevant spaces (as built) achieve the required performance standards. Where testing identifies that spaces do not meet the standards, remedial works are carried out prior to handover and occupation. Testing must be carried out in line with Section 1.3 of BB93 and the ANC Good Practice Guide,Acoustic testing of Schools[1]. Remedial works must be carried out in line with the Section 1.3 of BB93.

Pre-schools, schools and sixth form colleges (Three credits)	
Room function	As required by relevant standard.
Criteria	Rain noise - For roofs with a mass per unit area less than 150kg/m^2(light-weight roofs) or any roofs with glazing/rooflights, calculations or laboratory data are required for teaching/learning spaces to demonstrate that the reverberant sound pressure level in these rooms are not more than 20dB above the indoor ambient noise level for the equivalent type of room given in Table 1.1 of Building Bulletin 93 during heavy rain.
Credits	1
Testing Requirement	Installation of a specification compliant with the above criteria demonstrates compliance. No testing of the roof installation is required.
Notes	For heavy weight roofs, or parts of the roof that are heavyweight, with a mass per unit area greater than 150kg/m2 (including those with sedum planting) that do not have any glazing/rooflights, calculations are not required, as such the credit can be awarded on a default basis of compliance. For the purpose of assessing the reverberant sound pressure levels on rooms beneath light weight roofs and roofs with glazing and/or roof lights the levels should be calculated using laboratory test data from measurements conducted in accordance with BS EN ISO 140-18 [2] 'Heavy' rain noise excitation
Room function	As required by relevant standard.
Criteria	All music accommodation (or multi-purpose halls in primary schools with no music accommodation) is to meet the performance levels set within BB93. Where noise levels are expected to exceed 95dBA (e.g. in the case of amplified music and/or percussion) the design team must demonstrate that the need for higher sound insulation has been designed out through careful space planning.
Credits	1
Testing Requirement	As above where applicable. Where is it not considered applicable a justification and alternative means of compliance should be provided by the Suitably Qualified Acoustician
Notes	Whilst careful timetabling of lessons may also mitigate adverse acoustics issues, BREEAM's focus for new construction is building performance. Timetabling is likely to change over the building's lifetime, therefore, it cannot be used to demonstrate compliance with this criterion. This credit can be awarded on a default basis where there is no music accommodation or a multi purpose hall proposed in the assessed building/development.

Further or Higher Education buildings (Two credits)	
Room Function	As required by relevant standard.
Criteria	Achieve the indoor ambient noise level criteria for secondary schools in Section 1 of Building Bulletin 93. Where appropriate indoor ambient noise levels in all non-teaching spaces i.e. spaces/rooms not covered in BB93, comply with the "good practice" criteria levels of BS 8233[3]:, Tables 5 & 6. For the purposes of acoustic measurement and calculation these spaces should be considered unoccupied.
Credits	1
Testing Requirement	A programme of pre-completion acoustic testing is carried out by a compliant test body to ensure that the relevant spaces (as built) achieve the required performance standards. Where testing identifies that spaces do not meet the standards, remedial works are carried out prior to handover and occupation. The procedures outlined in BB93 and the ANC Good Practice Guide, Acoustic testing of Schools, can be followed if/where appropriate.
Room Function	As required by relevant standard.
Criteria	All areas used for teaching, training and educational purposes (such as classrooms, seminar rooms and lecture theatres) achieve reverberation times compliant with Table 1.5 of BB93.
Credits	1
Testing Requirement	A programme of pre-completion acoustic testing is carried out by a compliant test body to ensure that the relevant spaces (as built) achieve the required performance standards. Where testing identifies that spaces do not meet the standards, remedial works are carried out prior to handover and occupation. The procedures outlined in BB93 and the ANC Good Practice Guide can be followed if/where appropriate

Healthcare Buildings (Two credits)	
Room Function	As required by relevant standard.
Criteria	The values for noise intrusion from external sources in Table 1 of HTM 08-01 Acoustics Health Technical Memorandum 08-01: Acoustics, Department of Health Gateway Review, Estates & Facilities Division, 2008.4 are not exceeded. The values for internal noise from mechanical and electrical services in Table 2 of HTM 08-01 Acoustics are not exceeded. The weighted standardized level differences measured between rooms on site are not lower than the values of the sound insulation ratings (dB DnT,w) in

Healthcare Buildings (Two credits)	
	Table 4 of HTM 08-01 :Acoustics (the values in Table 4 are determined according to the privacy requirements, noise generation of the source room and noise sensitivity of the receiving room as specified in Table 3 of HTM 08-01 :Acoustics) Impact noise is controlled at source and the weighted standardised impact sound pressure level (L'nT,w) does not exceed 65dB in noise sensitive rooms
Credits	1
Testing Requirement	A programme of pre-completion acoustic testing is carried out by a compliant test body to ensure that the relevant spaces (as built) achieve the required performance standards. Where testing identifies that spaces do not meet the standards, remedial works are carried out prior to handover and occupation. The procedures outlined in HTM 08-01 Acoustics, Chapter 7 Testing and Validation should be followed.
Notes	Deviations from the values in Table 1 are acceptable only in the circumstances specified by HTM 08-01. The design team must use the recommendations specified in HTM 08-01 to justify any deviation.
Room Function	As required by relevant standard.
Criteria	Sound-absorbent treatment is provided to control reverberation in rooms and circulation spaces in accordance with paragraphs 2.110 of HTM 08-01 Acoustics.
Credits	1
Testing Requirement	None
Notes	None

Multi-residential Buildings (Four credits)	
Room Function	Individual bedrooms & self contained dwellings
Criteria	Airborne sound insulation values are at least 3dB higher and impact sound insulation values are at least 3dB lower than the than the performance standards in the Building Regulations or Standards.
Credits	1
Testing	A programme of pre-completion testing is carried out by a compliant test

Multi-residential Buildings (Four credits)	
Requirement	body based on the normal programme of testing described in the Building Regulations or Standards for every group or sub-group of dwelling-houses, flats or rooms for residential purposes; this must demonstrate that the performance standards detailed within this table are achieved. OR Use of constructions for all relevant building elements have been registered with and assessed and approved by Robust Details Limited (RDL) and found to achieve the performance standards required for the number of credits sought (see additional information section for further information on Robust Details).
Notes	Testing should be between habitable rooms on the Ground Floor and at higher storey levels if applicable. Where there are insufficient suitable separating walls or floors in a development to carry out the number of tests specified in the appropriate Building Regulations or Standards, all of the available suitable separating walls or floors must be tested.
Room Function	Individual bedrooms & self contained dwellings
Criteria	Airborne sound insulation values are at least 5dB higher and impact sound insulation values are at least 5dB lower than the than the performance standards in the Building Regulations or Standards.
Credits	3
Testing Requirement	A programme of pre-completion testing is carried out by a compliant test body based on the normal programme of testing described in the Building Regulations or Standards for every group or sub-group of dwelling-houses, flats or rooms for residential purposes; this must demonstrate that the performance standards detailed within this table are achieved. OR Use of constructions for all relevant building elements have been registered with and assessed and approved by Robust Details Limited (RDL) and found to achieve the performance standards required for the number of credits sought (see additional information section for further information on Robust Details).
Notes	Alternative to pre-completion testing or RDL approval includes, where separating walls or floors only occur between non-habitable rooms. In such cases, three credits can be awarded by default.
Room Function	Individual bedrooms & self contained dwellings
Criteria	Airborne sound insulation values are at least 8dB higher and impact sound insulation values are at least 8dB lower than the than the performance standards in the Building Regulations or Standards.
Credits	4

Multi-residential Buildings (Four credits)	
Testing Requirement	A programme of pre-completion testing is carried out by a compliant test body based on the normal programme of testing described in the Building Regulations or Standards for every group or sub-group of dwelling-houses, flats or rooms for residential purposes; this must demonstrate that the performance standards detailed within this table are achieved. OR Use of constructions for all relevant building elements have been registered with and assessed and approved by Robust Details Limited (RDL) and found to achieve the performance standards required for the number of credits sought (see additional information section for further information on Robust Details).
Notes	Alternative to pre-completion testing or RDL approval includes, where the dwellings are detached. In such cases, four credits can be awarded by default

Office, Industrial, Retail, Prisons, Courts and other building types (Two credits)	
Room Function	All room functions
Criteria	Indoor ambient noise levels comply with the "good practice" criteria levels of BS8233:1999, Tables 5 & 6 (see additional information section) unless otherwise stated below. Where the room types below are present, the appropriate criteria for ambient noise levels, sound insulation and acoustic privacy must also be achieved.
Credits	First credit
Testing Requirement	A programme of pre-completion acoustic testing is carried out by a compliant test body to ensure that the relevant spaces (as built) achieve the required performance standards. Where testing identifies that spaces do not meet the standards, remedial works are carried out prior to handover and occupation. The acoustic testing and measurement procedures in the Additional Guidance section should be followed.
Notes	For the purposes of acoustic measurement and calculation these spaces should be considered unoccupied. Typical, appropriate noise levels are given in the table below (additional information section), the list is not intended to be exhaustive.
Room Function	Educational space (teaching & lecture spaces)
Criteria	Achieve the indoor ambient noise level criteria outlined above for FE and HE buildings. See also the requirements below for acoustically sensitive rooms and apply if relevant.

Office, Industrial, Retail, Prisons, Courts and other building types (Two credits)	
Credits	First credit
Testing Requirement	A programme of pre-completion acoustic testing is carried out by a compliant test body to ensure that the relevant spaces (as built) achieve the required performance standards. Where testing identifies that spaces do not meet the standards, remedial works are carried out prior to handover and occupation. The procedures outlined in BB93 and the ANC Good Practice Guide, Acoustic Testing of Schools can be followed if/where appropriate.
Notes	None
Room Function	Medical treatment rooms
Criteria	Achieve the airborne and impact sound insulation criteria in Health Technical Memorandum 08-01.
Credits	First credit
Testing Requirement	A programme of pre-completion acoustic testing is carried out by a compliant test body to ensure that the relevant spaces (as built) achieve the required performance standards. Where testing identifies that spaces do not meet the standards, remedial works are carried out prior to handover and occupation. The procedures outlined in HTM 08-01 Acoustics, Chapter 7 Testing and Validation should be followed.
Notes	None
Room Function	Acoustically sensitive rooms
Criteria	The sound insulation between acoustically sensitive rooms and other occupied areas complies with the following, where relevant: General office type areas, section 7.6.3.1 of BS8233 , as follows, Dw + LAeq,T > 75.Where privacy is viewed to be critical by the client and/or design team, or where the room is adjacent to a noisy space such as a music room, the area should comply with an enhanced privacy index: Dw + LAeq,T > 85. Examples of rooms where this criteria may be applicable include a judges chamber that is next to another judges chamber or waiting room, a Human Resources meeting room next to an adjacent office (cellular or open plan). Bedrooms in hotels or other residential institutions not assessed under BREEAM Multi-residential, section 7.6.2.2 of BS8233 as follows: sound insulation (DnT,w) of not less than 50 dB for partitions and floors between rooms and between rooms and corridors.
Credits	First credit
Testing Requirement	A programme of pre-completion acoustic testing is carried out by a compliant test body to ensure that the relevant spaces (as built) achieve the required performance standards. Where testing identifies that spaces do not

Office, Industrial, Retail, Prisons, Courts and other building types (Two credits)	
	meet the standards, remedial works are carried out prior to handover and occupation. The acoustic testing and measurement procedures in the Additional Guidance section (below) should be followed.
Notes	See Compliance notes for definition of "acoustically sensitive rooms". Dw is the weighted sound level difference between the two spaces LAeqT is the measured indoor ambient noise level in the acoustically sensitive room (for the purposes of awarding design stage credits, the design ambient noise level can be used). The source and receive room sound pressure levels from which Dw is derived must be measured in accordance with BS EN ISO 140-4:1998 and the guidance in Annex B of Approved Document E. Measurements must be based on finished but unfurnished rooms, accounting for and including the effect of any carpets and acoustically absorbent ceilings specified. To increase the ambient noise level, where privacy is required or the ambient targets include a minimum as well as maximum limit, an artificial sound source or sound masking system may be required. Any artificial sound source or sound masking system should be installed and in operation at the time of the acoustic testing to demonstrate compliance.
Room Function	Rooms/areas used for speech or performance, including public speaking
Criteria	Achieve reverberation times compliant with Table 8 of BS8233 1999. In addition, or alternatively, if relevant to assessed building; classrooms, seminar rooms and lecture theatres achieve reverberation times compliant with Table 1.5 of BB93
Credits	Second credit (note: credit not dependant on first credit being achieved)
Testing Requirement	A programme of pre-completion acoustic testing is carried out by a compliant test body to ensure that the relevant spaces (as built) achieve the required performance standards. Where testing identifies that spaces do not meet the standards, remedial works are carried out prior to handover and occupation. The acoustic testing and measurement procedures in the Additional Guidance section (below) should be followed.
Notes	Where the reverberation time required by the relevant standard is not appropriate for the type of space/building assessed, the acoustician must confirm why this is the case. In addition the acoustician must set alternative appropriate reverberation times and provide these to demonstrate compliance.

Compliance Notes

Ref	Terms	Description
CN1	Shell only	Where it is not possible to define the type of office space due to the speculative nature of the development, i.e. open plan or cellular, it must be assumed that it will be open plan with an occupancy rate of 1 person per 10m^2. Assessments of buildings that are not fully fitted do not need to assess the criteria associated with sound insulation of acoustically sensitive rooms.
CN2	Building types without areas "used for speech"	Where a building type (other than education, healthcare, multi-residential types) does not have areas "used for speech", it does not need to comply with the relevant reverberation criteria. In these instances, the two available credits can be awarded where the building complies with the indoor ambient noise level and, if relevant, sound insulation criteria.
CN3	BB93 relaxation of requirements for schools in Northern Ireland	The Department for Education Northern Ireland (DENI) issued a note to designers in November 2006 detailing relaxations in compliance with BB93. The relaxations were made to facilitate the particular design requirements for new schools in Northern Ireland (as recommended in the various DENI Building Handbooks). Subsequently, where an assessed school in Northern Ireland has cited the note and applied the relaxation of BB93 requirements, they are not prevented from achieving the available BREEAM credits provided, in all other respects, the building complies with BB93 (and the above BREEAM requirements).
CN4	BB93 alternative performance standards	BB93 recognises alternative standards and details what is required should these be used within the building project, where appropriate this approach may also be used to demonstrate compliance with BREEAM criteria.
CN5	Acoustically sensitive rooms	Where the term 'acoustically sensitive rooms' is referenced in this BREEAM issue, it refers to any room/space the design team or client deems to be acoustically sensitive for the purposes of privacy which may include the following types of space/rooms (where specified); 1. Cellular offices, 2. Meeting/interview/consulting/treatment rooms In addition; 1. Court buildings: Witness/consultation rooms and Judges'/magistrates' chambers and jury retiring rooms. 2. Prison buildings: Care/listener suites, Official visit rooms, 'Closed visits' rooms. 3. Educational buildings/spaces: rooms for teaching and learning i.e. classrooms, lecture theatres.

Ref	Terms	Description
		4. Rooms used for public speaking or seminars 5. Any other room/space the design team or client deems to be acoustically sensitive for the purposes of privacy.
CN6	Unoccupied spaces	Where the term 'unoccupied space' is referenced in this BREEAM issue it refers to the nature of the space for the purpose of carrying acoustic calculations or measurements i.e. such measurements must be carried when the space is unoccupied and therefore devoid of sources of noise.
CN7	Multi-residential developments with CSH assessed dwellings	Building's with self-contained dwellings also being assessed under the Code for Sustainable Homes (CSH), the following applies: The number of credits achieved for the self-contained dwellings assessed under the CSH issue Hea 2 (Sound Insulation) can also be applied to this issue of the Multi-residential assessment for those dwellings. Other residential and non-residential areas, not forming part of a self-contained dwelling, must meet the above requirements in order for this credit to be awarded.
CN8	Robust Details	It must be noted that the Robust Details scheme is not applicable in the assessment of forms of construction which fall into the categories of material change of use or rooms for residential purposes. (Refer to additional Guidance section for more detail/definition of Robust Details.)

Schedule of Evidence

Ref	Design stage	Post-construction stage
All	Professional report/study and calculations from the acoustician. Letter of appointment or other confirmation demonstrating when the acoustician was appointed. Relevant section/clauses of the building specification or contract and/or formal letter from the project team regarding commitments	Professional field report/study and calculations from the acoustician post construction. Evidence, such as a formal letter from the acoustician or their test report confirming that they meet BREEAM's definition of a suitably qualified acoustician. A letter from the design team or principal contractor confirming that any and all required remedial works have been carried out in accordance with the acoustician's recommendations.
Multi-Residential only	Where pre-completion testing will be carried out a letter from the	Either 1. Copies of the sound insulation

Ref	Design stage	Post-construction stage
	developer confirming the intent to: 1. Meet the relevant sound insulation performance levels 2. Use a Compliant Test Body to complete testing Where Robust Details will be used; 1. Confirmation that the Robust Details chosen will achieve the required performance standards for sound insulation (as applicable) 2. Confirmation that the relevant plots are registered with RDL (the Purchase Statement)	field test results and/or a letter of confirmation that the required sound insulation performance standards as detailed in the assessment criteria have been achieved AND 2. Evidence that the tests have been carried out by a Compliant Test Body OR 3. Completed Robust Details Ltd Compliance Certificate signed by the developer for all relevant constructions relating to the plots being assessed

Additional Information

Relevant definitions

Building Bulletin 93 revision (schools)

BB93 is under revision (as of March 2010) and may change its title to Guidelines for acoustic design of schools to include criteria for refurbishment and conversion work as well as new build.

Building Regulations/Standards

For England and Wales – Approved Document E 2003 edition, with amendments 2004 – Resistance to sound, for Northern Ireland – DOE Technical Booklet G - Sound, for Scotland – Technical Handbook Section 5 - Noise

Compliant Test Body

A Compliant Test Body is defined as :

1. Organisations having UKAS accreditation to the appropriate scope, or who are accredited by a member of the International Accreditation Forum (IAF - www.iaf.nu) to the appropriate scope OR
2. Organisations or individuals registered with the Association of Noise Consultants (ANC) Registration Scheme OR
3. Organisations who can provide evidence that they follow the relevant principles of BS EN ISO 17024 (Conformity assessment - General requirements for bodies operating certification of persons)[4] in relation to BREEAM requirements.

Groups and Sub-groups

As defined in the Building Regulations for England and Wales Approved Document E: Resistance to the Passage of sound, section 1 (paragraphs 1.11 – 1.17). For example, flats and study bedrooms are usually considered as two separate groups, and if there are significant differences in construction type then the groups will need to be broken down into sub groups. In addition to this, where there are steps or staggers greater than 300mm between dwellings, dwellings without steps/staggers should be treated as a different sub-group to those with step/staggers. This is because the presence of steps/staggers is likely to improve performance.

Habitable rooms

For the purpose of this issue, habitable rooms include any room where individuals will sit or lie down and require a reasonably quiet environmental to concentrate or rest. Such rooms are bedrooms, living rooms, dining rooms, studies as well as kitchen-dining and kitchen-living rooms.

Material change of use

is where there is a change in the purpose for which or the circumstance in which a building is used e.g. where a building has been converted from a non dwelling (school, church etc.) to a dwelling.

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.

Non-habitable rooms

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

Occupied spaces

Refer to BREEAM issue Hea 01 and note that for Hea 05 there is a specific, unrelated, definition of 'unoccupied' with reference to acoustic testing and measurement, see Compliance notes for details.

Robust Details

Robust Details (RDs) are construction solutions that provide an alternative to pre-completion sound insulation testing as a method of complying with Requirements E1 of Approved Document E (2003 edition) of the Building Regulations (England and Wales). The relevant plots on a development must be registered with RDL and built in accordance with the RD specification. To give a reasonable level of assurance that these details will achieve the required minimum standards, RDL carry out random inspections during construction and random sound insulation tests after construction. A Robust Detail is deemed to be approved for BREEAM (Multi-residential building) credits only when it achieves a specified performance level as assessed by RDL. Robust Details can only be used in relation to assessment for new build dwellings and cannot be used to assess the performance of construction details in rooms for residential purposes or material change of use.

Room for residential purposes

is defined within the Building Regulations for England and Wales Approved Document E as a room, or a suite of rooms which is not a dwelling-house or a flat and which is used by one or more persons to live and sleep and includes a room in a hostel, hotel, a boarding house, a hall of residence or a residential home, whether or not the room is separated from or arranged in a cluster group with other rooms, but does not include a room in hospital, or other similar establishment, used for patient accommodation.

Specified performance level

Robust Details are approved for credits under the Code for Sustainable Homes (CSH), where the specified performance levels set out below are met. Construction types that meet these levels are listed on the Robust Details website www.robustdetails.com on the CSH page. Where assessing self contained dwellings in multi-residential buildings that are not defined as material change of use or rooms for residential purposes, Robust Details that meet the specified performance level as set out below can also comply with the credit criteria for self contained units in multi-residential buildings and reference must be made to the CSH page on the Robust Details website:

1. Mature Robust Details (published for over 12 months and at least 100 test results) – regular assessment based on the 90th percentile of results from the

last 100 site tests

2. Low use Robust Detail (published for over 12 months but fewer than 100 test results) – initial assessment based on the first 30 tests needed to qualify for the Robust Details scheme and the site tests available, and reviewed regularly as new test results become available, until it becomes a mature Robust Detail or is rejected.
3. New Robust Detail (published for less than 12 months and fewer than 100 test results) – initial assessment based on the first 30 tests needed to qualify for the Robust Details scheme, and reviewed regularly as new test results become available, until it becomes a mature Robust Detail or is rejected.

It should be noted that not all RDs will necessarily achieve the performance levels required to achieve multi-residential credits. If in doubt, please check the list of currently approved details with RDL directly at www.robustdetails.com or on 0870 240 8210.

Suitably qualified acoustician

An individual who holds a recognised acoustic qualification and membership of an appropriate professional body. The primary professional body for acoustics in the UK is the Institute of Acoustics.An individual achieving all the following items can be considered to be "suitably qualified" for the purposes of a BREEAM assessment:

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

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:

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

Additionally, written confirmation from the third party verifier that they comply with the definition of a 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^2).

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

HTM08-01 defines this as the 'unit for rating airborne sound insulation on site'.

Weighted standardised impact sound pressure level ($L'_{nT,w}$)

HTM08-01 defines this as the 'unit for rating impact airborne sound insulation on site'.

Checklists and Tables

Table - 9: A selection of good practice indoor ambient noise levels from table 5 and 6 of BS8233:1999

Function of area	Indoor ambient noise level*
Single occupancy offices	≤ 40dB $L_{Aeq,T}$
Multiple occupancy offices	40-50dB $L_{Aeq,T}$

Function of area	Indoor ambient noise level*
Meeting rooms	35-40 dB LAeq,T
General spaces (staffrooms, restrooms)	≤40dB $L_{Aeq,T}$
Spaces designed for speech e.g. seminar/lecture rooms	≤35dB $L_{Aeq,T}$
Informal café/canteen areas	≤ 50 dB $L_{Aeq,T}$
Catering kitchens	≤ 50 dB $L_{Aeq,T}$
Restaurant areas	40-55dB $L_{Aeq,T}$
Manual workshops	≤55 dB $L_{Aeq,T}$
Courtrooms with no public address	≤30dB $L_{Aeq,T}$
Courtrooms with public address	≤40dB $L_{Aeq,T}$
Consulting/treatment rooms	≤35dB $L_{Aeq,T}$
Sound recording studios	≤30dB $L_{Aeq,T}$
Bars	40-45dB $L_{Aeq,T}$
Laboratories	≤40 dB $L_{Aeq,T}$
Lecture theatre/seminar room	≤35dB $L_{Aeq,T}$
Concert hall/theatre/auditoria	≤30dB $L_{Aeq,T}$
Bedrooms	≤35dB $L_{Aeq,T}$
Library areas	40-50 $L_{Aeq,T}$
Open visit areas (Prisons)	≤45 $L_{Aeq,T}$
* 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 level criteria to be lower than or equal to the upper limit of the range.	

Calculation procedures

Testing, measurement and calculation procedures

Where specific guidance on testing, measurement and calculation is not stated in the criteria table above for the relevant building type, or within the relevant standard/guidance referenced, the

following procedures can be followed by the acoustician when measuring or calculating the levels required to demonstrate compliance with this BREEAM issue.

Measurements of sound insulation (airborne and impact) should be made in accordance with the relevant part of BS EN ISO 140 series, or the successor to these standards. For measurements of reverberation time, the relevant principles of BS EN ISO 354:2003 should be used and the guidance provided in BS EN ISO 140-7:1998 should be followed in respect of the number of source and microphone positions, and decay measurements. For measurements of ambient noise, when no specific guidance is available, the following procedures should be used:

1. Noise from both internal sources (e.g. mechanical ventilation systems, plant noise, noise making systems) and external sources (e.g. traffic noise transmitted via the building façade) should be included, and, where windows are openable as part of the ventilation strategy, these should be assumed to be open for the purposes of calculations and open for measurements. If openable windows are not part of the background/permanent ventilation strategy, then these should be assumed to be closed for the purposes of calculation and closed for measurements.
2. Noise from occupants and office equipment (e.g. computers) should not be included in the measurements.
3. 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.
4. 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.
5. T in $L_{Aeq,T}$ is taken as the duration of the normal working day (typically 8 hours between 09.00 and 17.00).
6. 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.
7. Measurement periods less than 30 minutes may give representative values for indoor ambient noise levels and may be utilized where this is the case. However measurement periods shorter than 5 minutes should not be used.
8. 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.
9. Where relevant, measurement of airborne sound insulation between teaching spaces should be conducted between one in four pairs of adjacent rooms (or teaching spaces) of each room type or performance requirement category and construction type.
10. Where relevant, measurement of impact sound pressure level should be conducted in one in four teaching spaces (separated from rooms above) of each room type or performance requirement category and construction type.
11. The measured level of ambient noise should be used to determine compliance with the criteria for acoustically sensitive rooms. If at the time of acoustic commissioning it is not possible to measure ambient noise levels in the absence of construction or other extraneous noise sources that will not be present when the building is complete, then, for mechanical services the lower level of 35 dB, LAeq or the lowest design limit for the acoustically sensitive space should be used.

The above is intended as guidance for undertaking acoustic testing/measurement to demonstrate compliance with the performance requirements in BREEAM. If the acoustician has felt it necessary to deviate from the above procedures, they should provide a reason for doing so and confirm that the alternative procedures are adequate for demonstrating that the building meets the acoustic performance requirements.

Other information

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.
The sound insulation between acoustically sensitive rooms and other occupied areas complies with section 7.6.3.1 of BS8233 , as follows, Dw + LAeq,T > 75.

---

[1] ANC Good Practice Guide, Acoustic Testing of Schools, version 1.2, July 2011
[2] BS EN ISO 140-18:2006 Acoustics. Measurement of sound insulation in buildings and of building elements.
[3] BS 8233:1999 Sound insulation and noise reduction for buildings - code of practice
[4] ISO/IEC 17024:2003 Conformity assessment - General requirements for bodies operating certification of persons

Hea 06 Safety and security

Number of credits available	Minimum standards
2	No

Aim

To recognise and encourage effective design measures that promote low risk, safe and secureaccess toand use ofthe building.

Assessment Criteria

The following is required to demonstrate compliance for:

One credit

Safe access

Where external site areas form part of the assessed development the following apply:

1. Dedicated cycle lanes are provided and have been designed and constructed in accordance with either:
    a. Local Transport Note 2/08 Cycle Infrastructure Design, Department of Transport, 2008.
    b. The National Cycle Network Guidelines and Practical Details – issue 2, Sustrans and the relevant parts of Appendix VI NCN Design and Construction Checklist[1]
2. The cycle lanes provide direct access from the site entrance(s) to any cycle storage facilities provided, without the need to deviate from the cycle path and, if relevant, connects to offsite cycle paths where these run adjacent to the development's site boundary.
3. Footpaths on site provide direct access from the site entrance(s) to the building entrance(s) and connect to public footpaths off site (where existing), providing access to local transport nodes and other offsite amenities (where existing).
4. Where provided, drop-off areas are designed off/adjoining to the access road and provide direct access to pedestrian footpaths, therefore avoiding the need for the pedestrian to cross vehicle access routes.
5. Where a 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), unless pavement is at road level (this may be the case in some car parks).
6. For large developments with a high number of public users/visitors, pedestrian pathways must be signposted to other local amenities off site, including public transport nodes (where existing).
7. The lighting for access roads, pedestrian areas, footpaths and cycle lanes is compliant with the external lighting criteria defined in BREEAM issue Hea 01, i.e. in accordance with BS 5489-1:2003+A2:2008 Lighting of roads and public amenity areas.

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

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

9. There is a separate parking/waiting area for goods vehicles away from/adjacent to the manoeuvring area and staff/visitor car parking.
10. Parking and turning areas are designed for simple manoeuvring according to the type of delivery vehicle likely to access the site, thus avoiding the need for repeated shunting.
11. There is a dedicated space for the storage of refuse skips and pallets away from the delivery vehicle manoeuvring area and staff/visitor car parking (if appropriate given the building type/function).

One credit

Security of site and building

12. The project team have accounted for security considerations in the new building design and site layout through consultation with a suitably qualified security consultant.
13. Consultation with the suitably qualified security consultant occurred during or prior to the concept design stage (RIBA stage C) or equivalent.
14. The final design embodies the recommendations/solutions of the suitably qualified security consultant and is built to conform to either :
    a. The principles and guidance of Secured by Design (SbD)[2] and/or Safer Parking (SP) Scheme[3]

    Or where SbD/SP is of less relevance to the building type/operation:

    b. A site specific security risk and threat assessment and subsequent security strategy and recommendations for security measures (as developed/recommended by the suitably qualified security consultant).

Compliance Notes

Ref	Terms	Description
CN1	Development does not have any external site areas. See criteria 12, 13 & 14	The safe access criteria apply only to developments that have areas external to the assessed building and within the boundary of the assessed development (regardless or not of whether that external area is/will be the responsibility of the future building occupant). If the assessed building does not have any external areas and access to the building is direct from the public highway/footpath i.e. there is no onsite vehicle access and parking areas, then the criteria concerning safe access are not applicable.In such instances the two available credits must be assessed and awarded based on compliance with the security criteria.
CN2	Covered parking area. See criteria 1 to 11	Where the assessed building has no external areas but does have a covered parking facility, and cyclists/pedestrians/delivery vehicles access the assessed building via this area, then the relevant safe access criteria apply and this area must be assessed against those criteria.
CN3	Delivery access through parking areas (smaller sites/deliveries)	Criteria 8 (delivery access through general parking areas) can be relaxed for smaller sites if it can be confirmed that the building is of an operational type and size which is likely to mean all deliveries to the building will be made by small vans and not heavy goods

Ref	Terms	Description
	See criteria 1 to 11 apart from 8	vehicles.
CN4	No vehicle delivery and manoeuvring areas See criteria 1 to 7	The criteria concerning vehicle delivery access is not applicable where dedicated delivery access and drop-off areas do not form part of the assessed development.
CN5	Suitably qualified security consultant. See criterion 12	Refer the Additional Information section (below) for a current list of suitably qualified security consultants.
CN6	SBD Award See criterion 14a	An actual Secured by Design and/or Park Mark® Safer Parking Award/certificate is not required, though this does provide a means of demonstrating compliance at the post construction stage of assessment.
CN7	Public car parks See criterion 14a	The Secured by Design equivalent for parking facilities is the Safer Parking Scheme. Where public car parking facilities are provided as part of the assessed development then, in addition to designing the building/site in accordance with SBD principles, the parking facilities should be designed in accordance with the principles and guidance of the Safer Parking standards.
CN8	Multi-residential Accommodation and CSH assessed dwellings	For buildings with self-contained dwellings also being assessed under the Code for Sustainable Homes (CSH), the following applies: Where CSH issue Man 4 (Security) has been achieved, the development complies with the 'security' criteria of BREEAM issue Hea 06, provided the recommendations of the ALO cover the entire building and any associated parking facilities.
CN9	Scope of security criteria for buildings on prison sites	In the case of an assessment of a prison building/development the security criteria apply only to new publicly accessible car parks or existing car park facilities that are being refurbished or expanded as part of the development's scope of works. Security relating to buildings and site layout falls outside of the scope of BREEAM for prison buildings.

Schedule of Evidence

Ref	Design stage	Post-construction stage
Safe Access		
All	Design drawings (including a scaled site plan), AND/OR relevant sections of the specification highlighting all necessary compliant features and dimensions.	Assessor's building/site inspection and photographic evidence confirming compliance AND/OR 'As built' site plan and design details.
Security of Site and Building		
12 & 13	Correspondence from or a copy of the report/feedback from the ALO/CPDA/Security Consultant confirming: 1. Scope of their advice/involvement 2. The stage of design in which their advice was sought 3. Summary of their recommendations	No additional evidence required to that outlined for the design stage of assessment.
14	Design drawings AND/OR relevant sections of the specification or contract	Assessor's building/site inspection and photographic evidence OR Correspondence from the ALO/CPDA/Security Consultant OR (if relevant) A copy of the development's Secured by Design and/or Park Mark® Award certificate.
12, 13 & 14	Where relevant for multi-residential and CSH assessed buildings: Evidence in line with the Design Stage evidence requirements of the CSH issue Man 4. OR A copy of the Design Stage CSH certificate and report from the CSH online reporting system confirming the number of credits achieved for CSH issue Man 4.	Where relevant for multi-residential and CSH assessed buildings: Evidence in line with the Post Construction Stage evidence requirements of the CSH issue Man 4. OR A copy of the Post Construction Stage CSH certificate and report from the CSH online reporting system confirming the number of credits achieved for CSH issue Man 4.

Additional Information

Relevant definitions

Architectural Liaison Officer (ALO)

An ALO is the same as the Crime Prevention Design Advisor (see below) and is the title given to the same role in some police forces. http://www.securedbydesign.com/

Crime Prevention Design Advisor (CPDA)

is a specialist crime prevention officer, trained at the Home Office Crime Reduction College, who deals with crime risk and designing out crime advice for the built environment. In addition to physical security measures the officer will consider defensible space, access, crime and movement generators all of which can contribute to a reduction in crime and disorder. http://www.securedbydesign.com/

Development Managers

DMs are independent persons appointed by the SPS scheme managers (the British Parking Association) and will assist designated police staff in carrying out site assessments of individual parking facilities.

External site areas

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

Peer review

A process employed by a professional body to demonstrate that potential or current full members maintain a standard of knowledge and experience required to ensure compliance with a code of conduct and professional ethics.

Secured by Design (SBD)

A police initiative that seeks to encourage the construction industry to adopt crime prevention measures in the design of developments, to assist in reducing the opportunity for and fear of crime.

Secured by Design is owned by the Association of Chief Police Officers (ACPO) and has the support of the Home Office Crime Reduction & Community Safety Group and the Planning Section of the Department for Communities and Local Government.

The Association of Chief Police Officers for England Wales and Northern Ireland (ACPO) and the Association of Chief Police Officers for Scotland (ACPOS) represent the police forces of the United Kingdom and both organisations endorse and support the Secured by Design programme.

The Safer Parking Scheme

An initiative of the Association of Chief Police Officers aimed at reducing crime and the fear of crime in parking facilities. Safer parking status, Park Mark®, is awarded to parking facilities that have met the criteria of a risk assessment conducted by the Police. The scheme is managed by the British Parking Association (BPA) and supported by the Home Office and Scottish Executive.

Suitably Qualified Security Consultant (SQSC)

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

1. Crime Prevention Design Advisors (CPDA)
2. Police Architectural Liaison Officers (ALO)

A list of contact details for the above are available from: www.securedbydesign.com. Alternatively, individual security consultants that meet the following requirements are also deemed to be suitably qualified:

1. They are a practising security consultant with a minimum of three years relevant experience within the last five years. This experience must clearly demonstrate a practical understanding of factors affecting security in relation to construction and the built environment, including, acting in an advisory capacity to provide recommendations for security and crime prevention.
2. Hold a recognised qualification in design and crime prevention. This qualification must incorporate Secured by Design (or an equivalent). Where the qualification incorporates Secured by Design, the training and qualification must have been provided by an organisation/company that is a member of the Secured by Design membership scheme and whose courses have the 'Police Preferred Specification' accreditation status.
3. Continue to maintain their qualification/status through (full) membership of a relevant industry professional body or accreditation scheme that meets the following:
    a. Has a professional code of conduct, to which members must adhere to.
    b. Ongoing membership is subject to peer review or the consultants SbD advice/reports are subject to regular audits by the scheme operator.

Organisations, associations or scheme operators who wish to have their membership recognised as 'suitably qualified', should review their current status (and therefore their members) against the requirements above and, where they feel they are compliant, contact BRE Global with the relevant information/evidence.

Checklists and Tables

None

Calculation procedures

None

Other Information

The Metric Handbook[4] contains details of typical delivery/freight vehicle sizes and turning circles.

In addition to the SbD Schools guidance, Managing School Facilities, Guide 4 Improving Security in Schools, published by the Department for Education and Employment (1996)[5], offers guidance on how to improve the security of school premises.

[1] NCN Guidelines and Practical Details and NCN Design and Construction checklist: www.sustrans.org.uk
[2] Secured by Design: www.securedbydesign.com/professionals/guides.aspx
[3] Secured by Design: Car parks: www.securedcarparks.com and www.britishparking.co.uk
[4] Metric handbook Planning and design data, Adler, Architectural Press 3rd Ed. 2007.
[5] Managing School Facilities, Guide 4 Improving Security in Schools, published by the Department for Education and Employment (1996)

Energy

Ene 01 Reduction of emissions

Number of credits available	Minimum standards
15	Yes

Aim

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

Assessment Criteria

The following is required to demonstrate compliance:

1. Calculate an Energy Performance Ratio for New Constructions (EPR_{NC}) using BREEAM's Ene 01 calculator.
2. The EPR_{NC} calculation takes account of the following parameters;
    a. the building's operational energy demand,
    b. the building's primary energy consumption and
    c. the total resulting CO_2 emissions.
    The calculation is determined using the following performance data from energy modelling of the building's specified/designed regulated fixed building services and fabric, as undertaken by an accredited energy assessor using approved building energy calculation software:
        i. Building floor area (m^2)
        ii. Notional building energy demand (mJ/m^2)
        iii. Actual building energy demand (mJ/m^2)
        iv. Notional building energy consumption (kWh/m^2)
        v. Actual building energy consumption (kWh/m^2)
        vi. Target Emission Rate ($kgCO_2/m^2$)
        vii. Building Emission Rate ($kgCO_2/m^2$)
3. Compare the EPR_{NC} achieved with Table - 10 of benchmarks below and award the corresponding number of BREEAM credits.

Table - 10: Ene 01 EPR_{NC} benchmark scale

BREEAM credits	EPR_{NC}	Minimum requirements
1	0.06	Requires a performance improvement progressively better than the notional building level (as defined in the 2010 version of the Building Regulations, Part L2a).
2	0.12	
3	0.18	
4	0.24	
5	0.30	
6	0.36	BREEAM Excellent requires a minimum EPR_{NC} of 0.36 (6 credits) and a 25% reduction in CO_2 emissions arising from regulated building energy consumption.
7	0.42	
8	0.48	
9	0.54	
10	0.60	BREEAM Outstanding requires a minimum EPR_{NC} of 0.60 (10 credits) and a 40% reduction in CO_2 emissions arising from regulated building energy consumption.
11	0.66	
12	0.72	
13	0.78	
14	0.84	
15	0.90	15 credits require a minimum EPR_{NC} of 0.90 and a 100% reduction in CO_2 emissions arising from regulated building energy consumption i.e. zero net CO_2 emissions.

A detailed description of how a buildings modelled operational energy performance and CO_2 emissions are benchmarked against the above scale is provided in the 'Calculation procedures' within the Additional Information section.

4. Report the building's total modelled operational primary energy consumption in kWh/m^2/yr and carbon dioxide emissions in kgCO_2/m^2/year via the BREEAM scoring and reporting tool.

Exemplary level criteria

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

Five credits

5. The building is 'carbon negative' in terms of its total modelled operational energy consumption (see Relevant definitions in the Additional Information section of this issue).

Up to four credits

6. The building achieves an $EPR_{NC} \geq 0.9$ and zero net CO_2 emissions (see Relevant definitions)
7. An equivalent percentage of the buildings modelled 'regulated' operational energy consumption, as stipulated in the table below, is generated by carbon neutral on-site, near-site or 'accredited external' sources and used to meet energy demand from 'unregulated' building systems or processes.

Innovation credits	Equivalent % criteria
4	80%
3	50%
2	20%
1	10%

Compliance Notes

Ref	Terms	Description
CN1	Extensions to existing buildings See criterion 1	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 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. 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.
CN2	Shell only	When calculating the energy performance 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 the 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, for the design team to substitute the maximum design fit-out performance specification for the performance specifications confirmed within a Green Lease Agreement, which are or will be legally committed to by the tenant(s). This rule applies only to those areas of the building that the scope of the green lease covers. Speculative areas of the assessed building development not covered by the scope of such a lease must assume the maximum

Ref	Terms	Description
		design fit-out specification i.e. performance compliance with Building Regulations, but no better. The use of a Green Building Guide for tenants fit out (as defined in Appendix D) cannot be used to substitute the maximum design fit out specification for the purpose of assessing BREEAM issue Ene 01, because this type of Guide is not legally enforceable.
CN3	Renewable and low carbon Installations See criterion 2c	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 off-set CO_2 emissions arising from 'regulated' and, in the case of innovation credits, 'unregulated' energy consumption. The LZC technology can be installed on-site, near-site where a private wire arrangement is in place (see Relevant definitions) or off-site via accredited external renewables (see Compliance note below).
CN4	Accredited external renewables	For the purpose of this BREEAM issue accredited external renewables are renewable energy schemes located off-site, but within the UK, which: 1. Are accredited renewables (as defined by the Energy Act 2004). These will be Renewable Energy Guarantee of Origin (REGO) certified 2. Create new installed generation capacity, designed to meet the loads of the building (i.e. not just units of carbon) 3. Are additional to capacity to that already required under the Renewables Obligation At the time of writing, BRE Global are not aware of a mechanism for accrediting off-site renewables and therefore of any renewable energy schemes that meet the above definition; though some ESCOs may achieve these criteria. The term 'Accredited External Renewables' differs from and should not be confused with 'Allowable Solutions' (see 'Other information' in the Additional Information section of this BREEAM issue).
CN5	Zero carbon sources of energy - Double counting See criteria 6 & 7	The project team must avoid double counting the energy from the zero carbon source. This may be particularly relevant where that source of energy generation is being accounted for in terms of the assessed building's regulated CO_2 emissions and/or it will contribute to off-setting other 'non-assessed' buildings CO_2 emissions.

Ref	Terms	Description
CN6	Buildings assessed using SAP or SAP and SBEM See criterion 1	In some instances BREEAM assessed buildings with residential areas may have been classified under Approved Document L1A[1] of the Building Regulations, and will therefore have had their energy use modelled using SAP, as well as or instead of SBEM. Further guidance on assessing a building's Ene 01 performance where SAP is used is provided (below) in the Other Information section for this assessment issue.
CN7	BREEAM Ene 01 Compliance Checker website	BRE Global provides a website to convert the energy modelling outputs generated by approved building energy calculation software into the energy and CO_2 outputs required to determine the number of BREEAM 2011 Ene 01 credits achieved. In converting the outputs, this website verifies the values required for the purpose of the BREEAM Ene 01 assessment issue as well as indicating the number of Ene 01 credits achieved. To convert data, the user is required to upload a BRUKL.inp file, which is generated by the third party approved software. The website is predominantly available for use by licensed BREEAM Assessors undertaking a registered BREEAM 2011 assessment. However, anyone involved with the design and procurement of a building which is being or will be BREEAM assessed can register to use the site for the purpose of converting and verifying the outputs for their building. www.epbhub.net/BREEAM/200/index.php?page=00090 Note: At the time of writing (Oct2012) current versions of the approved building energy modelling software calculate energy consumption on the basis of delivered energy, not primary energy. In the short term therefore it will not be possible to use the figures reported in the BRUKL Output Document (technical data sheet) to accurately determine the number of BREEAM credits achieved. Until such time as the next version of the National Calculation Methodology is revised to include primary energy, BREEAM assessors and consultants will need to upload their BRUKL output files to the BREEAM Compliance Checker website to accurately calculate and verify the three EPRs for demand, consumption and CO_2 and the number of BREEAM credits achieved. For updates on Approved Software tools accepted for use by BREEAM please visit the Ene01 Compliance Checker website.
CN8	Assessing the Ene 01 performance of buildings in Scot-	Benchmarking for the BREEAM 2011 New Construction scheme has been calibrated using the notional building used to deter-

[1] Department for Communities and Local Government. Approved Document L1A Conservation of fuel and power (New dwellings)). CLG, London, 2010.

Ref	Terms	Description
	land and Northern Ireland See criteria 1 & 2	mine the Target Emission Rate (TER) in the Building Regulations 2010, Approved Document L2A. This Regulation applies in England and Wales only. Buildings in Scotland and Northern Ireland are covered by a different set of regulations with a different definition of notional building to the current Building Regulations for England and Wales. For the purpose of consistency and comparability in BREEAM, buildings assessed in Scotland and Northern Ireland will need to compare and determine their performance relative to the notional building used to determine the TER in the Building Regulations 2010, Approved Document L2A. This does not necessarily require design teams for buildings in Scotland and Northern Ireland to undertake additional energy modelling. In most cases the energy modelling software should enable the user to determine performance for their modelled building against either the Scotland, Northern Ireland or England and Wales Building Regulations. Using iSBEM as an example, buildings that have been modelled for compliance with the Scotland or Northern Ireland regulations can measure their performance against the Building Regulations 2010 notional building for England and Wales by changing the 'Purpose of analysis' from 'Scottish Building Regulations 2010' to 'England and Wales Building Regulation 2010 Part L' and then re-run the calculation. Once completed, assessment against the BREEAM benchmarks using the BRUKL.inp file (generated by the approved software) and the BREEAM Ene01 Compliance Checker website can then be determined. If the approved software used does not have the functionality to change the 'Purpose of analysis', additional modelling using alternative software may be required.
CN9	Estimating energy demand from unregulated building systems/processes	At present there is no standard or national calculation methodology for modelling unregulated energy demands in a building. To demonstrate compliance with the 'Exemplary level criteria' the building's modelled operational 'regulated' energy consumption is therefore used as a proxy for a building's unregulated energy demand. Whilst not accurate, this approach enables BREEAM to assess and award credits for buildings that meet a proportion of its unregulated energy demand via carbon neutral on-site, near-site or 'accredited external' sources. Where unregulated energy demand for the building can be accurately predicted, possibly on the basis of metered data from similar or the same building type with the same unregulated system/process loads, then this data can be used to determine the percentage of unregulated energy demand met via by carbon neutral on-site, near-site or 'accredited external' sources.

Schedule of Evidence

Ref	Design stage	Post-construction stage
1-4	A copy of the Building Regulations Output Document from the approved software. The output documents must be based on the "As designed" stage of analysis. A print-out of the results from the BREEAM New Construction 2011 Ene01 Compliance Checker website containing the ID number and EPRs generated by the Checker for the project.t Where relevant for multi-residential buildings, a copy of the calculations based on design stage SAP outputs.	As design stage, but with the output documents from the Approved Software reflecting performance at the "As built" stage of analysis. This must account for any changes to the specification during construction and the measured air leakage rate, ductwork leakage and fan performances (as required by Building Regulations).
5-7	As above, plus: 1. A copy of a report, calculations/outputs from the manufacturer, supplier, engineer or software modelling confirming: a. The total carbon neutral energy generation (kWh/yr) b. The source of the carbon neutral energy c. Calculated estimate of energy consumption from 'unregulated' systems/process (kWh/yr) (required only if confirming 'carbon negative' status') d. Calculated estimate of exported energy surplus (required only if confirming 'carbon negative' status'). 2. Written confirmation from the developer/client/owner-occupier that any surplus carbon neutral energy generated by the development and exported to the Grid will not be used to claim Renewable Obligation Certificates (ROCS), via an accredited generator.	As required above and at the design stage.

Additional Information

Relevant definitions

Accredited energy assessor

A person registered with an accredited energy assessment scheme provider. The scheme provider will be licensed by the relevant government department to accredit competent persons in the energy assessment of non-domestic/domestic buildings for the purposes of demonstrating compliance with Building Regulations in the country of origin.

For a full list of approved accreditation schemes/organisations for energy assessors and links to registers of accredited energy assessor's visit:

1. England and Wales: www.communities.gov.uk/www.ndepcregister.com (non domestic) /www.epcregister.com (domestic)
2. Scotland: www.scotland.gov.uk
3. Northern Ireland: www.dfpni.gov.uk/www.epbniregisternd.com (non domestic) www.epbniregister.com (domestic)

Approved building energy calculation software

Software approved for the purpose of demonstrating compliance with the energy efficiency and carbon emission requirements of the Building Regulations (and in turn compliance with the Energy Performance of Buildings Directive (PD)). The definition includes SBEM (Simplified Building Energy Model) and its interface iSBEM, as well as third party software approved by the relevant Government department.

A list of approved software for non domestic buildings is available from:

1. England and Wales: contact DCLG for details.
2. Scotland: www.scotland.gov.uk/Topics/Built-Environment/Building/Building-standards/profinfo/techguide/proftechS6software
3. Northern Ireland: www.dfpni.gov.uk/

Approved building energy calculation software will provide the data required for calculating the EPR_{NC} and BREEAM Ene 01 credits.

Please note that for dwellings (where relevant to the assessment of multi-residential buildings), the Government's Standard Assessment Procedure for the Energy Rating of Dwellings (SAP) may be used. The current version is SAP 2009 version 9.90 dated March 2010 rev. October 2010 (See also compliance note above regarding the use of SAP outputs in multi-residential building assessments).

Building Emission Rate (BER)

The building CO_2 emission rate expressed as $kgCO_2/m^2$/year. The BER is calculated in accordance with the National Calculation Methodology (NCM) and the Simplified Buildings Energy Model (SBEM).

Carbon negative building

A building/site that generates, surplus to its own energy demand, an excess of renewable or carbon neutral energy and exports that surplus via the National Grid to meet other, off-site energy demands, i.e. the building is a net exporter of zero carbon energy.

Surplus in this respect means the building/site generates more energy via renewable/carbon neutral sources that it needs to meet its own regulated and unregulated energy needs. Any surplus must be exported through the National Grid as additional capacity to that required by the Renewables Obligation i.e. Renewable Obligation Certificates are not claimed/sold for the renewable energy generation (see definition of Renewables Obligation Certificate).

This definition of carbon negative focuses only on energy and carbon dioxide emissions resulting from the operational stage of the building life cycle (as this is the stated aim of this assessment issue). It does not take in to account the embodied carbon, in terms of carbon fixing or

emissions resulting from the manufacture or disposal of building materials and components (these impacts/benefits are dealt with in BREEAM issue Mat 01 Life Cycle Impacts).

Carbon neutral

Carbon neutral means that, through a transparent process of calculating emissions, reducing those emissions and offsetting residual emissions, net carbon emissions equal zero' (Source: Department for Energy and Climate Change, Oct 2009). See also, zero net CO_2 emissions definition below.

Controlled service or fitting

The Building Regulations[1] define this as a service or fitting in relation to which the Building Regulations imposes a requirement.

Dwelling Emission Rate (DER)

This is the equivalent of the BER for dwellings. The DER is the estimated carbon dioxide emissions per m^2 per year ($kgCO_2/m^2$/year) for the dwelling as designed. It accounts for energy used in heating, fixed cooling, hot water and lighting.

Dynamic Simulation Model (DSM)

A software tool that models energy inputs and outputs for different types of building over time. In certain situations, SBEM will not be sophisticated enough to provide an accurate assessment of a building's energy efficiency. In these cases Government-approved proprietary dynamic simulation models may be used. Communities and Local Government provide such approval.

Energy Performance Ratio for New Constructions (EPR_{NC})

A metric that is unique to BREEAM and calculated by the BREEAM Ene 01 calculator (and the BREEAM Ene01 Compliance Checker website) using modelled outputs from the approved building energy calculation software. It is a ratio that defines the performance of a BREEAM assessed building in terms of its regulated operational energy demand, primary energy consumption and CO_2 emissions. This measure of performance is used to determine the number of Ene 01 credits a building achieves in the BREEAM assessment. A description of how the EPR_{NC} is defined and calculated is provided in the Additional Information section of BREEAM issue Ene 01.

Fixed building service

The Building Regulations defines this as any part of, or any controls associated with:

1. fixed internal or external lighting systems but does not include emergency escape lighting or specialist process lighting; or
2. fixed systems for heating, hot water service, air-conditioning or mechanical ventilation.

National Calculation Method (NCM)

The National Calculation Method (NCM) enables quantification of building operational energy consumption and CO_2 emissions resulting from regulated building services/systems and fabric performance. The NCM is the methodology used for demonstrating compliance with the Energy Performance of Buildings Directive. Building energy modelling compliant with the NCM can be carried out using approved software (see Relevant definition of approved software above).

Notional building

A hypothetical building of the same size and shape as the actual building, but with predefined specified properties for the building fabric, fittings and services.

Near-site LZC

A low or zero carbon source of energy generation located near to the site of the assessed building. The source is most likely to be providing energy for all or part of a local community of

buildings, including the assessed building e.g. decentralised energy generation linked to a community heat network or renewable connected via private wire.

On-site LZC

A low or zero carbon source of energy generation which is located on the same site as the assessed building.

Primary energy consumption

This refers to the direct use at the source, or supply to users without transformation, of crude energy, that is, energy that has not been subjected to any conversion or transformation process. Source: Glossary of Environment Statistics, Studies in Methods, Series F, No. 67, United Nations, New York, 1997.

Private wire arrangement

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.

Regulated energy

Building energy consumption resulting from the specification of a 'controlled', 'fixed building service'.

Renewables Obligation Certificate (ROC)

This is a green certificate issued to an accredited generator for eligible renewable electricity generated within the United Kingdom and supplied to customers within the United Kingdom by a licensed electricity supplier. One ROC is issued for each megawatt hour (MWh) of eligible renewable output generated[2].

(SAP) Standard Assessment Procedure for Energy Rating of Dwellings

The Government's approved methodology for assessing the energy performance of new dwellings. The current version is SAP 2009 version 9.90, dated March 2010, rev October 2010. The procedure accounts for energy used in:

- Space heating and cooling
- Hot water provision
- Fixed lighting.

SBEM (The Simplified Building Energy Model)

SBEM is software developed for CLG by BRE. SBEM is a computer program that provides an analysis of a building's energy consumption. It calculates monthly energy use and carbon dioxide emissions of a building (excluding dwellings) based on a description of the building geometry, construction, use and HVAC and lighting equipment. SBEM is accompanied by a basic user interface, iSBEM. There also exists alternative approved software 'front-end' interfaces for SBEM (see definition of approved software above).

Target Emission Rate (TER)

The target emission rate is the minimum energy performance requirement (required by Building Regulation) for a new non domestic building ($kgCO_2/m^2/year$). The TER is calculated in accordance with the National Calculation Methodology (NCM) and the Simplified Buildings Energy Model (SBEM). For dwellings, the TER is calculated using the SAP methodology according to the requirements defined in the Building Regulations Approved Document L1A. The TER is expressed in terms of the mass of CO_2 emitted per year per square metre of total useful floor are of the building ($kgCO_2/m^2/year$).

Unregulated energy

Building energy consumption resulting from a system or process that is not 'controlled' i.e. energy consumption from systems in the building on which the Building Regulations do not impose a requirement. For example, this may include energy consumption from systems integral to the building and its operation e.g. lifts, escalators, refrigeration systems, ducted fume cupboards; or energy consumption from operational related equipment e.g. servers, printers, desktops, mobile fume cupboards, cooking and other appliances etc.

Zero net carbon (CO_2) emissions

The annual building CO_2 emissions ($kgCO_2/m^2/year$) arising as a result of energy consumption from fixed building services i.e. space heating and cooling, water heating, ventilation and lighting, also referred to as a controlled service or fitting as a result of requirements imposed on such systems by the Building Regulations.

In aiming to achieve a zero carbon status, the building energy modelling can take account of contributions of energy generated from on-site, near-site and accredited external renewable and low carbon installations. Energy generated and supplied from off-site renewable and low carbon installations that are not accredited cannot be used to meet this definition.

Checklists and Tables

None

Calculation procedures

A new calculation methodology for determining the number of credits achieved in the Ene01 assessment issue was introduced in to the BREEAM New Construction 2011 version. This methodology is a departure from previous versions of BREEAM which awarded credits based solely on a single, carbon emissions metric. This change was made to enhance the ability of BREEAM to promote designs that minimise energy demand and consumption in buildings, and then to reduce the carbon emissions resulting from that energy use.

The New methodology considers three metrics of modelled building performance when determining the number of credits achieved for this issue, as follows:

1. Energy demand: This measures how well the building reduces heating and cooling energy demand, it is influenced by factors including building fabric heat loss and air permeability.
2. Primary energy consumption: This measures how efficiently a building meets its energy demand. It is influenced by factors including the type of building services systems specified and the efficiency of the energy generation and distribution infrastructure installed/utilised.
3. CO_2 emissions: This measures the amount of carbon dioxide emissions the building emits meeting its operational energy demands. It is influenced by factors including building fabric performance, systems and distribution efficiency and fuel source. The specification of low or zero carbon forms of energy generation (on site, near site or accredited external renewables) are accounted for in this parameter (they may also have a positive influence on primary energy consumption where they are displacing grid supplied electricity or gas.

This triple metric approach ensures that standard practice against the energy efficiency or consumption scale cannot be completely offset by best practice against the carbon performance scale through the specification of low or zero carbon, on or off-site energy solutions. Therefore, BREEAM seeks to encourage and reward a holistic approach to reducing energy and CO_2 emissions, through a balance of good building design and systems specification.

The procedure for translating performance in each of the above metrics into BREEAM credits is outlined in detail below along with a worked example. This includes a description of the BREEAM Ene01 credits benchmark scale and how this relates to Building Regulation compliance and achieving net zero carbon status.

The necessary energy modelling data required to determine building performance is sourced from National Calculation Method compliant energy modelling software, used by the design team to demonstrate Building Regulation compliance. This data is then entered in to the BREEAM Ene01 calculator to determine the EPR_{NC} and number of credits achieved (see also compliance note: The BREEAM Ene01 Compliance Checker website)

Stage 1 - Defining the building's performance improvement:

Actual building performance, expressed as a percentage of the 2010 notional building level, is determined for the assessed building's modelled energy demand, consumption and CO_2 emissions.

Stage 2 - Benchmarking the performance improvement against the modelled building stock:

Each of the percentages from stage 1 is then 'translated' into a ratio of performance expressed as a value between 0 and 1. See below for a detailed description of how the translators are derived and building performance is benchmarked.

Stage 3 - Weighting the individual ratios for each metric

The ratios from stage 2 are then multiplied by the following weightings:

Performance Indicator	Weighting
Energy demand	0.25
Energy consumption	0.41
CO_2 emissions	0.34

These weightings reflect the maximum that each parameter can contribute towards the overall EPR_{NC} and therefore BREEAM credits. See below for a description of the weightings and how they are defined.

Note:
The weightings above are those used for buildings that have been modelled using SBEM i.e. non-domestic building types and function areas. A different set of weightings are used for buildings/building areas assessed using the Standard Assessment Procedure (SAP), i.e. residential areas. Please refer to the Other Information section for guidance on calculating the Ene01 performance of buildings with residential areas modelled using SAP.

Stage 4 - Awarding the BREEAM credits:

The weighted ratios of performance from stage 3 are totalled to give an overall EPR_{NC} which is then compared to the table of benchmarks and minimum standards to determine the number of BREEAM credits awarded. See below for a description of the BREEAM credits benchmark scale and its relation to the Building Regulations and BREEAM's minimum standards.

Translators

The translator of performance for each of the three metrics is derived from performance modelling of a stock of actual buildings (using a National Calculation Methodology compliant software package), converted to comply with 2010 Building Regulations and then modified to a 'best practice' configuration.

Using the data from this modelling, a normal distribution of performance has been established for each metric (graphically represented by the bell curve in the example below). This distribution has then been used to define a means of benchmarking actual building performance (graphically represented by the curve in the example below).

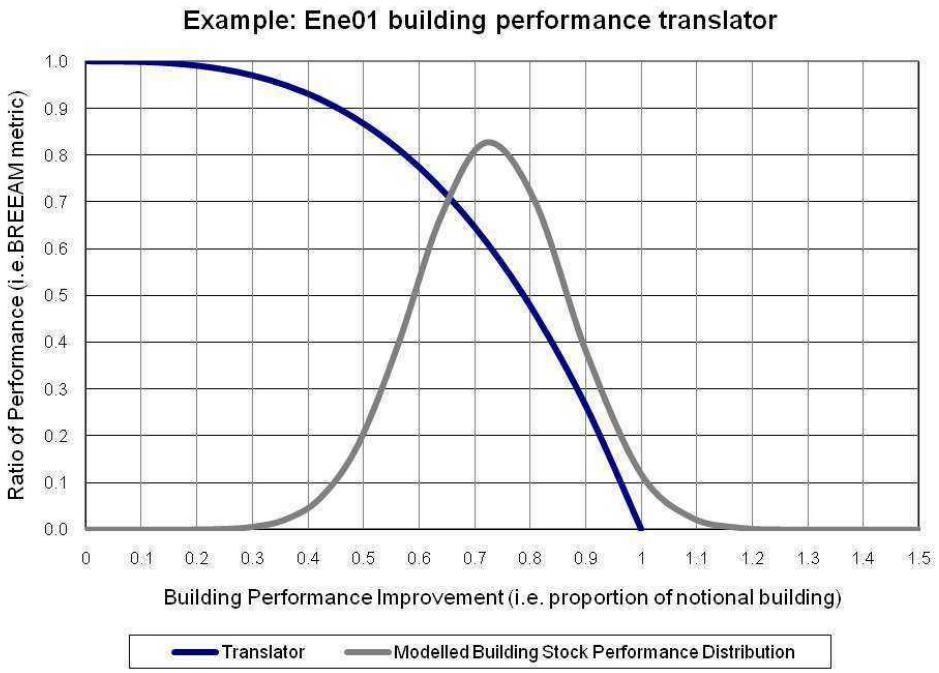


Figure 3: Example Ene01 building performance translator

The un-weighted ratio of performance for each metric is derived by determining the point that the assessed buildings performance intersects with the translator curve. Using the above graph as an example for the CO_2 metric, a building whose emissions are 20% lower than the notional building i.e. it's emissions are 80% of the notional buildings emissions, would achieve a ratio of performance of just under 0.50 (0.477 to be precise).

The weightings outlined above are then applied to the values calculated for each metric using this translation method. These weighted values are totalled to give the EPR_{NC}, which is then used to determine the number of BREEAM credits achieved (outlined in stages 3 and 4 of the calculation procedure above). A completed example of this calculation procedure is provided on the following pages.

Each metric translator curve is defined by best practice from the modelled building stock, and the following 'policy' decisions:

1. Energy demand: A ratio of 0.80 will be achieved where the actual building achieves a defined level of typical best practice. Where typical best practice for demand is approximately a 25% improvement on the notional building (based on the modelled building stock).
2. Primary energy consumption: A ratio of 0.80 will be achieved where the actual building achieves a defined level of typical best practice. Where typical best practice for consumption is approximately an 18% improvement on the notional building (based on the modelled building stock).
3. Carbon dioxide emissions: A ratio of 0.60 will be achieved where the actual building achieves a defined level of typical best practice. Where typical best practice for CO_2 emissions is approximately a 27% improvement on the notional building (based on the modelled building stock).

To achieve a ratio less than one for any of the three metrics the assessed buildings performance must be better than the level achieved for the same metric by the 2010 notional building specification.

The BREEAM EPR_{NC} weightings

The weightings are intended to reflect the degree of influence that a designer has over the buildings performance against each parameter. They also act to ensure that each parameter is considered and building performance improved before a high level of performance can be achieved in terms of BREEAM credits. In terms of their derivation, the weightings are inversely proportional to the standard deviation of the modelled sample set. A metric with a larger standard deviation will therefore have a lower weighting. These weightings are reviewed and fine-tuned over time as more actual building data is obtained through certified BREEAM assessments.

The BREEAM credits scale, minimum standards and comparison with Building Regulations

The following describes how the BREEAM credit scale and EPR_{NC} relate to BREEAM's minimum standards and the 2010 Building Regulations:

1. The EPR_{NC} required to achieve 1 credit is 0.06, this entry level serves to recognise buildings which achieve a small improvement over a Building Regulations compliant design i.e. an improvement on the level achieved by the notional building.
2. The minimum performance requirements for achieving a BREEAM Excellent rating are six credits (equivalent to an EPR_{NC} of 0.36) and a 25% improvement on the Building Regulations Target Emission Rate. This equates to a contribution to the EPR_{NC} of 0.1928 from the CO_2 metric. Therefore, to achieve a BREEAM Excellent the demand and consumption metrics must contribute a combined total of 0.1672 to the EPR_{NC} (or a relatively lower combined total where the percentage improvement on the Target Emissions Rate is higher than 25%).
3. The minimum performance requirements for achieving a BREEAM Outstanding rating are ten credits (equivalent to an EPR_{NC} of 0.60) and a 40% improvement on the Building Regulations Target Emission Rate. This equates to a contribution to the EPR_{NC} of 0.2631 from the CO_2 metric. Therefore, to achieve a BREEAM Outstanding the demand and consumption metrics must contribute a combined total of 0.3369 to the EPR_{NC} (or a relatively lower combined total where the percentage improvement on the Target Emissions Rate is higher than 40%).
4. The maximum number of standard BREEAM credits (15) is awarded where a building achieves an EPR_{NC} of 0.90 and a 100% improvement on the Building Regulations Target Emission Rate i.e. a net zero carbon building. This equates to a contribution to the EPR_{NC} of 0.34 from the CO_2 metric (i.e. equivalent to the maximum weighting for the CO_2 metric). Therefore, to achieve 15 credits the demand and consumption metrics must contribute a combined total of 0.560 to the EPR_{NC} (from a maximum available of 0.66). This could be achieved for example through a 20% reduction in building energy demand (which would contribute 0.1772 to the EPR_{NC}) and 30% reduction in primary energy consumption (which would contribute 0.3872 to the EPR_{NC}).

Note: BRE Global undertook and published a review of the BREEAM 2011 Ene01 methodology in June 2012. This review resulted in changes in how the energy consumption metric is assessed, switching from delivered energy to primary energy consumption, and an updated set of weightings and credit benchmarks. These changes have been reflected in issue 3.0 of the BREEAM 2011 New Construction Technical Manual. The BREEAM 2011 Ene01 methodology review paper contains further details and is available to download from the BREEAM Assessors Extranet and BREEAM website (Resources section).

Future revisions to the translators, weightings and credit scale

The benchmarking for this assessment issue is based on modelling (using the National Calculation Method) of a stock of actual buildings. Each was modified to comply with the latest Building Regulations and then configured to meet varying levels of best practice. In line with future revisions to the BREEAM New Construction scheme, BRE Global will review and update these benchmarks. In doing so performance data from actual certified buildings coupled with changes in Building Regulations will be used to inform and re-define the scale. This will ensure that BREEAM continues to align with achievable and cost effective best practice, whilst acting as a driver for low and zero carbon buildings.

Example calculation

Stages	Calculation
Stage 1: Defining the building's performance improvement, or proportion of the 2010 notional building level	
Demand (MJ/m^2)	94/145 = 0.648
Consumption (kWh/m^2):	126/135 = 0.933
CO_2 ($kgCO_2/m^2$):	28/33 = 0.848
Stage 2: Benchmarking the performance improvement against the modelled building stock i.e. the point that a buildings performance improvement intersects with the translator curve	
Demand ratio:	1 – (0.648 ^ 5.53) = 0.9090
Consumption ratio:	1 – (0.933 ^ 8.10) = 0.4281
CO_2 ratio:	1 – (0.848 ^ 2.91) = 0.3810
Stage 3: Applying the weightings	
Demand ratio:	0.9090 x 0.25 = 0.2273
Consumption ratio:	0.4281 x 0.41 = 0.1755
CO_2 ratio:	0.3801 x 0.34 = 0.1292
Stage 4: Determining the number of BREEAM credits	
Overall EPR_{NC}:	0.2273+0.1755+0.1292 = 0.5320
No. of BREEAM credits:	= 8 BREEAM credits

The table below is intended to provide guidance on the contribution to the EPR_{NC} for differing levels of good and best practice i.e. percentage improvement on the level achieved by the notional building for each of the three metrics. The table can therefore be used to determine an approximate EPR_{NC} for a building and estimate the number of BREEAM credits achieved. Please note, to confirm actual performance and credits please use the BREEAM Ene01 Compliance Checker website or Ene01 Calculator.

Table - 11: Contribution to the EPR_{NC} for differing levels of building performance

Energy Demand		Primary Energy Consumption		CO_2 emissions	
% improvement in energy demand	Contribution to EPR_{NC}	% improvement in primary energy consumption	Contribution to EPR_{NC}	% improvement on Target Emission Rate	Contribution to EPR_{NC}
1%	0.0135	1%	0.0321	1%	0.0098
2%	0.0264	2%	0.0619	2%	0.0194
3%	0.0388	3%	0.0896	3%	0.0288
4%	0.0505	4%	0.1154	4%	0.0381
5%	0.0617	5%	0.1394	5%	0.0471
6%	0.0724	6%	0.1616	6%	0.0560
7%	0.0826	7%	0.1822	7%	0.0647
8%	0.0924	8%	0.2013	8%	0.0733
9%	0.1016	9%	0.2190	9%	0.0816
10%	0.1104	10%	0.2354	10%	0.0898
11%	0.1188	11%	0.2505	11%	0.0978
12%	0.1267	12%	0.2644	12%	0.1056
13%	0.1343	13%	0.2773	13%	0.1133
14%	0.1414	14%	0.2892	14%	0.1208
15%	0.1482	15%	0.3001	15%	0.1281
16%	0.1547	16%	0.3101	16%	0.1353
17%	0.1608	17%	0.3194	17%	0.1423
18%	0.1666	18%	0.3278	18%	0.1492
19%	0.1720	19%	0.3356	19%	0.1559

Energy Demand		Primary Energy Consumption		CO_2 emissions	
% improvement in energy demand	Contribution to EPR_{NC}	% improvement in primary energy consumption	Contribution to EPR_{NC}	% improvement on Target Emission Rate	Contribution to EPR_{NC}
20%	0.1772	20%	0.3427	20%	0.1624
25%	0.1991	25%	0.3701	25%	0.1928
30%	0.2152	30%	0.3872	30%	0.2196
35%	0.2269	35%	0.3975	35%	0.2429
40%	0.2352	40%	0.4035	40%	0.2631
45%	0.2408	45%	0.4068	45%	0.2803
50%	0.2446	50%	0.4085	50%	0.2948
55%	0.2470	55%	0.4094	55%	0.3067
60%	0.2484	60%	0.4098	60%	0.3164
65%	0.2492	65%	0.4099	65%	0.3240
70%	0.2497	70%	0.4100	70%	0.3298
75%	0.2499	75%	0.4100	75%	0.3340
80%	0.2500	80%	0.4100	80%	0.3369
100%	0.2500	100%	0.4100	100%	0.3400

Other Information

Allowable Solutions

The BREEAM definition of 'Accredited External Renewables' differs from and should not be confused with the term 'Allowable Solutions'. The term Allowable Solutions forms part of the proposed Zero Carbon definition, furthermore what constitutes an 'Allowable Solution' is not yet defined (at the time of writing). Once an official definition of Zero Carbon and Allowable Solutions is confirmed by Government for non domestic buildings, BRE will advise accordingly on the contribution of Allowable Solutions toward achieving BREEAM credits.

Building Regulations Approved Document Part L Conservation of Fuel and Power - classifications

Multi-residential building that can be assessed under BREEAM New Construction 2011 will be classified under either AD L2A or a combination of AD L1A and AD L2A of the building regulations. Areas classified under AD L2A are classed as 'buildings other than dwellings' however this does also include 'rooms for residential purposes' (see below). Areas classified as AD L1A are 'self-contained dwellings'. The AD L classification impacts this BREEAM issue in that areas classified as AD L2A must be assessed using SBEM and areas classified as AD L1A must be assessed using SAP.

AD L2A - Room for residential purposes

The Building Regulations gives the following definition; This means a room, or suite of rooms, which is not a dwelling-house or a flat and which is used by one or more persons to live and sleep and includes a room in a hostel, a hotel, a boarding house, a hall of residence or a residential home, whether or not the room is separated from or arranged in a cluster group with other rooms, but does not include a room in a hospital, or other similar establishment, used for patient accommodation and, for the purposes of this definition, a 'cluster; is a group of rooms which is:

- Separated from the rest of the building in which it is situated by a door which is designed to be locked
  AND
- Not designed to be occupied by a single household.

Guidance for assessing Ene01 performance in buildings that contain residential areas

Guidance for assessing performance where the building has been modelled using SAP only:

The relevant data must be sourced from the SAP Datasheet from the approved software (provided by the Accredit Energy Assessor). This data must first be entered in to the 'Ene01 Supplementary Calculator for Multi-Residential Buildings Using SAP'. The calculator converts the data into the outputs outlined in criterion 2c (above). Once converted by the Ene01 Supplementary Calculator, the outputs should be entered into BREEAM's Ene01 Calculator. This calculator will then confirm the Energy Performance Ratio (EPR) and number of BREEAM credits achieved.

The Ene01 Supplementary Calculator for Multi-Residential Buildings Using SAP describes in detail what data to source from the SAP datasheet(s).

Guidance for assessing performance where the building has been modelled usingSAP and SBEM:

Where the building has been classified under both Approved Document L1A and L2A, because it contains both residential and non-residential areas, two sets of energy performance data will be required; one set from SBEM for the non-domestic (AD L2A classified) areas and one from SAP for the self-contained dwellings (ADL1A classified).

The relevant SAP data must first be entered into the 'Ene01 Supplementary Calculator for Multi-Residential Buildings Using SAP'. This calculator converts the data into the outputs outlined in criterion 2c (above). This converted SAP data along with the relevant outputs from SBEM must then be added to BREEAM's Ene01 Calculator. This calculator will then confirm the Energy Performance Ratio (EPR) and number of BREEAM credits achieved.

Where both SBEM and SAP outputs are used, the total credits achieved is determined by area weighting the credits achieved for the domestic and non-domestic parts of the building. The area weighted totals are then added together and rounded down to the nearest whole credit. The same method of area weighting is applied to the percentage improvement on the building's Target

Emission Rate. The area weighted credits and percentage improvement are the totals used to determine compliance with BREEAM's Ene01 minimum standards.

---

[1]The Building Regulations 2000, Approved Document Part L2A: The conservation of fuel and power in new buildings other than dwellings, 2010 edition, HM Government.
[2]www.ofgem.gov.uk

Ene 02 Energy monitoring

Number of credits available	Minimum standards
Building type dependent	Yes

Aim

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

Assessment Criteria

Please note:

- The first credit is applicable to all building types
- The second credit is not applicable to pre-schools, primary schools, courts, prisons, multi-residential and other residential buildings.

The following is required to demonstrate compliance for:

One credit

1. The following major energy consuming systems (where present) are monitored using either a Building Energy Management System (BEMS) or separate accessible energy sub-meters with a pulsed output to enable future connection to a BEMS:
    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).
2. The end energy consuming use is identifiable to the building user through labelling or data outputs.

One credit

3. An accessible BEMS or accessible sub-meters are provided covering the energy supply to all tenanted, or in the case of single occupancy buildings, relevant function areas or departments within the building/unit.

Compliance Notes

Ref	Terms	Description
CN1	Extensions to existing buildings	Where an existing building is being extended and it has existing building services plant and systems that will be common to both the new extension and existing building, the criteria for energy metering cover the entire building.
CN2	Shell only	**Plant/equipment sub-metering** 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: 1. Option 1 – Use of a tenancy lease agreement between the developer and tenant/s (full value of available credits) 2. Option 2 – A Green Building Guide for tenant fit outs (half the value of the available credits) 3. Option 3 – Developer/Tenant collaboration (full value of available credits) Refer to Appendix D – BREEAM New Construction and shell and core/speculative assessments of this Scheme Document for further description of the above options. **Tenancy sub-metering** For speculative buildings, meters must be installed on the energy supply to each separate tenanted unit or floor plate within the assessed development.
CN3	Lighting & small power	Due to traditional distribution methods, it can be difficult to cost-effectively separate lighting and small power. It is acceptable, within a single floor, for lighting and small power to be combined for metering purposes, provided that sub-metering is provided for each floor plate.
CN4	Other major energy-consuming systems See criterion 1h	Other major energy-consuming systems, 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. See also CIBSE TM39: Building Energy Metering [1]
CN5	Modular boiler systems See criterion 1	Where a modular boiler system has individual boilers each with a power input of less than 50kW but an overall power rated input of ≥50kW, the lead boiler must be sub-metered

Ref	Terms	Description
		regardless of its individual power rated input.
CN6	Accessible meters See criterion 3	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 BEMS is installed).
CN7	Healthcare buildings: BEMS requirementsSee criterion 3	The systems outlined above (where present) must be monitored using either a Building Energy Management System (BEMS) or other automated control system, e.g. outstations linked to a central PC, for the monitoring of energy consumption. Provision of a pulsed output is not sufficient to award the credit in these building types.
CN8	Small office, industrial or retail units See criterion 3	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 < 200m2.
CN9	Large office, industrial or retail units See criterion 3	A development consisting of one or more larger units (i.e. >200m^2), sufficient sub metering to allow for monitoring of the relevant function areas/departments within the unit must be specified, in addition to metering of the unit as a whole.
CN10	Healthcare Buildings: Medical-based systems See criterion 3	Large-scale medical equipment/systems can be ignored when assessing compliance with this issue (although it is recommended that sub-metering is considered in such instances).
CN11	Single occupant buildings: Relevant function areas/departments See criterion 3	The lists below summarise the commonly found functions by building types. These lists are not exclusive and where other areas/departments exist these should also be separately metered.
CN12	Office buildings	1. Office areas (Metering by floor plate) 2. Catering
CN13	Retail buildings	1. Sales area 2. Storage and warehouse 3. Cold storage 4. Offices 5. Catering 6. Tenant units
CN14	Industrial units	1. Office areas

Ref	Terms	Description
		2. Operational area 3. Ancillary areas (e.g. canteen etc)
CN15	Education buildings	1. Kitchens (excluding small staff kitchens and food technology rooms) 2. Computer suites 3. Workshops 4. Lecture halls 5. Conference rooms 6. Drama studio 7. Swimming pool 8. Sports hall 9. Process areas 10. Laboratories 11. High containment suites within laboratories 12. Controlled environment chambers 13. Animal accommodation areas 14. Data centres 15. I.T work and study rooms, including I.T equipped library space and any space with provision of more than 1 PC terminal per 5m2 Individual sub-metering of standard classrooms/seminar rooms is not required.
CN16	Hospitals and other healthcare facilities	1. Operating department 2. Imaging department 3. Radiotherapy department 4. Pathology department 5. Dialysis department 6. Medical physics 7. Mortuary and post-mortem department 8. Rehabilitation, when including hydrotherapy pools 9. Central Sterile Supplies Department (or equivalent) 10. Process areas, e.g. commercial-scale kitchens and laundries 11. IT rooms 12. Pharmacy department 13. Laboratories 14. Tenancy areas (e.g. catering, retail, laundry) In small healthcare buildings (< 999 m^2) with no high-energy load areas (as defined above), a single meter per floor plate is sufficient to achieve this credit. Individual areas within each floor plate do not need to be sub-metered.
CN17	Other buildings See criterion 3	Other types of single occupant buildings should use the above lists of function areas as a guide to the level of provision required to comply, bearing in mind the aim of the credit is to encourage the installation of energy sub-metering that facilitates the monitoring of in-use energy consumption (in this case by area).

Schedule of Evidence

Ref	Design stage	Post-construction stage
All	Relevant section/clauses of the building specification or contract. Design drawings	BREEAM Assessor's site inspection report and photographic evidence

Additional Information

Relevant definitions

BEMS

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

Energy supply

All types of energy supplied to a building area (department/tenancy/unit) within the boundary of the assessed development; including electricity, gas, heat or other form of energy/fuel which is consumed as a result of the use of and operations within each relevant area.

Checklist and Tables

None

Calculation procedures

None

Other information

Detailed guidance on how to develop an appropriate metering strategy for the energy criteria of a new building is available in CIBSE TM39 Building Energy Metering and General Information Leaflet 65: Metering energy use in new non-domestic buildings[2].

[1] TM39 Building Energy Metering, CIBSE, 2009
[2] General Information Leaflet 65, Metering energy use in new non-domestic buildings, BRECSU, 2002

Ene 03 External lighting

Number of credits available	Minimum standards
1	No

Aim

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

Assessment Criteria

The following is required to demonstrate compliance for:

One credit

1. All external fittings, where provided, within the construction zone meet the lighting requirements as given in Table - 12. External lighting requirements by location.
2. 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

Table - 12: External lighting requirements by location

	Light fittings measured in lamp lumens/circuit Watt, when:		LED luminaires where the lamp is integral to the fitting measured in luminaire lumens/circuit Watt, when:	
External lighting location	Colour rendering index (Ra) ≥ 60	Colour rendering index (Ra) ≥ < 60	Colour rendering index (Ra) ≥ 60	Colour rendering index (Ra) < 60
Building, access ways, pathways	50	60	40	50
Car parking, associated roads, floodlighting	70	80	55	60
	Lamp wattage ≥ 25W	Lamp wattage < 25W	Lamp wattage ≥ 25W	Lamp wattage < 25W
Signs, uplighting	60	50	50	50

Compliance Notes

Ref	Terms	Description
CN1	Shell Only/Speculative developments	Typically external lighting will be specified and installed by the developer and not the future tenant. If external lighting will be specified and installed by the tenant, then compliance can be demonstrated via one of the following available means: 1. Option 1 – Use of a tenancy lease agreement between the developer and tenant/s (full value of available credits) 2. Option 2 – A Green Building Guide for tenant fit outs (half the value of the available credits) 3. Option 3 – Developer/Tenant collaboration (full value of available credits) Refer to Appendix D – BREEAM New Construction and shell and core/speculative assessments of this Scheme Document for further description of the above options. If responsibility for the external lighting specification and installation is shared by each party (developer and tenant), then compliance can be demonstrated via a combination of the base build design drawings/site inspection and one of the above options. Note; where option two is used as a means of demonstrating compliance in this manner, only half the value of the credits available can be awarded.
CN2	Extensions to existing buildings	Refer to the guidance below for single building assessments on large existing developments/campuses.
CN3	Single building assessments on larger developments/ campuses	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 construction zone of the assessed building.
CN4	No external lighting specified	The credit can be awarded where the building is designed to operate without external lighting, including external lighting on the building, signs and at entrances.
CN5	Decorative and floodlighting	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.
CN6	Multi-residential developments with CSH assessed dwellings	For buildings with self-contained dwellings also being assessed under the Code for Sustainable Homes (CSH), the following applies: Where the external space lighting credit for issue Ene 6 of the CSH has been achieved, the credit available for issue Ene 03 of the Multi-residential scheme is also achieved for the same external areas. Any

Ref	Terms	Description
		external space lighting outside of the scope of CSH issue Ene 6, but within the wider scope of the Multi-Residential scheme, must comply with the requirements of either CSH issue Ene 6 or BREEAM issue Ene 03 to achieve the credit. Where there are no self-contained dwellings in the building requiring a separate CSH assessment or where credits are not sought for CSH issue Ene 6, the BREEAM Multi-residential credit can only be awarded where the BREEAM Multi-residential issue requirements have been met for all relevant external lighting.
CN7	Prisons and other securedbuild-ings security lighting	The criteria are concerned only with general external lighting e.g. way-finding, car parking, decorative, signage, landscape, storage areas etc. Lighting specified for specific security purposes within secured buildings, such as prisons, does not need to be assessed against the BREEAM criteria.

Schedule of Evidence

Ref	Design stage	Post-construction stage
All	Relevant section/clauses of the building specification or contract Design drawings Where relevant for multi residential buildings; Evidence in line with the Design Stage evidence requirements of CSH issue Ene 6 OR A copy of the Design Stage CSH certificate and report from the CSH online reporting system confirming the number of credits achieved for CSH issue Ene 6.	BREEAM Assessor's site inspection report and photographic evidence AND/OR 'As built' drawings Manufacturers product details Where relevant for multi residential buildings; Evidence in line with the Post Construction Stage evidence requirements of CSH issue Ene 6 OR A copy of the Post Construction Stage CSH certificate and report from the CSH online reporting system confirming the number of credits achieved for CSH issue Ene 6.

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.

Checklist and Tables

None

Calculation procedures

None

Other information

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.

In BS 5489-1:2003 Code of practice for the design of road lighting - Part 1: Lighting of roads and public amenity areas[1], this is acknowledged by allowing a relaxation of the lighting levels (illuminance levels) required when the source specified has a colour rendering index Ra greater than or equal to 60.

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).

[1] BS 5489 Part 1 Code of practice for the design of road lighting: lighting of roads and public amenity areas, BSI, 2003.

Ene 04 Low and zero carbon technologies

Number of credits available	Minimum standards
5	Yes

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

This issue is split into three parts:

- Feasibility study OR renewable energy supply contract (1 credit)
- Low or zero carbon technology specification and installation (4 credits plus an exemplary credit)
- Free cooling (1 credit)

The following is required to demonstrate compliance for:

Feasibility study/Renewable supply contract

One 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) low or zero carbon (LZC) energy source for the building/development. This study covers as a minimum:
    a. Energy generated from LZC energy source per year
    b. Life cycle cost of the potential specification, accounting for payback
    c. Local planning criteria, including land use and noise
    d. Feasibility of exporting heat/electricity from the system
    e. Any available grants
    f. All technologies appropriate to the site and energy demand of the development.
    g. Reasons for excluding other technologies.
    h. Where appropriate to the building type, connecting the proposed building to an existing local community CHP system or source of waste heat or power OR specifying a building/site CHP system or source of waste heat or power with the potential to export excess heat or power via a local community energy scheme.
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.

Low or zero carbon technology specification and installation

Up to four credits

5. Criteria 1 to 3 are achieved.
6. A local LZC energy technology has been installed in line with the recommendations of the feasibility study and this method of supply results in a reduction in regulated CO_2 emissions as follows:

No of credits	% reduction in regulated CO_2 emissions
2	10%
3	20%
Exemplary level	30%

- OR alternatively
- Where the feasibility study includes a Life Cycle Assessment of the carbon impact of the chosen LZC system(s), accounting for its embodied carbon emissions and operational carbon savings and emissions, and this method of supply results in a reduction in life cycle CO_2 emissions as follows:

No of credits	% reduction in life cycle CO_2 emissions
2	N/A (study only)
3	10%
4	20%
Exemplary level	30%

The LCA study must be completed in accordance with ISO 14044:2006 Environmental Management Life Cycle Assessment – Requirements and Guidelines[1]
The LCA must consider a 60 year period (a typical assumption for the life of a building) and any necessary replacements/maintenance requirements within this period.

7. Figures used for calculations of the percentage carbon reduction provided by LZC technology are based on the output from approvedenergy modelling software.

Free cooling

One credit

8. Where, regardless of the percentage reduction in the building's CO_2 emissions from LZC sources and number of BREEAM credits achieved above, the building utilises ANY of the following free cooling strategies and the first credit within the BREEAM issue Hea 03 Thermal comfort has been achieved:
    a. Night-time cooling (requires fabric to have a high thermal mass)
    b. Ground coupled air cooling
    c. Displacement ventilation (not linked to any active cooling system)

d. Ground water cooling
e. Surface water cooling
f. Evaporative cooling, direct or indirect
g. Desiccant dehumidification and evaporative cooling, using waste heat
h. Absorption cooling, using waste heat.
i. The building does not require any form of cooling (i.e. naturally ventilated)

Exemplary level criteria

The exemplary level criteria to achieve an innovation credit for this BREEAM issue are outlined in the section above.

Compliance Notes

Ref	Terms	Description
CN1	Shell only	To award credits for speculative buildings the feasibility study must be completed as part of the shell only design and build. Where appropriate, as determined by the recommendations of the feasibility study and practicality of installing the LZC technology during the tenant fit-out works, responsibility for specifying/installing the relevant LZC technology can be passed to the future tenant in order to comply with the remaining criteria for this issue. In these circumstances compliance is demonstrated at the design and post construction stages of assessment via either: 1. Option 1 – Inclusion of the relevant clause(s) in a tenancy lease agreement between the developer and tenant/s (full value of available credits) 2. Option 2 – N/A 3. Option 3 – Developer/Tenant collaboration (full value of available credits) Refer to Appendix D – BREEAM New Construction and shell and core/speculative assessments of this Scheme Document for further description of the above options.
CN2	Feasibility study. See criteria 1 & 3	When undertaking a feasibility study at a stage later than concept design (RIBA stage C or equivalent), 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. If the feasibility was commissioned at the concept design (outline proposals) 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; however subsequent credits for installing LZC technology to meet a percentage of building energy demand will not be achievable.
CN3	Recognised	Technologies eligible to contribute to achieving the requirements

Ref	Terms	Description
	'local' LZC technologies See criterion 2	of this issue must produce energy from renewable sources and meet all other ancillary requirements as defined by Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC (www.eur-lex.europa.eu/). The following requirements must also be met: 1. Where not provided by accredited external renewables there must be a direct supply of energy produced to the building under assessment. 2. Where covered by the Microgeneration Certification Scheme (MCS), technologies under 50kWe or 45kWth must be MCS (or equivalent) certified products installed by MCS (or equivalent) certified installers. 3. Combined Heat and Power (CHP) schemes above 50kWe must be certified under the CHPQA standard. CHP schemes fuelled by mains gas are eligible to contribute to performance against this issue. Where these schemes are above 50kWe they must be certified under the Combined Heat and Power Quality Assurance (CHPQA). 4. Air source heat pumps can only be considered as a renewable technology when used in heating mode. Refer to Annex VI of Directive 2009/28/EC for more detail on accounting of energy from heat pumps.
CN4	LZC technology not listed See criterion 2	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 and the carbon benefits achieved. The BREEAM Assessor must confirm acceptability with BRE if in doubt.
CN5	Waste heat from a building related operational process See criterion 1	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.
CN6	Community and off-site schemes See criterion 1	'Local' does not have to mean on-site; community schemes (near site) can be used as a means of demonstrating compliance. As this BREEAM issue seeks to encourage the installation of on-site and near-site LZC technologies, accredited external renewables (except where stated to achieve one credit) cannot be used to demonstrate compliance with the criteria of this BREEAM issue.
CN7	Waste incineration See criterion 1	Waste heat from an incineration plant can only be considered as low carbon for the purpose of this BREEAM issue under the following circumstances: 1. All other LZC technologies have been considered and discounted in the feasibility study and EITHER

Ref	Terms	Description
		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 OR 3. A near or onsite facility connected to the building, via a private wire arrangement, which is demonstrably removing reusable and recyclable waste material prior to incineration.
CN8	First generationbiofuels See criterion 1	Given the current uncertainty over their impact on biodiversity, global food production and greenhouse gas savings, plus the ease of inter-changeability between fossil fuels, BREEAM does not recognise or reward building systems fuelled by first generation biofuels manufactured from feedstock's e.g. biofuels manufactured from sugars, seeds, grain, animal fats etc. where these are grown or farmed for the purposes of biofuel production. Subject to review against the criteria set out in the compliance note belowBREEAM may recognise systems using second generation biofuels (see Relevant definitions) or biofuels manufactured from biodegradable waste materials e.g. biogas, waste vegetable oilor locally and sustainably sourced solid biofuels e.g. woodchip, wood pellets where these are not interchangeable with fossil fuels or first generation biofuels.
CN9	Second generation biofuels and biofuels from waste streams See criterion 1	BREEAM recognises that biofuels produced from biomass which is a by-product of other processes may provide a more sustainable alternative to fossil fuels. Typically, these use waste feedstock consisting of residual non-food parts of current food crops, industry waste such as woodchips and other waste vegetable matter to produce biofuel. Such biofuels will, in principle be recognised by BREEAM for the purposes of defining low/zero carbon technologies, however due to the emerging nature of such technologies, full details will be required for review by BRE Global prior to confirmation of acceptability. Matters which will be required for consideration include the following: 1. Type, provenance and sustainability of the biomass feedstock 2. Avoidance/minimisation of fossil fuel use in extracting the biofuel 3. Minimising fossil fuel use in transporting the biomass/biofuel 4. Presence of a supply agreement and a robust supply chain 5. Compatibility of the biofuel with the specified boiler/plant and manufacturer's warranty issues The use of other recycled or waste-derived biofuels such as waste oil from catering may also be recognised by BREEAM subject to the above criteria. For smaller scale applications, the Assessor will, in addition, be required to demonstrate that the biofuel is locally sourced. BREEAM does not qualify the term 'locally sourced' or specify a minimum supply contract, however the Assessor must determine and demonstrate that these are reasonable for the particular application.

Ref	Terms	Description
CN10	More than one technology See criteria 1 & 6	The percentage can be made up from more than one of the above technologies.
CN11	Building assessed part of a larger development	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_2 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).
CN12	LZC technology already available on site See criterion 1	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. In order to be compliant the energy from any existing LZC energy source must be offsetting the carbon from the building in addition to any existing carbon offsetting that it was established for.
CN13	Calculation of the CO_2 emissions saved See criterion 6	When calculating the energy contribution and CO_2 emissions saved from the LZC installation the following rules should be applied: 1. The net yield of the LZC installation(s) must be used (i.e. subtract any CO_2 related to the energy used by the LZC technology itself such as pumps, inverters, controllers, etc). 2. The percentage CO_2 savings should be calculated using the following assumptions: a. 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.* b. Renewable electrical energy is displacing grid electricity at the national CO_2 conversion rate. In many instances, Low or Zero Carbon (LZCs) technologies may have been specified to help the building achieve its Target Emission Rate (TER). Furthermore, replacement of the LZCs with a gas boiler would result in the Building Emission Rate (BER) failing to achieve or better the TER and therefore failing to maintain performance in line with Building Regulations standards. This issue seeks to incentivise the provision of energy from LZC technologies within the standards set by Building Regulations. Therefore, for the purposes of this issue, the percentage reduction in regulated CO_2 emissions as a result of specifying an LZC technology should only account for CO_2 savings made on the TER and not the BER in

Ref	Terms	Description
		such instances. * The design team is required to provide the assessor with sufficient justification that gas is not available.
CN14	Regulated and unregulated energy	Refer to BREEAM issue Ene 01 Reduction of emissions : Relevant definitions.
CN15	Multi-residential accommodation with CSH assessed self-contained dwellings	For buildings with self-contained dwellings also being assessed under the Code for Sustainable Homes (CSH), the following applies: Credits achieved under issue Ene 7 of the CSH cannot be applied directly to issue Ene 04 for assessments of multi-residential buildings. This is due to the differing requirement and number of credits assessed in BREEAM. Where specific criteria in this BREEAM issue, identical to that of the CSH, have been demonstrably achieved under a CSH assessment, then the CSH assessment and evidence of compliance can be used to assess and demonstrate compliance with the relevant corresponding criteria in this BREEAM issue.
CN16	Schools : Information Communication Technology (ICT) classrooms	With respect to the free cooling credit, it is possible for ICT classrooms to be designed to avoid the use of mechanical cooling, as such they are not exempt from the requirements of this issue i.e. if mechanical cooling is used to treat these spaces it will not be possible to achieve the free cooling credit within this BREEAM issue.
CN17	Requirement to achieve first credit within Hea 03 See criterion 8	This requirement is set as a condition of awarding the free cooling credit to ensure that the cooling strategy implemented is fit for purpose i.e. it achieves the required internal thermal comfort conditions.

Schedule of Evidence

Ref	Design stage	Post-construction stage
1-3	The feasibility study report. Design drawings or relevant section/clauses of the building specification or contract.	As design stage AND BREEAM Assessor's site inspection report and photographic evidence AND/OR "As built" drawings
4	Name and details of supplier Details of the source of supply. A copy of the contract or other	As design stage

Ref	Design stage	Post-construction stage
	formal documentation confirming the length of contract to supply 100% renewable energy.	
5-7	Evidence (as outlined above) confirming compliance with the first credit. Report, calculations/outputs from the manufacturer, supplier, engineer or approvedmodelling software confirming carbon savings as a result of the installed LZC technology. A copy of the LCA study report/findings (if relevant) demonstrating the percentage carbon saving over the lifetime of the LZC system.	Evidence (as outlined above) confirming compliance with the first credit. As design stage evidence (using post construction details if changes have been made since the design stage assessment) plus, BREEAM Assessor's site inspection report and photographic evidence AND/OR "As built" drawings
8	Correspondence from the building services engineer summarising the 'purpose designed' free cooling strategy. The results from a dynamic simulation model demonstrating the feasibility of the free cooling strategy. Evidence as required for the first credit within the BREEAM issue Hea 03 Thermal comfort	As design stage BREEAM Assessor's site inspection report and photographic evidence AND/OR "As built" drawings Evidence as required for the first credit within the BREEAM issueHea 03 Thermal comfort.

Additional Information

Relevant definitions

Accredited External Renewables

Refer to BREEAM issue Ene 01 Reduction of emissions.

Approved Energy Modelling Software

Refer to Ene 01 Reduction of emissions.

Dynamic Simulation Model (DSM)

Refer to Ene 01 Reduction of emissions.

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[2] Common first generation biofuels include vegetable oil, biodiesel and bioalchols.

Free cooling

The ability of the building to provide cooling to the internal occupied areas without the need to rely on energy consuming mechanical chillers.

Life Cycle Cost

Refer to BREEAM issue Man 05 Life cycle cost and service life planning.

Life Cycle Assessment

The requirement to look at the carbon balance of each technology over its whole life. This is to encourage people to consider both operational savings or emissions and also the savings or emissions over the whole life of the technology (from 'cradle to grave') therefore reflecting that different technologies have different life spans and impacts at each stage of the life cycle.

Microgeneration Certification Scheme (MCS)

The Microgeneration Certification Scheme (MCS) is an independent scheme that certifies microgeneration products and installers in accordance with consistent standards. It is designed to evaluate microgeneration products and installers against robust criteria, and provides consumers with an independent indication of the reliability of products, assurance that the installation will be carried out to the appropriate standard and a route for complaints should there be any issues.

The MCS is a United Kingdom Accreditation Service (UKAS) accredited certification scheme covering all microgeneration products and services. It has support from the Department of Energy and Climate Change (DECC), industry and non-governmental groups as a prime method for making a substantial contribution to cutting the UK's dependency on fossil fuels and carbon dioxide emissions.

Near-site LZC

Refer to BREEAM issueEne 01 Reduction of emissions.

On-site renewable

Refer to BREEAM issue Ene 01 Reduction of emissions.

Private wire arrangement

Refer to BREEAM issue Ene 01 Reduction of emissions.

Payback period

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

Regulated energy

Refer to BREEAM issue Ene 01 Reduction of emissions.

Unregulated energy

Refer to BREEAM issue Ene 01 Reduction of emissions.

Checklists and Tables

None

Calculation procedures

None

Other information

None

[1] ISO 14044:2006 Environmental Management Life Cycle Analysis, principals and Framework, International Standards Organisation, Geneva

[2] Sustainable Bioenergy: a framework for decision makers, United Nations – Energy, 2007.

Ene 05 Energy efficient cold storage

Number of credits available	Minimum standards
2	No

Aim

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

Assessment Criteria

The following is required to demonstrate compliance for:

One credit

1. The refrigeration system, it's controls and components have been designed, installed and commissioned as follows:
    a. In accordance with the Commercial Refrigeration Code of Conduct for Reducing Carbon Emissions[1] (see Compliance note).
    b. Use robust and tested refrigeration systems/components, normally defined as those included on the Enhanced Capital Allowance (ECA) Energy Technology Product List[2] or an equivalent list (see Compliance note for list of components).
2. The refrigeration plant has been commissioned to comply with the criteria for commissioning outlined in BREEAM issue Man 01 Sustainable Procurement.

One credit

3. Criteria 1 and 2 are achieved.
4. With reference to The Carbon Trust Refrigeration Road Map[3], the installed refrigeration system demonstrates a saving in indirect greenhouse gas emissions (CO_2 eq.) with respect to the 'baseline' building through specification of technologies described in 'CO_2 emissions. saving options available when designing a new store/retail concept'.

Note: For non-retail building types with cold storage refrigeration systems, refer to the relevant Compliance note.

Exemplary level criteria

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

5. Criteria 1 and 2 are achieved.
6. With reference to The Carbon Trust Refrigeration Road Map, the installed refrigeration system is of a type described in 'Future technologies'. The system must demonstrate a saving in indirect greenhouse gas emissions (CO_2 eq.) in concept or through previous experience, with respect to currently available technologies listed in Figure 7 of the Road Map.

Note: For non-retail building types with cold storage refrigeration systems, refer to the relevant Compliance note.

Compliance Notes

Ref	Terms	Description
CN1	Scope of this BREEAM issue	This issue is applicable only in instances where commercial/industrial sized refrigeration and storage systems are specified, for example; 1. Storage and refrigeration of food in supermarkets 2. Cold storage facilities in industrial, laboratory, healthcare and other buildings. The criteria do not apply where only domestic-scale refrigeration is to be installed, this type of installation is covered within BREEAM issue Ene 08 Energy efficient equipment. If the building does not contain commercial/industrial sized refrigeration system(s), this issue is not applicable to the assessment.
CN2	Commercial Refrigeration Code of Conduct for Reducing Carbon Emissions See criterion 1a	The Code of Conduct has been developed by the Carbon Trust, in partnership with the Institute of Refrigeration (IoR) and the British Refrigeration Association (BRA). The Code is intended to compliment the Carbon Trust Refrigeration Road Map. Note: At the time of writing the Code of Conduct is under development. The 'Buildings' section will be the first completed part and is due to be published in June 2011. The building/design team must demonstrate that the refrigeration system, its controls and components has been designed, installed and commissioned in accordance with the Code of Conduct.
CN3	Non retail buildings and the Carbon Trust Refrigeration Road Map Action Plan See criteria 3, 4, 5 & 6	The Carbon Trust's Refrigeration Road Map introduces the main energy saving opportunities for refrigeration use in the retail sector and defines a 'baseline supermarket'. However, many of the technologies outlined in the Road Map are appropriate to non-food applications and therefore non-retail building types that specify/install cold storage systems. If the 'baseline supermarket' does not provide an appropriate benchmark for achieving the second and third credit, the design team can still comply with the criteria by demonstrating a reduction in indirect greenhouse gas emissions (CO_2 eq.) against an alternative baseline. The design team must confirm details of the alternative baseline system used and that it is based on a typical installation/technology for that building type. The systems being compared must have the same duty and service conditions and includes the relevant consumption from the refrigeration systems ancillary equipment
CN4	Calculating indirect Greenhouse Gas emissions (CO_2 eq.) See criteria 4 & 6	The indirect emissions must be calculated in accordance with the procedures in BS EN 378-1[4], Refrigerating System and Heat Pumps Safety and Environmental Requirements, Annex B (total equivalent warming impact). Further detail on applying this method to calculate the indirect emissions is available in the Guideline Methods of Calculating TEWI[5] published by the British Refrigeration Association.

Ref	Terms	Description
CN5	Components on the ECA Energy Technology Product List See criterion 1b	Where specified as part of the refrigeration system, products used for the following components must be listed on the ECA Energy Technology Product List (or equivalent list): 1. Air cooled condensing units 2. Automatic air purgers 3. Cellar cooling equipment 4. Commercial service cabinets (cold food storage) 5. Curtains, blinds, sliding doors and covers for refrigerated display cabinets 6. Evaporative condensers 7. Forced air pre-coolers 8. Liquid pressure amplification 9. Refrigerated display cabinets 10. Refrigeration compressors 11. Refrigeration system controls
CN6	Future refrigeration technology	Below are some of the types of future technology listed in the Carbon Trust Refrigeration Road Map action plan at the time of writing. Other types of technology not listed may become available. Where this is the case and the design team wish to have this recognised, they can apply for a BREEAM Innovation credit. Where such an application is approved, the type of technology will be added to the list below and credit made available to all buildings using that application (until such time as BRE Global updates/removes the list in future BREEAM versions, due to the technology becoming standard specification). 1. Acoustic refrigeration 2. Air cycle 3. Ammonia (sealed hermetics) 4. Automation and vending type cabinets (retail buildings) 5. Electrocaloric refrigeration 6. Hydraulic refrigeration 7. Magnetic refrigeration 8. Optical cooling 9. Peltier or thermo-electric devices 10. Pulsed electrical thermal de-icers 11. Stirling cycle variations 12. Thermionic refrigeration 13. Vortex tube cooling Where other technologies are added to the Carbon Trust list, these will be recognised by BREEAM.
CN7	Extensions to existing buildings	If the assessed building is an extension to an existing building and there is cold storage plant in the existing building that will serve the new extension, then this plant must meet the criteria in order to achieve any available credits.
CN8	Shell only	Where a cold storage system will be required and installed by a future tenant, compliance with this BREEAM issue can be demonstrated via one of the following means for shell only/speculative buildings/areas: 1. Option 1 – Use of a tenancy lease agreement between the developer and tenant/s (full value of available credits)

Ref	Terms	Description
		2. Option 2 – A Green Building Guide for tenant fit outs (half the value of the available credits) 3. Option 3 – Developer/Tenant collaboration (full value of available credits) Refer to the Scope of BREEAM 2011 New Construction section of this Scheme Document (section 2) for further description of the above options.

Schedule of Evidence

Ref	Design stage	Post-construction stage
1, 3 & 5	Relevant section/clauses of the building specification or contract or other documentary evidence, such as a letter from the design team. A letter from the manufacturer/supplier or copies of their technical literature AND/OR a print out of the ETPL listing the specific products.	As design stage.
2, 3 & 5	Evidence as outlined under BREEAM issue Man 01 Sustainable procurement for the relevant criteria.	Evidence as outlined under BREEAM issue Man 01 Sustainable procurement for the relevant criteria.
4&6	Documentary evidence confirming the type of technology specified and estimated savings in indirect greenhouse emissions, including a description of how this saving is achieved. Calculations should be carried out by an appropriately qualified professional (e.g. a building services engineer) including justifications for assumptions and methodologies for savings in indirect greenhouse emissions.	As design stage plus confirmation of installed technology.

Additional Information

Relevant definitions

ECA Energy Technology Product List (ETPL)

The ETPL 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.

Indirect operational greenhouse gas emissions

These are the indirect greenhouse gas emissions that result from the production of energy used to power the refrigeration systems cooling plant. This includes the emissions from the production of grid electricity or an onsite source of energy generation e.g. Gas CHP. In the case of refrigeration systems the term 'direct greenhouse gas emissions' is also used, this refers to the emissions that occur as a direct result of leakage of refrigerant from the system. The impacts of direct greenhouse gas emissions from refrigeration systems are dealt with in the BREEAM issue Pol 01 Impact of refrigerants. Therefore, only indirect emissions resulting from the energy consumption of the system are covered in this issue.

Checklists and Tables

None

Calculation procedures

None

Other Information

None

---

[1]Commercial Refrigeration Code of Conduct for Reducing Carbon Emissions, Carbon Trust, British Refrigeration Association, Institute of Refrigeration (due for publication June 2011).
[2]www.eca.gov.uk
[3]Refrigeration Road Map – An action plan for the retail sector, Carbon Trust 2010, www.carbontrust.co.uk/Publications/pages/publicationdetail.aspx?id=CTG021
[4]BS EN 378:2008 Refrigerating systems and heat pumps. Safety and environmental requirements, BSI.
[5]Guideline Methods of Calculating TEWI Issue 2, (2006), BRA Specification.

Ene 06 Energy efficient transportation systems

Number of credits available	Minimum standards
2	No

Aim

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

Assessment Criteria

The following is required to demonstrate compliance for:

One credit

1. Where either lifts, escalators or moving walks (transportation types) are required:
    a. An analysis of the transportation demand and usage patterns for the building has been carried out by the design team to determine the optimum number and size of lifts (including counter-balancing ratio), escalators and/or moving walks.
    b. The energy consumption has been estimated for one of the following:
        i. At least two types of system (for each transportation type required) or
        ii. An arrangement of systems (e.g. for lifts, hydraulic, traction, MRL) or
        iii. A system strategy which is 'fit for purpose' (scheduling)
    c. The lift/escalator/moving walk system/strategy with the lowest energy consumption is specified.

One credit

2. Criteria 1 is achieved.
3. For lifts, of the following energy-efficient features the three that offer the greatest potential energy savings are specified:
    a. The lifts operate in a stand-by condition during off-peak periods. For example the power side of the lift controller and other operating equipment such as lift car lighting, user displays and ventilation fans switch off when the lift has been idle for a prescribed length of time.
    b. The lift car uses energy-efficient lighting and display lighting i.e. an average lamp efficacy, across all fittings in the car, of > 55 lamp lumens/ circuit watt and lighting switches off after the lift has been idle for a prescribed length of time.
    c. The lift uses a drive controller capable of variable-speed, variable-voltage, variable-frequency (VVVF) control of the drive motor.
    d. The lift has a regenerative drive unit so that any energy generated by a traction lift (due to running up loaded to less than the counterbalancing ratio or running down loaded to more than the counter balancing ratio) or by a hydraulic lift (due to running down) is returned back to the electricity utility supplier or used elsewhere in the building.
4. For escalators and/or moving walks, each escalator and/or moving walk complies with EITHER of the following:

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

Compliance Notes

Ref	Terms	Description
CN1	Shell Only/Speculative developments	Typically lifts and escalators will be specified and installed by the developer as part of the base build. If the future tenant will be responsible for specifying some or all of these items, then compliance can be demonstrated via one of the following available means: 1. Option 1 – Use of a tenancy lease agreement between the developer and tenant/s (full value of available credits) 2. Option 2 – A Green Building Guide for tenant fit outs (half the value of the available credits) 3. Option 3 – Developer/Tenant collaboration (full value of available credits) Refer to Appendix D – BREEAM New Construction and shell and core/speculative assessments of this Scheme Document for further description of the above options. If responsibility for the transportation systems specification and installation is shared by each party (developer and tenant), then compliance can be demonstrated via a combination of the base build design drawings/site inspection and one of the above options. Note; where option two is used as a means of demonstrating compliance in this manner, only half the value of the credits available can be awarded.
CN2	Counter balancing ratio requirement See criterion 1	Lifts have a specified rated load and as such the counterbalancing ratio will be set accordingly (generally the counterbalance ratio used is between 40% and 50%). Provided the type, number of lifts and the rated lift load specified, is based on an appropriate analysis of the transportation/lift passenger demand and traction required for the building, then the counterbalancing ratio can be considered optimised for the purposes of compliance with BREEAM.
CN3	Exemptions	The criteria relating to lifts within this issue do not apply to lifting platforms, wheelchair stairlift/platforms or other similar facilities to aid persons with impaired mobility. However, any lift with a rated speed greater than 0.15m/s must be assessed inclusive of goods, vehicle, passenger and impaired mobility lifts.
CN4	Building has no lifts, escalators or moving walks	Please note this issue will not be assessed where a building contains no lifts, escalators or moving walks.
CN5	Lift car lighting	The requirement for switching off the lift car lighting after the lift has

Ref	Terms	Description
	See criterion 3b	been idle for a prescribed length of time shall not affect any lift emergency lighting requirements, which will switch on automatically in the event of any loss of power.

Schedule of Evidence

Ref	Design stage	Post-construction stage
1-2	Professional report/study of transportation analysis AND/OR Calculations	As design stage
3-4	Relevant section/clauses of the building specification or contract AND EITHER Manufacturers products details OR Formal letter of commitment from the system(s) manufacturer/supplier	Manufacturers products details BREEAM Assessor's site inspection report and photographic evidence AND/OR "As built" drawings

Additional Information

Relevant definitions

Counterbalancing ratio

Traction lifts may use a counterweight to balance the weight of the car plus a proportion of the rated load; 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. Counterbalancing ratios are normally provided in the range of 40-50% for safety reasons. Any other values should be carefully considered. Hydraulic lifts may use a balance weight to balance out a proportion of the weight of the car; this reduces the size of the drive motor required for the lift.

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

It has been estimated that approximately 5% of a building's total energy consumption can be attributed to the operation of lifts and a large proportion of this in many situations can be attributable to standby mode.

A Working Group of an International Standards Organisation's Technical Committee (Working group number ISO/178/WG10) is developing a draft standard for the Energy performance of lifts, escalators and moving walks. This draft standard outlines proposed procedures to be used when making energy measurements of lifts, escalator and moving walks. The Working Group is also preparing CD25745-2 to provide an energy classification system for lifts, escalators and moving walks.

Lift car lighting

The level of lift car lighting is determined by the relevant standards. For example, BS EN81-1/2: 1998+A3:2009 requires 50 lux on the car floor and any control surfaces

M.R.L.: Machine Room Less lift

All equipment is contained in the lift well, not in a separate machine room.

Standby condition

A condition when a lift is stationary at a floor and has reduced the power consumption to the minimum level set for that particular lift and terminates at the next traffic demand [from ISO/DIS25745-1]. The period between when the lift was last used and when standby condition is entered is not defined, but should be as short as possible without compromising any safety requirements

Checklist and Tables

None

Calculation procedures

None

Other information

Bibliography - CIBSE Guide D: 2010 Transportation systems in buildings, Chapter 13, 4th Edition.

Ene 07 Energy efficient laboratory systems

Number of credits available	Minimum standards
Building type dependent	No

Aim

To recognise and encourage laboratory areas that are designed to minimise the CO_2 emissions associated with their operational energy consumption.

Assessment Criteria

The following is required to demonstrate compliance for:

One credit

School, Sixth Form College and Further Education buildings only (criteria 1-3)

1. Recirculatory filtered fume cupboards (as oppose to ducted fume cupboards) are specified as the preferred option for the majority of applications (see Compliance notes where ducted fume cupboards may be acceptable).
2. If ducted fume cupboards are specified, the fume cupboards have a face velocity of less than or equal to 0.5 m/s (see Compliance notes).
3. The specification of fume cupboards has been carried out in accordance with all relevant guidelines and recommendations contained in;
    a. Schools and sixth form: Building Bulletin 88[1] and if relevant:
        i. BS 7989:2001[2] (for recirculatory fume cupboards)
        ii. BS EN 14175-2[3] (for ducted fume cupboards, if applicable)
    b. Further Education colleges: In accordance with the above British Standards, or for fume cupboards in labs for subjects up to and including A Level, compliance with Building Bulletin 88 would also be acceptable.

Other building types with laboratories (criterion 4.)

4. Laboratories with fume cupboards and/or other containment devices meet the following requirements:
    a. Compliance with the laboratory fume cupboards and containment areas criteria 17 and 18 in issue Hea 02 Indoor air quality.
    b. Compliance with item a) in Table - 13
    c. The measurement of volume flow rates in the exhaust duct (at the boundary of the laboratory) take account of reductions in (inward) fume cupboard leakage
    d. A reduction in air flow does not compromise the health and safety of the building occupants.

An additional two to four credits (applicable where the laboratory area accounts for at least 10% of the total building floor area - see also Compliance notes)

5. Criteria 1-4 are achieved (unless the laboratory has no fume cupboards and/or containment devices in which case the maximum number of credits available is either 2 or 4 as indicated in 6a. or 6b. below)
6. Laboratory plant and systems are designed, specified and installed in compliance with items b to l in Table - 13 (see (a) and (b) below and Additional Information for how credits are awarded)

a. Up to 2 credits: The laboratory area accounts for at least 10% (but less than 25%) of the total building floor area OR
b. Up to 4 credits: The laboratory area accounts for at least 25% of the total building floor area.

7. To achieve credit for an item, that chosen item must have a reasonably significant effect on the total energy consumption of the laboratory i.e. 2% reduction or greater. This must be demonstrated by calculations or modelling.
8. The energy efficient measures taken must not compromise the health and safety of the building occupants.

Compliance Notes

Ref	Terms	Description
CN1	Synergy with BREEAM issue Ene 01 Reduction of emissions	This BREEAM issue has been developed to recognise improvements made to laboratory areas/buildings, as part of the design and procurement of the building, that currently are not recognised fully through the National Calculation Methodology used to assess and award credits in Ene 01 Reduction of CO_2 Emissions.
CN2	Building has no laboratory areas and fume cupboards	Please note that where a building contains no laboratory space and fume cupboards this issue is not applicable and will not require assessment.
Schools, Sixth Form and Further Education buildings		
CN3	Criterion 3 for schools and sixth form	For fume cupboards specified/installed for up to and including A' Level subjects, specification and installation in accordance with Building Bulletin 88 will be acceptable for BREEAM compliance. BS7989 and parts of BS14175 may be relevant to some installations, such as those that will use ducted fume cupboards. In these cases the person/organisation responsible for producing/installing the equipment should be able to confirm their relevance given the type of fume cupboard installation.
CN4	Filtered vs. Ducted fume cupboards See criteria 1, 2, 3 & 4	The performance specifications for fume cupboards used in schools tend to be lower than that required for universities, research institutes and industry. As a result, typically, filtered fume cupboards i.e. those not requiring a ducted system for extract, are the most energy efficient option for schools (up to and including A Level subjects). However, where the project requires ducted fume cupboards for the purpose of meeting the brief, the credit can still be awarded. For example, where the nature of the laboratory space and the type of experiments undertaken require, for health and safety reasons, full extraction from the internal space. This is only likely to be the case for a building undertaking lab based research that exceeds A Level subject

Ref	Terms	Description
		areas, i.e. commercial R&D labs and some further or higher education functions/subjects.
CN5	Criterion 2 (schools/FE) Fume cup-board face velocity	CIBSE Guide B2[4] recommends a face velocity of 0.5m/s in order to achieve good containment but advises that adequate containment may be achievable at lower face velocities. Due to safety considerations however, in some circumstances meeting the requirement for a face velocity of 0.5 m/s may not be feasible. Where this is not achievable, justification must be provided and the lowest possible face velocity specified for the degree of containment required. For schools, up to and including A Level chemistry, there is unlikely to be a requirement for fume cupboards to exceed a face velocity of 0.5m/s, based on the current curriculum demands.
Other buildings including Higher Education		
CN6	Determining the per-centage of laboratory area See criterion 6	Laboratories are defined as highly serviced (temperature/ventilation/humidity/containment controlled) spaces where physical/biological or chemical processing and/or testing is carried out. Such areas will have an inherently high energy requirement. Therefore, for the purpose of assessing this BREEAM issue, the definition of laboratory areas excludes any laboratory support areas such as: 1. Write up/offices 2. Meeting rooms 3. Storage 4. Ancillary and other support areas with lower servicing requirements. Teaching and other laboratories/workshops with a limited amount of fume cupboards or other containment devices and/or no energy intensive process equipment specified are excluded, unless the design team can provide evidence that their consumption is at least 50% higher than a typical office due to the laboratory process related activities. Benchmarks for general offices can be found in Table 1 in CIBSE TM46[5] Energy Benchmarks. Typically, in buildings where 40% of the floor area is laboratory related, only 10% will actually constitute laboratory areas as per the BREEAM definition.
CN7	Awarding the addi-tional cred-its See criterion 6	When awarding credits using the additional items listed in Table - 13, please note that only whole credits can be awarded. Therefore, for example, where three and half credits are achieved this would need to be rounded down to three credits.

Schedule of Evidence

Ref	Design stage	Post-construction stage
School, Sixth Form College and Further Education buildings		
All	Relevant section/clauses of the building specification or contract AND/OR supplier/manufacturers documentation	BREEAM Assessor's site inspection report and photographic evidence AND/OR 'As built' drawings Supplier/manufacturers/design team documentation for 'as built' specification
Other buildings including Higher Education buildings		
All	Evidence as required for compliance with the relevant Hea 02 criteria. Drawings, relevant section/clauses of the building specification or contract Modelling results/calculations/manufacturers information Formal correspondence from the design team	As design stage but for 'as built' information BREEAM Assessor's site inspection report and photographic evidence AND/OR 'As built' drawings. A commissioning report demonstrating that the design containment performance and airflows have been achieved.

Additional Information

Relevant definitions

Laboratory Areas

A laboratory is a facility designed for collection, processing and/or testing of specimens or procedures, some of which may be hazardous. In order to maintain controlled conditions to enable experiments and comply with health and safety standards, typically laboratories:

1. Contain various exhaust and containment devices (such as fume cupboards and microbiological safety cabinets)
2. Are heavily serviced to circulate air and to supply heating, cooling, humidity, and clean air
3. Often require 24-hour access and fail-safe redundant backup systems and uninterrupted power supply or emergency power to enable irreplaceable experiments.

As a consequence laboratories can consume up to 4 times more energy than the typical office.

From www.labs21.org.uk:

Different types of laboratories have different requirements for HVAC, plug load equipment and access. This can lead to enormous variations in energy and water requirements.

The main types of laboratories include:

1. Wet laboratories - where chemicals, drugs or other material or biological matter are tested and analysed requiring water, direct ventilation and specialised piped

utilities. Typically includes chemical science laboratories. These laboratories require specially designed facilities.

2. Dry laboratories - contain dry stored materials, electronics, and/or large instruments with few piped services. Typically includes engineering or analytical laboratories that may require accurate temperature and humidity control, dust control, and clean power.
3. Microbiological/clinical laboratories - often involve working with infectious agents. Typically require higher levels of primary containment and multiple secondary barriers including specialized ventilation systems to ensure directional air flow, air treatment systems to decontaminate or remove agents from exhaust air, controlled access zones, airlocks as laboratory entrances, or separate buildings or modules to isolate the laboratory.
4. In vivo laboratories - these require highly controlled environments for the care and maintenance of flora and fauna. The facilities are complex, and expensive to build and to operate. Tight environmental control over the facility is required to avoid the introduction of contaminants or pathogens, and prevent the possibility of infectious outbreaks, and avoid the transmission of odours.
5. Teaching laboratories - unique to academic institutes, they require space for teaching equipment, storage space for student belongings and less instrumentation than research labs.
6. Cleanrooms - refers to a controlled environment (air quality, temperature and humidity) which prevent contamination and the regulating of environmental conditions, to facilitate accurate research and production needs. Typically used in UK universities for Nanotechnology, medical and pharmaceutical research/studies and microelectronics applications.

Checklists and Tables

Table - 13: Best Practice Energy Practices in Laboratories

Item	Category	Item Description	Credits 1
a.	Fume cupboard reduced volume flow rates	An average design air flow rate in the fume cupboards specified no greater than 0.16m^3/s per linear metre (internal width) of fume cupboard workspace	1
Additional Items			
b.	Fan power	Specification and achievement of best practice fan power figures (as per Table - 14) for all air handling units, laboratory extract systems, local extract ventilation, containment area extracts (where applicable) and fume cupboard extracts (where applicable).	1
c.	Fume cupboard volume flow rates (further reduction)	An average design air flow rate of <0.12m^3/s per linear metre of	0.5

Item	Category	Item Description	Credits 1
		sash opening.	
d.	Grouping and/or isolation of high filtration/ventilation activities	Minimisation of room air change rates and overall facility ventilation flows by grouping together or isolating activities and equipment with high filtration or ventilation requirements.	0.5
e.	Energy recovery - heat	Heat recovery from exhaust air (where there is no risk of cross-contamination) or via refrigerant or water cooling systems.	0.5
f.	Energy recovery – cooling	Cooling recovery via exhaust air heat exchangers (where there is no risk of cross-contamination) or via refrigerant or water cooling systems.	0.5
g.	Grouping of cooling loads	Grouping of cooling loads to enable supply efficiencies and thermal transfer.	0.5
h.	Free cooling	Specification of free cooling coils in chillers or dry air coolers related to laboratory-specific activities.	0.5
i.	Load responsiveness	Effective matching of supply with demand through modularity, variable speed drives and pumps, and other mechanisms.	0.5
j.	Clean rooms	Specification of particle monitoring systems, linked to airflow controls.	0.5
k.	Diversity	Achievement of high levels of diversity in central plant sizing and laboratory duct sizing, where compatible with safety.	0.5
l.	Room air changes rates	Reducing air change rates by matching ventilation airflows to environmental needs and demands of containment devices.	0.5

Item	Category	Item Description	Credits 1
1. Only whole credits can be awarded in BREEAM. Therefore to achieve credit for items c to l (above) the laboratory must comply with at least two of the items.			

Table - 14: Best Practice Specific Fan Power

Laboratory system	Specific fan power (W/l/s)
General laboratory supply air AHUs with heating and cooling	1.5
General laboratory extract systems	1.2
Laboratory local extract ventilation – ducted	1.0
Containment area extract, without HEPA filtration	1.5
Containment area extract, with HEPA filtration	2.5
Fume cupboard extract	1.5

Calculation procedures

None

Other information

Further information on the more complex items in Table - 13: Best Practice Energy Practices in Laboratories

The notes below are provided as a means of explanation and advice concerning the items in the above tables, they are not part of the assessment criteria.

Items a. and c. Volume flow rates for fume cupboards

BS EN 14175 defines a fume cupboard as a protective device to be ventilated by an induced flow of air through an adjustable working opening.

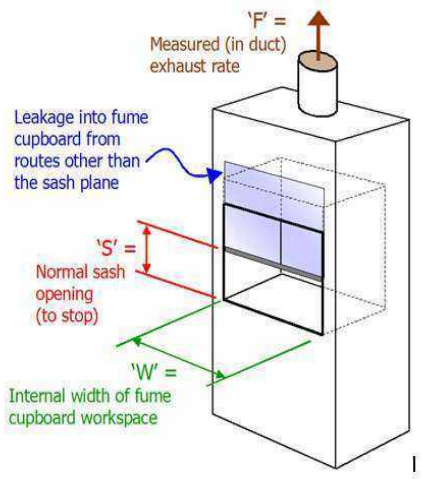


Figure 4: Conventional vertical-sash fume cupboard

The figure above demonstrates a traditional arrangement for a fume cupboard, this arrangement would typically involve:

1. A constant volume configuration, that is, as the sash is lowered it uncovers a by-pass grille at high level on the front face of the fume cupboard.
2. Flat, non-aerodynamic sides so that the internal width of fume cupboard workspace ('W') is very close to the external dimension.
3. A normal sash opening height, to stop, ('S') of 0.5m.
4. A volume flow rate expressed to produce a face velocity ('W' x 'S') of 0.5ms-1.

It should also be noted that the exhaust airflow will increase further as a result of leakage into the fume cupboard from routes other than the sash opening (good practice would have an objective of < 5%, although levels of > 25% are not unknown in the UK). The overall airflow situation for a flat-sided, vertical-sash fume covered can therefore be summarised as:

Exhaust Airflow 'F' = 'W' x 'S' x Face Velocity + Leakage

Applying the traditional norms and considering a 1.0m wide fume cupboard gives an exhaust airflow demand per linear (internal) metre of:

Exhaust Airflow 'F' = 1.0m x 0.5m x 0.5ms-1 + Leakage

Exhaust Airflow 'F' = $0.25m^3s-1$ + Leakage

Reductions in exhaust air flows can be achieved.

A range of tried and tested options are available to reduce exhaust air flows below the traditional norm of $0.25m^3s-1$. These include:

1. Reduced volume flow rates (translating into lower face velocities), being enabled/validated by means of objective risk analysis.
2. Improved aerodynamics producing effective containment with lower volume flow rates/face velocities.
3. Lower sash openings (reduced sash stop settings): for instance Scandinavian experience supports 0.4m (rather than 0.5m) as producing advantages in ergonomics, safety, and energy efficiency.
4. Reduced width of sash opening (per linear metre of internal space): examples can include the use of aerodynamic entry 'cheeks' and horizontal/combination sashes.
5. Reduced leakage.
6. Variable air volume (VAV) extract with VAV supply tracking for make-up air with + 10% accuracy.

The application of this metric must necessarily recognise a variety of factors associated with the installation of fume cupboards in labs, including:

1. All flow rates should be measured at the cupboard exhaust to ensure that leakage is taken into account.
2. Where there are multiple fume cupboard exhaust duct connections from the laboratory the total shall be used in the calculation of the metric.
3. Where variable air volume (VAV) exhaust control systems are provided the average airflow rate shall be used ('F' = 0.5['F_{open}'+'F_{closed}'] where 'F_{open}' is the situation with all fume cupboards open and 'Fclosed' is the situation with all fume cupboards closed).
4. Where a laboratory exhaust system is arranged to have a night set-back condition (for example, such as 100% system flow rate for 12 hours/day when a particular lab is likely to be occupied and a reduction to 50% for 12 hours/day when the lab is unoccupied), then the time-weighted average value for 'F' shall be calculated. This type of system is associated with situations in which a 24 hour flow through the fume cupboard(s) is required for reasons of safety, irrespective of the presence of users.
5. The flow of CAV cupboards with two position operation should be calculated as the average of the high and low flow rates.
6. For horizontal sash fume cupboards (with multiple, overlapping, horizontally-sliding sash panes) the operating conditions (sashes open and closed) shall be as defined and set out in Part 3 of BS EN 14175.

Although a variety of sizes and types of fume cupboard may be installed in a laboratory, the metric will be unaffected since the total of the internal spaces will be used in the calculation. Examples of situations justifying the award of the credit can be given, as below:

Example 1: Lab with 6 x 1.5m Constant Volume Fume Cupboards

1. Sash height ('S') set at 0.4m.
2. Aerodynamic 'cheeks' giving a sash opening of 1.2m (for 'W' = 1.5m).
3. Face velocity of 0.45ms-1.
4. Leakage of 5%.
5. Total exhaust volume 'F' = 6 x 0.4 x 1.2 x 0.45 x 1.05 = 1.3608m^3s-1.
6. Total linear m (fume cupboard internal workspace) = 6 x 1.5 = 9.0m.
7. Exhaust volume/linear metre = 1.3608m^3s-1/9.0 = 0.1512m^3s-1, and therefore qualifies for the award of the first credit on the basis of being < 0.16m^3s-1.

Example 2: Lab with 10 x 1.4m Variable Volume Fume Cupboards

1. Sash height ('S') set at 0.5m.
2. Flat sides giving a sash opening of 1.4m (for 'W' = 1.4m).
3. Face velocity of 0.4ms-1.
4. Leakage of 5%.
5. Total VAV exhaust volume with sashes open 'Fopen' = 10 x 0.5 x 1.4 x 0.4 x 1.05 = 2.94m^3s-1.
6. Total VAV exhaust volume with sashes closed (turndown of 4:1) 'Fclosed' = 0.25 x 2.94 = 0.735m^3s-1.
7. Average (sashes open and closed) total VAV exhaust volume 'F' = 0.5 (2.94 + 0.735) = 1.8375m^3s-1.
8. Total linear m (fume cupboard internal workspace) = 10 x 1.4 = 14.0m.
9. Exhaust volume/linear metre = 1.8375m^3s-1/14.0 = 0.13125m^3s-1, and therefore qualifies for the award of the first credit on the basis of being < 0.16m^3s-1.

Item b. Fan Power

The figures in Table - 14 are based on best practice and experience at the University of Cambridge. Fan power requirements can be reduced by a variety of means, including:

1. Use of variable speed drives.
2. Use of VAV fume cupboards and other containment devices with modular (or VAV) extract fans.
3. Low pressure drop design, which aims to reduce resistance within the ventilation system by techniques such as low pressure drop air handling units, optimised sizing of ducts and optimised

layouts to reduce unnecessary bends and distortions (most easily enabled by use of 3D modelling software).

Item d. Grouping and/or isolation of high filtration/ventilation activities

The aim of this strategy is to avoid disproportionately high ventilation rates in all, or a significant proportion, of a laboratory simply because it is required by a few activities or items of equipment. Examples include:

1. Isolation of areas with higher standards (fewer particles per cubic metre of air) in clean rooms so that the need for higher air flows is confined to a part of the room.
2. Specification of Individually Ventilated Cages (IVC) and isolators (where applicable) to provide individual conditions where needed, to reduce the need for high air change rates for the entire space, subject to agreement with the local Home Office inspector.

Items e. and f. Energy recovery

This should be by controllable methods (e.g. face & bypass) to avoid recovering unwanted heat that leads to re-cooling or re-heating.

Item i. Load responsiveness

The aim of this strategy is to reduce the energy consumption of laboratory-specific equipment or systems by avoiding plant operating at sub-optimal levels of load and/or creating wasted outputs through a greater responsiveness to changes in demand. Examples of how this can be achieved include:

1. Installation of modularised cooling or ventilation so that units can be switched off at periods of low demand.
2. Specification of variable flow pumping systems in which the variable flow system is designed to reduce energy consumption, not for other purposes (e.g. commissioning adjustments).
3. Demand controlled ventilation related to laboratory activities, e.g. through measurement of pollutants (i.e. excluding conventional CO_2-based occupancy sensing).

Note: Installation of VAV fume cupboards and/or use of variable speed drives are generally excluded from this item as they are taken into account through items a., b. and c. However, the provision of controls that allow face velocities to be adjusted to individual fume cupboards in large VAV fume cupboard installations does qualify.

Item j. Particle monitoring systems in clean rooms

From an energy perspective, these systems are of benefit if they are used to reduce the air change rates within clean rooms. Hence, evidence must be provided that this has been achieved through linkages to air flow controls.

Item k. Diversity

Where large numbers of fume cupboards or similar containment devices are used, it is very unlikely that all will be operating at maximum flow rates simultaneously. Hence, diversity factors can be applied to central plant sizing and laboratory duct sizing. The levels achieved should be equivalent to, or better than, recent Oxford University installations where a diversity of 70% has been applied to the laboratory, and 50% to central plant. Note that the safety of any such diversity factors must be assessed in accordance with BS EN 14175 and other relevant guidance.

Item l. Air change rates

In most new or refurbished laboratories, specified air change rates are not evidence-based but are derived from 'traditional', empirically-derived, norms or long standing operational codes which have not been updated. Achieving this credit requires a calculated and validated matching of ventilation airflows to environmental needs and the demands of containment devices, which will require:

1. Identification of a documented reference case against which the achieved air change rates can be compared, e.g. a similar facility, guidance materials, and a demonstration that a lower air change rate has been achieved;
2. Calculation of the ventilation air flow necessary to 'feed' the various containment devices located within the laboratory having given due regard to commissioning and operational tolerances, variable volume system diversity, future flexibility, and control/pressure regime functional bands;
3. Calculation of the ventilation air flow necessary to satisfy other demands within the laboratory including those of occupancy, equipment heat gain, lighting heat gain, and solar gains;
4. Use of techniques such as mock-ups/full-size modelling and Computational Fluid Dynamics (CFD) to verify the effectiveness of the proposed design solutions (investigating issues including 'spot' air change rates, spillage clearance performance, and air input system/containment device interactions);
5. Assurance that the chosen air change rates do not jeopardise safety (which will normally involve acceptance by relevant health and safety authorities, e.g. university safety officers, Home Office inspectors).

---

[1]Building Bulletin 88: Fume Cupboards in Schools (Revision of Design Note 29), Department for Education and Employment, 1998.
[2]BS 7989 Specification for recirculatory filtration fume cupboards, BSI, 2003.
[3]BS EN 14175-2:2003 Fume cupboards - Part 2: Safety and performance criteria, BSI, 2003.
[4]Guide B2 Ventilation and air conditioning, CIBSE, 2001.
[5]TM46 Energy Benchmarks. CIBSE, 2008.

Ene 08 Energy efficient equipment

Number of credits available	Minimum standards
2	No

Aim

To recognise and encourage procurement of energy-efficient equipment to ensure optimum performance and energy savings in operation.

Assessment Criteria

The following is required to demonstrate compliance for:

Two credits

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

Ref	Function/ equipment	Criteria
A	Small power, plug in equipment	The following equipment EITHER qualifies for an Enhanced Capital Allowance Scheme[1] claim (i.e. is on the Energy Technology Product List, ETPL) OR has been awarded an Energy Star[2] rating OR has been procured in accordance with the Government Buying Standards[3] OR are identified as products with at least a 'green tick' standard on the Buying Solutions[4] website. 1. Office equipment 2. Domestic scale white goods and other small powered equipment 3. Supplementary electric heating.
B	Swimming pool	1. Where automatic or semi-automatic pool covers or 'liquid' pool covers with an automatic dosing system are fitted to ALL pools, including spa pools and jacuzzi (if relevant). 2. The covers envelop the entire pool surface when fully extended. 3. Where the air temperature in the pool hall can be controlled so that it is 1 ^{O}C above the water temperature.
C	Communal laundry	At least one of the following can be demonstrated for commercial sized appliances: 1. Specification of heat recovery from waste water

Ref	Function/ equipment	Criteria
	facilities with commercial sized appliances	2. Use of greywater for part of the washing process i.e. either water from the final rinse used for the next pre-wash or water sourced from a rain water collection tank(s) 3. The commercial or industrial sized machine(s) is identified as eligible for the UK's Enhanced Capital Allowance Scheme.
D	Data Centre	1. Design is in accordance with the 'Best practices for the EU Code of Conduct on Data Centres'[5] principles with the data centre achieving at least the 'Expected minimum practice' level (as defined in the Code of Conduct). 2. Temperature set points are not less than 24°C, as measured at the inlet of the equipment in the rack.
E	IT-intensive operating areas	1. Uses a natural ventilation and cooling strategy as standard, with forced ventilation only to be used when the internal temperature exceeds 20°C and active cooling only when the internal temperature exceeds 22°C. 2. There is a mechanism to achieve automatic power-down of equipment when not in use, including overnight.
F	Residential areas with domestic scale appliances (individual and communal facilities)	1. Fridges, fridge freezers, washing machines, tumble dryers and dishwashers are all recommended by the Energy Savings Trust website[6] 2. Washer-dryers have a B rating (or better) under the EU Energy Efficiency Labelling Scheme. OR 3. If appliances will be purchased during occupation by the tenant/owner, information on the EU Energy Efficiency Labelling Scheme of efficient white goods must be provided to the residential aspect of the building. Note: 1. Any white goods available to purchase from the developer must be compliant with criteria F1 and F2 above. 2. If criteria F3 is chosen to demonstrate compliance, only one of the two available credits can be awarded.
G	Healthcare	1. The procurement of large scale equipment (where present, see Compliance note) and sets of electrical equipment (where numbering more than 50) has been informed and selected by life cycle costing analysis in accordance with HTM07-02, Chapter 3.0[7] 2. For each piece of equipment at least two options 'fit for purpose' have been analysed and the option(s) specified are those that demonstrate better performance in terms of: a. Direct running costs b. Indirect running costs and additional administration costs c. Cost of disposal d. Spending to save

Ref	Function/ equipment	Criteria
		e. Recyclability f. Improved manageability g. Energy performance h. Reduced harmful emissions to the atmosphere i. Improved services, comfort and productivity.
H	Kitchen and catering facilities	Where the project team can demonstrate that the project has incorporated at least one energy efficiency measure outlined in each of the following sections of CIBSE Guide TM50[8]: 1. Section 8 (Drainage and kitchen waste removal) 2. Section 9 (Energy controls - specifically controls relevant to equipment), 3. Section 11 (Appliance specification, fabrication specification - not utensil specification), 4. Section 12 (Refrigeration), 5. Section 13 (Warewashing: dishwashers and glasswashers), 6. Section 14 (Cooking appliance selection), 7. Section 15 (Water temperatures, taps, faucets and water saving controls)

Compliance Notes

Ref	Terms	Description
CN1	Shell only	Compliance with this BREEAM issue can be demonstrated via one of the following means for shell only/speculative buildings/areas: 1. Option 1 – Use of a tenancy lease agreement between the developer and tenant/s (full value of available credits) 2. Option 2 – A Green Building Guide for tenant fit outs (half the value of the available credits) 3. Option 3 – Developer/Tenant collaboration (full value of available credits) Refer to the Scope of BREEAM 2011 New Construction section of this Scheme Document (section 2) for further description of the above options.
CN2	Significant majority See criterion 1	BREEAM does not specify how "significant majority" is calculated as this may be complex. The project team must justify how they have determined or judged "significant majority" and the assessor must be satisfied that this is an appropriate justification.
CN3	Large-scale equipment in healthcare	This includes commercial-scale catering and laundry equipment, built-in cold storage and chilled rooms, lifts and escalators and all other equipment with connected electrical loads in excess of 10kW rated input power. All medical equipment can be exempted from complying with the criteria.

Ref	Terms	Description
	See criterion 1 Ref G	

Schedule of Evidence

Ref	Design stage	Post-construction stage
A-H	The following where appropriate: Relevant section/clauses of the building specification or contract. Manufacturers product details. Documentation confirming compliance with the relevant scheme or standard outlined in the criteria e.g. details of compliance with the ECA scheme. Design drawings and/or calculations.	The following where appropriate: BREEAM Assessor's site inspection report and photographic evidence Manufacturers product details Documentation confirming the installed equipment complies with the relevant scheme or standard outlined in the criteria
G only	Life cycle analysis report/documentation and details of how this has informed the procurement Documentation detailing the fit for purpose exercise and subsequent option selection.	As design stage

Additional Information

Relevant definitions

Buying Solutions

A website providing details of products meeting the performance specifications outlined in the Government's Buying Standards.

Data centre

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

Fit for purpose

This refers to the functional criteria that the piece of equipment is required to meet. Any option that is not fit for the purpose must not be considered or included in the analysis.

Government's Buying Standards

A website listing minimum and best practice standards for equipment being procured forprojects.

I.T-intensive areas

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

Life Cycle Cost analysis

A procurement evaluation technique which determines the total cost of acquisition, operation, maintenance and disposal of a product.

Office equipment

Computer monitors, desktop computers, scanners, photocopiers, printers, workstations etc.

Regulated energy

Refer to BREEAM issue Ene 01 Reduction of emissions.

Unregulated energy

Refer to BREEAM issue Ene 01 Reduction of emissions.

White goods and small power equipment

Domestic appliances for example washing machines, fridges and freezers, tumble dryers, air-movement fans/heaters, etc.

Checklist and Tables

None

Calculation procedures

None

Other information

None

---

[1]Enhanced Capital Allowance scheme, http://www.eca.gov.uk
[2]Energy Star labelling scheme, http://www.energystar.gov/index.cfm?c=products.pr_find_es_products
[3]Government Buying Standards, http://sd.defra.gov.uk/advice/public/buying/
[4]Buying solutions website http://www.buyingsolutions.gov.uk/aboutus/sustainability/sustainable-solutions/quickwins/
[5]EU Code of Conduct on Data Centres: http://re.jrc.ec.europa.eu/energyefficiency/html/standby_initiative_data%20centers.htm
[6]http://www.energysavingtrust.org.uk/Home-improvements-and-products/Home-appliances
[7]HTM 07-02: EnCO_2de, Making energy work in Healthcare, Department of Health, 2005.
[8]CIBSE TM50: Energy Efficiency in Commercial Kitchens, CIBSE

Ene 09 Drying space

Number of credits available	Minimum standards
1	No

Aim

To provide a reduced energy means of drying clothes.

Assessment Criteria

The following is required to demonstrate compliance for:

One credit

1. For self contained dwellings: An adequate internal or external space with posts and footings, or fixings capable of holding:
    a. 1 - 2 bedrooms: 4m+ of drying line
    b. 3+ bedrooms: 6m+ of drying line.

AND/OR

2. Individual bedrooms: An adequate internal or external space with posts and footings, or fixings capable of holding:
    a. 2m+ of drying line per bedroom for developments with up to 30 individual bedrooms plus
    b. 1.0m of additional drying line for each bedroom over the 30 individual bedroom threshold.

AND

3. The space (internal or external) is secure.

Compliance Notes

Ref	Terms	Description
CN1	Shell only	The provision of adequate drying space must be confirmed for any development seeking this credit. If the specification and installation of adequate posts and fittings, or fixtures for a drying line forms part of a subsequent fit-out of the building, and not a part of the base build, then compliance can be demonstrated via one of the following available means: 1. Option 1 – Use of a lease agreement between the building owner and landlord, if two separate parties (full value of available credits)

Ref	Terms	Description
		2. Option 2 – A Green Building Guide for fit outs (half the value of the available credits) 3. Option 3 – Confirmation of compliance is provided by the fit-out contractor or building landlord/owner (full value of available credits) Refer to Appendix D – BREEAM New Construction and shell and core/speculative assessments of this Scheme Document for further description of the above options
CN2	Multi-residential developments with CSH assessed dwellings See criterion 1	For buildings with self-contained dwellings also being assessed under the Code for Sustainable Homes (CSH), the following applies: Where CSH issue Ene 4 has been achieved for all dwellings assessed under the CSH, the requirements for self-contained dwellings under this issue are also met. If this is the case, the credit under this issue can be achieved provided any self contained dwellings not assessed under the CSH and/or individual bedrooms in the building meet the compliance requirements for this issue.
CN3	Adequate internal space See criteria 1 & 2	This is either; a heated space with adequate, controlled ventilation, complying with Building Regulations Approved Document F Ventilation 2006 (rooms that commonly meet these requirements are a bathroom or utility room). Or an unheated outbuilding, where calculations by an appropriate Chartered Institute of Building Services Engineer (CIBSE or equivalent professional) demonstrate that ventilation in the space is adequate to allow drying in normal climatic conditions and to prevent condensation/mould growth. The fixing/fitting needs to be a permanent feature of the room. Internal drying spaces in the following rooms do not comply: 1. Living rooms 2. Kitchens 3. Dining rooms 4. Main Halls 5. Bedrooms
CN4	Building has no residential areas	Please note that where a building contains no residential function this issue is not applicable and will not require assessment.
CN5	Supported living facilities	This issue does not apply to multi-residential assessments of supported living facilities (for safety reasons, to minimise ligature risk to particular residents).

Schedule of Evidence

Ref	Design stage	Post-construction stage
1	Design drawings AND/OR relevant	BREEAM Assessor's site inspection

Ref	Design stage	Post-construction stage
	section/clauses of the building specification or contract AND/OR a formal letter of instruction from the developer to a contractor/supplier Where relevant for multi residential buildings: Evidence in line with the Design stage evidence requirements of CSH issue Ene 4 OR A copy of the Design stage CSH certificate and report from the CSH online reporting system confirming the number of credits achieved for CSH issue Ene 4.	report and photographic evidence AND/OR 'As built' drawings. Purchase orders/receipts Where relevant for multi residential buildings: Evidence in line with the Post Construction stage evidence requirements of CSH issue Ene 4 OR A copy of the Post Construction stage CSH certificate and report from the CSH online reporting system confirming the number of credits achieved for CSH issue Ene 4.

Additional information

Relevant definitions

Secure space

For self contained dwellings this can be defined as an enclosed space only accessible to the residents of the dwelling. For buildings with a communal drying space it is an enclosed space with a secure entrance, accessible to the residents of the building only.

Checklist and Tables

None

Calculation procedures

None

Other information

None

Transport

Tra 01 Public transport accessibility

Number of credits available	Minimum standards
8	No

Aim

To recognise and encourage development in proximity of good public transport networks, thereby helping to reduce transport-related pollution and congestion.

Assessment Criteria

This credit is split into two parts:

- Accessibility index (up to 5 credits - building type dependent)
- Dedicated bus service (1 credit)

The following is required to demonstrate compliance for:

Accessibility index

Up to five credits

1. The public transport Accessibility Index (AI) for the assessed building is calculated and BREEAM credits awarded in accordance with the table of building types, AI benchmarks and BREEAM credits below:

Accessibility Index	≥2	≥4	≥8	≥10	≥12	≥18
Building Type	BREEAM credits available					
Business: Offices/Industrial, Multi-residential, Other building type 1	1	2	3	-	-	-
Pre-school, School, Sixth Form	1	2	3	-	-	-
Retail, Law Court, Further Education College, Higher Education type 1, Other building type 2	1	2	3	3	4	5
Higher Education type 2	1	2	3	4	5	-
Healthcare - Hospitals (Acute, Specialist, Teaching, Mental health)	1	2	3	3	4	5
Healthcare - GP surgery, Health cen-	1	2	3	4	5	-

Accessibility Index	≥2	≥4	≥8	≥10	≥12	≥18
tre, Community hospital						
Rural location sensitive buildings (see 'Building type definition' Compliance note), Other building type 3	1	2	-	-	-	-
Prison site, MOD site	1	2	-	-	-	-
Transport hub	1	2	3	3	3	4

2. The Accessibility Index is determined by entering the following information in to the BREEAM Tra 01 calculator:
    a. The distance (m) from the main building entrance to each compliant public transport node
    b. The public transport type(s) serving the compliant node e.g. bus or rail
    c. The average number of services stopping per hour at each compliant node during the standard operating hours of the building for a typical day (see Compliance notes and Table - 15 in the Additional Information section).

Dedicated bus service

One credit

3. For buildings with a fixed shift pattern i.e. where building users will predominantly arrive/depart at set times, one credit can be awarded where the building occupier will provide a dedicated bus service to and from the building at the beginning and end of each shift/day. The bus must provide transfer to the local population centre, public transport interchange or be a door-to-door service.
   This credit is available on the basis that the building is unable to achieve any of the available credits using the above methodology (i.e. it has a low Accessibility Index), yet the building occupier is providing a suitable alternative transport option (alternative to the use of a private vehicle for commuting) for a majority of the building users (see also Compliance note below).

Compliance Notes

Ref	Terms	Description
CN1	Operating hours See criterion 3	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 building types will operate a 24 hour 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 in the minority; such periods are not required to be accounted for in the assessment of this issue.

Ref	Terms	Description
		Where the assessed building operates on a 24-hour basis, or the operating hours are unknown at the time of assessment, then refer to and use the table of default operating hours, which can be found in the Additional Information section of this issue.
CN2	Compliant public transport node See criteria 2a & 2b	A compliant node includes any bus stop within 650m and any railway station within 1000m of the assessed building's main entrance, measured via a safe pedestrian route (not 'as the crow flies'). The service stopping at each node must provide transport from, or onward travel to, either an urban centre, major transport node or a community focal point e.g. doctor's surgery, library, school or village centre. Only local services should be assessed and any national public transport services should be excluded from the analysis, unless such a service can be said to provide a local commuter service. There is no limit on the number of nodes that can be considered when calculating the AI, provided they all meet the above criteria. Prison and M.O.D sites: The distance requirement for a compliant node for buildings on these sites is 1000m for both bus and rail.
CN3	Average number of services See criterion 2c	For the purpose of the calculation, the frequency of public transport is the average number of services per hour. This is calculated by determining the number of stopping services at the node during a typical day's operating hours, divided by the number of hours within the operating period. For example: the average number of services for an assessment of a building that operates between 8am - 7pm (11 hours) and is within proximity of a bus stop with 35 stopping services during this period is 3.2 (equivalent to an average service frequency of approximately 20 minutes).
CN4	Typical day See criterion 2c	The typical day is that which represents the period when travel to and from the building by its users and visitors will be at its highest. For most buildings this should be taken as a 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).
CN5	Building type definitions See criterion 1	Higher Education type 1: H.E buildings located on a campus where less than 25% of students are resident on the campus or within 1km radius from the campus' main entrance. Higher Education type 2: H.E buildings located on a campus where 25% or more of the students are resident on the campus or within 1km radius from the campus' main entrance. Other Building - transport type 1: A building predominantly occupied by staff/employees with occasional business related visitors. Other Building - transport type 2: A building occupied by a number of core staff/employees with a larger number of consistently frequent visitors/users (either resident or non resident).

Ref	Terms	Description
		Other Building - transport type 3: As type 2, but building types specifically required to be located rurally i.e. a building which would never be located within an urban area e.g. National Park visitor centre (see below for a definition of rural location). Rural: a rural location is defined in this context as a site clearly not within or on the boundary of a small, medium or large urban cover. An urban cover will have a population of 3000 or more, located within a tract of continuously built-up urban land extending 20 hectares or more. Therefore, the definition of rural includes village locations, green field sites or small urban centres with a population of less 3000 people within a tract of land no greater than 20 hectares. Such locations will most likely be on a local bus route to larger urban areas or other local towns and may have localised shops and other facilities. Rural location sensitive buildings: This definition includes any of the building types (listed below) where there is a demonstrable social or economic need from a rural population for the service/demand, which the new building is intended to meet; and therefore locating the building at an alternative site which could have higher public transport accessibility levels, i.e. within an urbanised area, is unfeasible. 1. Offices 2. Industrial 3. Retail 4. Pre-school and primary school 5. GP surgery This classification is based on the Department of Transport National Travel Survey definition, which specifies urban areas based on the extent of urban development indicated on Ordnance Survey maps.
CN6	Campus' development See criterion 1	Where 80% or more of the buildings on a campus style development, e.g. further or higher education sites, are within 1000m of the campus' main entrance, then the campus' main entrance can be used as the reference point for the assessment of distance to complaint public transport nodes for this issue. The campus' main entrance is that which is accessed by the majority of the assessed building's staff/students/visitors. A site may have more than one main entrance which between them account for the majority of staff, students and visitors that access the site. In such a case either entrance can be used as the basis for the calculation. Where less than 80% of the buildings on the campus development are within 1000m of the campus' main entrance, the assessed building's main entrance must be used as the reference point for the assessment of distance to complaint public transport node for this issue. This rule implies that for large campus developments, when distances are too great to be comfortably covered by walking, the needs of the building users would be served better by locating the public transport nodes inside or on the periphery of the campus. Where the building is not part of a centralised campus then its main entrance must be used as the reference point for the assessment of this issue.

Ref	Terms	Description
CN7	Multiple services See criterion 1	Services that operate from more than one node within proximity of the building, i.e. two separate bus stops served by the same bus, must be considered only once - at the node in closest proximity to the building. Different services at the same node can be considered as separate.
CN8	Bi-directional routes See criterion 2b	Routes will be bi-directional; however for the purpose of calculating the index, consider only the direction with the highest frequency (in accordance with the PTAL methodology).
CN9	Dedicated bus servicesSee criterion 3	The credit for the provision of a dedicated bus service is available for any building type with a fixed shift pattern; examples could include schools, offices, factories, prisons etc. The available credit cannot be awarded where credits are already being achieved for this issue via a compliant Accessibility Index. The credit is provided as an alternative, where the AI of the building is too low to achieve any BREEAM credits but where the building users will have the option of a dedicated bus service. A dedicated bus service can be included in the public transport Accessibility Index calculation as a means of contributing towards achieving credits via this method (regardless of the shift pattern). Where this is the case, the distance from the main building entrance to the drop-off/pick-up point (the transport node) of the service should be used.
CN10	Phased developments See criterion 3	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: 1. A commitment has been made to provide transport facilities within the shortest of the following periods, this is demonstrated either within the General Contract Specification or in the form of a Section 106 Agreement; a. The transport facilities will be available for use by the time 25% of all phases have been completed and are ready for occupation OR b. The transport facilities will be available for use within 25% of the total build time for the phase in which the assessed building forms a part, measured from the completion date of that phase. The most appropriate rule for the development in question must be used, ensuring that the time building users have to wait before having use of the transport facilities is as short as possible. Where the transport facilities will not be available for use within a period of five years from occupation of the building, they cannot be considered for determining compliance with the BREEAM criteria.
CN11	Buildings in Greater London	Buildings in Greater London should refer to the guidance in the Additional Information section of this issue for details of demonstrating compliance via other complementary means.

Schedule of Evidence

Ref	Design stage	Post-construction stage
1&2	Scale map highlighting the location of the building and all public transport nodes in proximity of the building. Timetables for each service at each public transport node considered. The calculated Accessibility Index for the building.	As design stage Where relying on a calculation carried out at the design stage to demonstrate compliance post construction, if the period between design and post construction stage reporting is greater than 12 months, then the AI must be re-calculated using up-to-date public transport timetable information.
3	A formal letter from the future building occupier confirming provision of and details for the dedicated bus service(s).	As design stage

Additional Information

Relevant definitions

Accessibility Index

A measure that provides an indicator of the accessibility and density of the public transport network at a point of interest (in the case of BREEAM, a building). The index is influenced by the proximity and diversity of the public transport network and the level or frequency of service at the accessible node.

For example, a building that has a single public transport node 500m from its main building entrance with one service stopping every 15 minutes i.e. 4 services per hour on average, will score an AI of approximately 1.90. Alternatively, the same node with one service every 15 minutes, but 300m from the building entrance will achieve an AI of 2.26. The same node with two services stopping every 15 minutes will score an AI of 2.85. The greater the number of compliant nodes, services and their proximity to the building, the higher the AI.

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).

Prison/MOD sites

For the purpose of assessment, the main entrance should be taken as the gatehouse entrance.

BREEAM Tra 01 Calculator

A spreadsheet-based calculator used to determine the Accessibility Index for the assessed building and the number of BREEAM credits achieved.

Checklists and Tables

Table - 15: Default hours of operation for a typical day

Building type	Default hours
Commercial	8.00am - 7.00pm
Pre-school, school, sixth form college	7.30am -10.00am,3.00pm - 5.30pm
Further & Higher Education	8.00am - 7.00pm
Healthcare	7.00am - 8.00pm (encompassing visiting hours and the typical daytime shift pattern)
Retail: Shopping centre	9.00am - 7.00pm
Retail: Supermarket	8.00am - 10.00pm
Retail: Service provider	8.00am - 6.00pm
Retail: Convenience store	7.00am - 10.00pm
Retail: DIY/retail park	8.00am - 8.00pm
Retail: shop	8.30am - 5.30pm
Multi-residential accom-modation	8.00am - 7.00pm
Court	8.00am - 7.00pm
Prison	7am - 8pm (encompassing visiting hours and the typical daytime shift pattern)
Other Buildings	8.00am - 7.00pm Or use any of the above hours, as appropriate to the building type.
24 hour use building	7am - 8pm

Calculation procedures

Calculation methodology

The methodology for calculating the Accessibility Index uses Transport for London's Public Transport Accessibility Level (PTAL) method, itself based on a methodology developed in 1992 by the London Borough of Hammersmith and Fulham. For a description of the PTAL methodology and how it works refer to appendix B of Transport Assessment Best Practice; Guidance Document:

http://www.tfl.gov.uk/assets/downloads/businessandpartners/transport-assessment-best-practice-guidance.pdf

Buildings in Greater London

Transport for London hosts a Planning Information Database that allows users to search for a specific London location by street name, co-ordinates or postcode and then calculate the Accessibility Index (AI) for that location.The Total AI is confirmed for the Point of Interest (POI) within the Summary Report, which can be downloaded and used as evidence of compliance for the assessed building. Go to:www.webptals.org.uk

Other information

None

Tra 02 Proximity to amenities

Number of credits available	Minimum standards
Building type dependent	No

Aim

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

Assessment Criteria

The following is required to demonstrate compliance:

1. Where the building is located within close proximity and accessible to the amenities outlined in Table - 16:

Table - 16: Building types and applicable amenities

	Building types					
Criteria	Type 1	Type 2	Type 3	Type 4		Type 5
No. of BREEAM credits	1	1	1	1	1	1
No. of amenities	All	5	All	All	8	2
Proximity (metres)	500	500	500	500	1000	500
Applicable amenities						
Grocery shop or food shop	✓	✓	✓	✓	✓	✓
Post Box	✓	✓	✓	✓	✓	✓
Cash Machine	✓	✓	✓	✓	✓	✓
Pharmacy			✓		✓	✓
GP surgery/medical centre		✓			✓	✓

	Building types					
Criteria	Type 1	Type 2	Type 3	Type 4		Type 5
Leisure/sport centre		✓			✓	
Library		✓				
Outdoor open public access area					✓	
Public House					✓	
Student union		✓				
Community centre					✓	
Place of Worship					✓	

Type 1: Offices, Retail, Industrial, Courts, Pre-school, Schools, Sixth Form, Further Education
Type 2: Higher Education
Type 3: Health Centre
Type 4: Type 4: Multi-residential (the two credits can be awarded independently of each other).
Type 5: Other Building types
This issue is not applicable to prison buildings/developments.

Compliance Notes

Ref	Terms	Description
CN1	Accessible amenities	The proximity 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, 'as the crow flies'.
CN2	Collective amenities	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 this issue that each amenity is 'stand alone'.
CN3	Amenities within assessed building or on site	An amenity within the building or on the same site as the proposed development, e.g. a campus in the case of further or higher education buildings, complies with the assessment criteria.
CN4	Food Outlet	This includes the following:

Ref	Terms	Description
		1. Grocery shop 2. Supermarket 3. Sandwich shop 4. On- or off-site cafeteria or staff canteen
CN5	Phased developments	The guidance provided in BREEAM issue Tra 01, concerning phased developments, also applies to this issue.

Schedule of Evidence

Ref	Design stage	Post-construction stage
All	Marked-up site plan or map highlighting: 1. Location of assessed building 2. Location and type of amenities 3. The route to the amenities 4. Plan/map scale OR Where the amenities do not currently exist, but are due to be developed, a letter from the client/developer confirming: 1. The location and type of amenities to be provided 2. The timescale for development of the amenities.	BREEAM Assessor's site inspection report and photographic evidence OR Where amenities do not yet exist, evidence as outlined at the design stage of assessment.

Additional Information

Relevant definitions

None

Checklists and Tables

None

Calculation procedures

None

Other information

None

Tra 03 Cyclist facilities

Number of credits available	Minimum standards
Building type dependent	No

Aim

To encourage building users to cycle by ensuring adequate provision of cyclist facilities.

Assessment Criteria

The tables below detail the cycle facility requirementsrequirements by building type and the number of credits available (see also Compliance notes):

Commercial

No. spaces per unit of measure	Unit of measure	No. cyclist facility types req.[1]	No. Credits	Notes
Offices, Industrial				
1	10 building occupants (staff)	<2	1	See Compliance note CN1 on sliding scale of compliance.
		2	2	
Large retail[1]				
1	10 staff	2	2*	* A single credit can be awarded for specifying compliant cycle storage spaces only. The number of staff should be the max-imum number using the building at any time/shift. The staff spaces must be provided in addition to customer spaces. Whilst they do not need to be separate from customer spaces, this is encouraged.

No. spaces per unit of measure	Unit of measure	No. cyclist facility types req.[1]	No. Credits	Notes
1	20 public car parking spaces	N/A		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. Disabled and parent-and-baby spaces where provided, can be excluded from the calculation.
Small retail[2]				
10	Total	<2	1	The spaces must be publicly accessible within proximity of a main building entrance.
10	Total	2	2	Compliant cyclist facilities are intended for staff only i.e. it is not a requirement of compliance to provide facilities for customers.

1. Large retail type: Includes large retail developments, such as shopping centres, retail parks, and supermarkets, which typically will have covered or uncovered parking or external areas, and therefore scope to provide their own dedicated cyclist facilities.
2. Small retail type:includes smaller retail units/shops that may form part of a wider retail/business district, city/town centre or mixed-use development, and typically do not have the scope to provide their own dedicated cyclist facilities.

Education

No. spaces per unit of measure	Unit of measure	No. cyclist facility types req.[1]	No. Credits	Notes
Pre-school/crèche				
1	10 staff	<2	1	See Compliance note CN1 on sliding scale of compliance.
		2	2	
Primary School				
5	form or class in year group	<2	1	For example: where a primary school has been designed to accommodate 3 classes per year, a total of 15 compliant cycle storage spaces are provided for the whole school. Where there are varying numbers of forms/classes per year, the calculation must be based on the year with the greatest number of classes/forms.
		2	2	
Secondary schools & sixth form, Further & Higher Education				
1	10 staff & pupils/students Total	<2 2	1 2	See Compliance note CN1 on sliding scale of compliance. FE/HE: student numbers must account for both under & post graduates, as well as PhD students and Post-Doctorates.

Healthcare

No. spaces per unit of measure		No. cyclist facility types req.[1]	No. Credits	Notes
All healthcare building types				
1	10 staff	2	2*	* A single credit can be awarded for specifying compliant cycle storage spaces only. See Compliance note on sliding scale of compliance. Unit of measure: use the measure which is the largest for the building type e.g. if hospital then use beds, if GP surgery then consulting rooms. The requirement for consulting rooms/beds is subject to a minimum of 4 compliant cycle storage spaces being provided.
1	2 consulting rooms OR 10 beds (see notes)	N/A		

Courts and Prisons

No. spaces per unit of measure	Unit of measure	No. cyclist facility types req.[1]	No. Credits	Notes
Prison establishment located building				
1	10 staff	2	1	See Compliance note on sliding scale of compliance.
Law Court				
1	10 building occupants (staff)	2	2*	* A single credit can be awarded for specifying compliant cycle storage spaces only. See Compliance note CN3 on sliding scale of compliance.
1	10 building visitors	N/A		

Multi-residential

No. spaces per unit of measure	Unit of measure	No. cyclist facility types req.[1]	No. Credits	Notes
Student residences,key worker accommodation				
1	10 staff	N/A	1	
1	10 staff	N/A	1	The requirement is subject to a minimum of 1 compliant space being provided.
1	2 res-idents			
Sheltered housing, Care homes,Supported living facility				
1	10 staff	2	1	* Or spaces specified in accordance with the number required as identified by the likely resident profile. Where the resident profile is not the elderly or physical disabled/impaired then, where appropriate, the requirement for wheelchair/electric buggy spaces should be changed to compliant cycle spaces
1 Compliant wheelchair/ electric buggy storage spaces	10 res-idents*	N/A		

Other Buildings

No. spaces per unit of measure	Unit of measure	No. cyclist facility types req.[1]	No. Credits	Notes
Transport type 1				
Use the criteria detailed for offices.				
Transport type 2				
1	10 staff	2	2*	* A single credit can be awarded for specifying compliant cycle storage spaces only. See Compliance note CN1 on sliding scale of compliance.
1	10 visitors or beds1	N/A		
Transport type 3				
1	20 staff	2	1	See Compliance note CN1 on sliding scale of compliance. See also notes for Transport type 2. The Compliance note allowing a reduction to the cyclist provision in rural locations has been accounted for in the unit of measure for this transport type. It should not therefore be applied again.
1	20 building visitors/ beds	N/A	1	
Transport hubs				
1	10 public users	N/A	1	See Compliance note CN1 on sliding scale of compliance. Apply the sliding scale (as per compliance note) to a maximum of 5000 daily public users. Public users refer to regular peak time users of the service who start and/or finish their public transport journey at the assessed building.
M.O.D non-residential				
1	10 living-out	2	2*	* A single credit can be awarded for

No. spaces per unit of measure	Unit of measure	No. cyclist facility types req.[1]	No. Credits	Notes
	personnel			specifying compliant cycle storage spaces only. These criteria apply to M.O.D buildings where the majority of personnel live off-site. See Compliance note CN1 on sliding scale of compliance.
M.O.D residential				
1	2 residents	N/A	1	None.
See BREEAM issue Tra 01 Public transport accessibility for a definition of transport type 1, 2 and 3.				

1. The unit of measure for visitors/beds does not apply in residential buildings with transient visitors, e.g. hotels, hostels, training centres where the visitor typically resides for less than one month. The compliance note 'capacity for building visitors' applies in this instance.For a secure accommodation unit compliance should be based on visitors (not beds).

Compliance Notes

Ref	Terms	Description
CN1	Sliding scale of compliance	To recognise the increased confidence in availability that occurs where there is larger scale provision of facilities, it is acceptable to reduce the provision requirement for building users (and potentially the provision of cyclist facilities) from 1 in 10 on a sliding scale as follows: 1. For buildings with users (as defined by the unit of measure) greater than 500 but less than 1000, the unit of measure can be increased to 15 for the 500-1000 user range, 2. For buildings with users (as defined by the unit of measure) greater than 1000, the unit of measure can be increased to 20 for the 1000+ user range, For example, a building with 1200 users would be required to provide the following number of cycle storage spaces: 1-500 users @ 1 space per 10 users = 50 spaces 501 – 1000 @ 1 space per 15 users = 34 spaces 1001 – 1200 @ 1 space per 20 users = 10 spaces Total compliant cycle storage spaces required = 94
CN2	Compliant	Compliant cycle storage facilities are those that meet the following:

Ref	Terms	Description
	cycle storage space	1. Where the calculated number of required cycle storage spaces is less than 4 total provision should be based on the lower of the following: a. a minimum of four compliant storage spaces must be provided (unless otherwise stated) OR b. one space per user (staff and where appropriate other user groups) 2. The space is covered overhead to protect from the weather. 3. Cycles are secured within spaces in rack(s). The rack(s) consists of fixings for one or more spaces. 4. The covered area and the cycle racks are set in or fixed to a permanent structure (building or hardstanding). Alternatively the cycle storage may be located in a locked structure fixed to or part of a permanent structure with CCTV surveillance. For proprietary systems see also compliance note below. 5. The distance between each cycle rack, and cycle racks and other obstructions e.g. a wall, allows for appropriate access to the cycle storage space, to enable bikes to be easily stored and accessed. 6. The facilities are in a prominent site location that is viewable/overlooked from either an occupied building or a main access to a building. 7. Lighting of the cycle storage facility must be compliant with the external (or internal where relevant) lighting criteria defined in BREEAM issue Hea 01 Visual comfort. The lighting must be controlled to avoid 'out-of-hours' use and operation during daylight hours, where there is sufficient daylight in/around the facility. 8. The majority of the cycle racks are within 100m of a building entrance (ideally within 50m). Or alternatively, in the case where the building forms part of a larger site e.g. campus, business park, hospital or prison establishment where it is not feasible to meet the 100m requirement, the assessor justifiably deems the facilities to be in an easily accessible location (within the site boundary).
CN3	Compliant showers	One shower must be provided for every 10 cycle storage spaces (unless stated, see below), subject to a minimum of one shower. Any development providing eight showers or more will comply regardless the number of cycle storage spaces provided. Both male and female users must be catered for i.e. either separate showers within shared gender-specific facilities (required provision split 50-50) or single shower cubicles and changing space for mixed use. The showers do not need to be dedicated to cyclists and can be those shared with other users/uses. Please note the BREEAM requirement for showers is based on accommodating good practice levels for commuting by bicycle. The maximum number of showers level is set to avoid unnecessary specification for typical buildings. Where a high ratio of cyclists is likely or expected for the building type, the provision of showers must reflect this and not be limited to the maximum without justification.

Ref	Terms	Description
CN4	Compliant showers - additional requirement for schools	In the case of a pre-school or primary school shower provision is for staff only and set at a rate of one shower for every 10 cycle storage spaces provided (subject to a minimum of one shower being provided). For example, where a primary school has been designed to accommodate 3 classes per year, a total of 15 compliant spaces are required to meet the BREEAM criteria for cycle storage, and therefore two showers for staff use would be required for compliance with the cycle facilities criterion. In secondary schools (and sixth forms) where there are less than 100 pupils, a minimum of 2 showers must be provided for pupils with one male and one female shower (where applicable). A minimum of one shower for staff should be provided in all cases.
CN5	Compliant changing facilities & lockers	Changing facilities and locker criteria; 1. The assessor should use their judgement to determine whether the changing area is appropriately sized given the number of cycle storage spaces/showers provided. 2. Changing areas must include adequate space and facilities to hang/store clothing and equipment whilst changing/showering e.g. bench seat and/or hooks. 3. The number of lockers is at least equal to the number of cycle spaces provided. 4. Lockers are either in or adjacent to compliant changing rooms. 5. The lockers are sized appropriately for the storage of a cyclists equipment e.g. helmet, shoes, clothing, panniers/back-pack and cyclists equipment. 6. Both male and female users are catered for i.e. either gender specific, shared facilities or individual changing cubicles in mixed use areas. 7. Toilet/shower cubicles can not be counted as changing facilities.
CN6	Compliant drying space	The drying space (for wet clothes) must be a specially designed and designated space with adequate heating/ventilation. A plant room is not a compliant drying space.
CN7	Existing/new site wide facilities	For assessments of new infill buildings on an existing site where there exist shared compliant facilities, or where the new building will form a part of a larger development (e.g. campus, retail or business park), the required number of facilities can be determined on a development-wide basis. The number of compliant facilities must be large enough to cater for the building occupants of the assessed building, in addition to the occupants of any existing or other new buildings that will share those facilities.
CN8	Building locations with a high level of public transport acces-	For sites where at least 50% of the available BREEAM credits for Public Transport Accessibility (Tra 01) have been awarded (rounded to the nearest whole credit), the number of compliant cycle spaces can be reduced by 50%. This reduction will also reduce the requirement

Ref	Terms	Description
	sibility	for compliant shower/lockers by the same margin for most building types by default, since the calculation is based on the number of cycle storage spaces. Building types where the number of required showers/lockers is not based on cycle storage provision can reduce the actual requirement for compliant showers/lockers by 50%.
CN9	Rural locations	For sites in rural locations, where the average building user commuting distances are likely to be greater than 10 miles, the number of compliant cycle spaces can be reduced by 50%. This reduction will also reduce the requirement for compliant shower/lockers by the same margin for most building types by default, since the calculation is based on the number of cycle storage spaces. Building types where the number of required showers/lockers is not based on cycle storage provision can reduce the actual requirement for compliant showers/lockers by 50%. A 50% reduction in this context cannot be applied in addition to the 50% reduction due to the building's Public Transport Accessibility level (as described in the Compliance note above). A rural location is defined in this context as a site clearly not within or on the boundary of a small, medium or large urban cover (an urban cover with a population of 3000 or more). Therefore the definition includes village locations, green field sites or small urban centres with a population of less 3000 people.
CN10	Number of building occupants unknown	If it is not possible to confirm the number of building occupants commuting to the development, possibly due to the speculative nature of the building, then the default occupancy rates given in the table in the additional information section of BREEAM issue Tra 04 Maximum car parking capacity can be used to help determine a default number of users. Alternatively, the number of building occupants in an existing development of similar type and size can be used (the assessor needs to justify/validate the number used in their certification report).
CN11	Sheltered housing/care homes and supported living facilities	Compliant wheelchair and buggy storage facilities are those that meet the following: 1. Charging points for electric buggies (at least 2) provided within the storage space 2. The storage area must be secure yet easily accessible to both the internal and external parts of the building e.g. direct access to the outside. 3. Direct access from the storage space to the interior of the building, without having to return outside, must be provided. 4. Lighting of the storage facility must be compliant with the external (or internal where relevant) lighting criteria defined in BREEAM issue Hea 01 Visual comfort. The lighting must be controlled to avoid 'out-of-hours' use and operation during daylight hours, where there is sufficient daylight in/around the facility.

Ref	Terms	Description
		5. Where access to and from the building main entrance needs to be tightly controlled for the safety/security of residents, and it can be demonstrated that compliance with points 2 and 3 above impact on this (e.g. where residents include those with mental health problems), these 2 items can be excluded from the compliance requirements. Where the resident profile is not the elderly or physical disabled/impaired then, where appropriate, the requirement for wheelchair/electric buggy spaces should be changed to compliant cycle spaces.
CN12	Multi-residential developments with CSH assessed dwellings	For buildings with self-contained dwellings also being assessed under the Code for Sustainable Homes (CSH), the following applies: All self-contained dwellings within the building assessed under the CSH must achieve the available credit for issue Ene8 of the CSH in order to achieve any credits under this issue. Other dwellings/building areas not covered under a CSH assessment must meet the requirements defined above.
CN13	Capacity for building visitors	For the majority of building types, staff numbers are the means by which compliance with the assessment criteria is determined (unless there is a separate, additional requirement for visitors). The percentage requirements for staff account for visitors and patients/community users (if applicable to building type) that will travel to and use or work within the building. As such the compliant cycle facilities must be accessible to these building users.

Schedule of Evidence

Ref	Design stage	Post-construction stage
All	Design drawings and/or relevant section/clauses of the building specification or contract Plus (if relevant to building type): 1. The location and size of the wheelchair and buggy storage facilities 2. Location and no. of charging points 3. Assumptions and calculations used to determine number of public users.	BREEAM Assessor's site inspection report and photographic evidence AND/OR 'As built' drawings.

Additional Information

Relevant definitions

Net lettable area (NLA)

This is the gross internal area less common areas, ancillary spaces (corridors, plant room, toilet blocks etc.) and structural/internal party walls (but not partitioning or other non load-bearing walls. NLA is often quoted in square feet; 1 square metre is 10.76 square feet.

Checklists and Tables

None

Calculation procedures

None

Other information

None

Tra 04 Maximum car parking capacity

Number of credits available	Minimum standards
Building type dependent	No

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 associated with the building's operation.

Assessment Criteria

The following is required to demonstrate compliance:

1. The building's car parking capacity is compared to the maximum car parking capacity permitted according to the benchmarks in the table below, and the relevant number of BREEAM credits awarded.

   For most building types, except those where stated, the benchmarks vary according to the buildings public transport Accessibility Index (determined in accordance with BREEAM issue Tra 01). Therefore, for these building types the AI must be determined prior to assessing this issue. This is required to ensure that the building's car parking capacity is relative to the development's accessibility to public transport links.

Building type	Criteria Building's Accessibility Index			No. of credits
	<4	≥4-<8	≥8	
	Max. parking capacity 1 space per x building users, where x is:			
Business – office, industrial, student residences and key worker accommodation	3	4	5	1
	4	5	6	2
Sheltered housing, care homes and supported living facility	4	5	6	1
	5	6	7	2

Building type	Criteria Building's Accessibility Index			No. of credits
	<4	≥4-<8	≥8	
Further & Higher Education	15	20	25	1
	20	25	30	2
Other Building – Transport type 1 & 2	3	4	5	1
	4	5	6	2
Other Building – MOD (where building users are 'living-out personnel')	2	3	4	1
	3	4	5	2
For the building types listed below, the maximum number of parking spaces provided must not be greater than the total of the following:				
Healthcare - Hospitals (Acute, specialist, teaching, mental health)	One parking space for every four staff, plus; One parking space for every four beds, plus Two parking spaces for each consulting, examination, treatment, therapy room and A&E cubicle.			1
Healthcare - GP surgery, Health centre, Community hospital	One parking space for every two medical staff, plus; One parking space for every three non-medical staff, plus; Two parking spaces for each consulting, examination, treatment, therapy room and A&E cubicle.			1
Pre-school, schools, sixth form, Retail, Prison, Court, Other Building – Transport type 3, Other Building – Transport hubs	Issue not assessed for these building types			

Compliance Notes

Ref	Terms	Description
CN1	Building users	Where the term building users is referenced in this BREEAM issue it refers to the following, where relevant to the building type: 1. Staff (who will work within the building). 2. Students (who will access the building for work or study during a typical academic term-time /semester day). 3. Residents (who will reside permanently or for a short period of time in the building).
CN2	Determining the number of building users	If known, or can be reasonably estimated by the design team, client or end occupier, actual building occupancy figures should be used. If an actual figure cannot be confirmed, for example where the building is a speculative development, use the default occupancy rates given in Table - 17 in the Additional Information section to determine the number of users.
CN3	Variable occupancy	Where the number of building users is variable, provision of parking spaces should be based on the maximum number of building users likely to be using the building at any time during a typical day.
CN4	Other building type definitions	See BREEAM issue Tra 01 for a definition of other building types 1, 2 and 3.
CN5	Exclusions	Parking spaces set aside for the following building users can be excluded provided these spaces are dedicated for that use i.e. sized accordingly with the appropriate signage/markings. 1. Disabled 2. Parent & baby 3. Motorbike 4. Car share In the case of excluding car share spaces, the future building occupier will need to confirm they have an enforceable car share policy.
CN6	Parking shared with other buildings	Where the assessed building forms part of a wider site development, e.g. campus, business park, hospital, and parking is not designated to individual buildings, then the assessor has two options: 1. Assess compliance on the basis of parking capacity for the whole development, accounting for all existing and new users and parking spaces. 2. Assess compliance using a pro-rata of parking capacity to building users e.g. if the assessed building is occupied by 20% of the development's total occupants, then attribute 20% of the total parking spaces to the assessed building for the purpose of the assessment.

Schedule of Evidence

Ref	Design stage	Post-construction stage
All	Drawings or relevant section/clauses of the building specification or contract confirming the number and type of parking spaces provided for the building. Relevant documentation or correspondence from the design team or client confirming the number of building users. Where relevant, confirmation of the buildings' Accessibility Index (as per BREEAM issue Tra 01) For healthcare buildings, relevant documentation or correspondence from the design team or client confirming: 1. The number of patients' and residential beds 2. The number of consulting, examination, treatment, therapy room and A&E cubicle rooms.	BREEAM Assessor's site inspection report and photographic evidence confirming the number and type of parking spaces provided. Evidence as outlined at the design stage for building users OR a physical check by the assessor of the relevant number of building users (if practical).

Additional Information

Relevant definitions

Accessibility Index

Refer to Tra 01 Public transport accessibility

Care Homes

For the purpose of BREEAM, care homes are those buildings legally required to register with the Commission for Social Care Inspection by the care Standards Act, 2000.

Sheltered Housing

Sheltered housing falls within Class C3 of the Town and Country Planning (use Classes) Order 1987, and can be defined as self-contained accommodation, usually with an emergency alarm system, communal facilities and a resident warden. This includes all sheltered housing defined as "Category 1, 2, 2.5 and 3" in accordance with the 1969 Ministry of Housing and Local Government circular 82/69 and Local Authority Guidelines.

MOD Living-out personnel

This refers to staff that work in the assessed building and are not residents on the M.O.D site where the assessed building is located.

Checklists and Tables

Table - 17: Default occupancy rates by building type

Building type and function area	Occupant density	Building type and function area	Occupant density
Business		**Secure Residential Institution**	
Office area (including reception areas)	0.111	Cell	0.190
Food preparation area (staffed)	0.108	Reception	0.121
Small workshop / category lab space	0.068	Hall/lecture theatre/assembly area	0.183
Industrial		Eating/drinking area	0.141
Food preparation area	0.213	Workshop - small scale	0.048
Industrial process area	0.022	Laundry	0.086
Laboratory	0.107	Classroom	0.183
Reception	0.110	Office and consulting areas	0.093
Warehouse storage	0.009	Food preparation area	0.111
Generic Office Area	0.108	**Libraries, Museums, Galleries**	
Hospitals, care homes		Reception	0.095
Reception	0.152	Food preparation area	0.176
Post Mortem Facility	0.050	Hall/lecture theatre/assembly area	0.150
Food preparation area	0.161	Laboratory	0.098
Physiotherapy Studio	0.200	Workshop - small scale	0.062
Bedroom Unit	0.105	Display and Public areas	0.150
Laundry	0.117	Generic Office Area	0.099
24 hours Con-	0.000	**General Assembly and Leisure, Clubs, Theatres**	

Building type and function area	Occupant density	Building type and function area	Occupant density
sulting/treatment areas			
Assembly areas / halls	1.000	Dry sports hall	0.047
Hydrotherapy pool hall	0.100	Fitness Studio	0.132
Industrial process area	0.124	Fitness suite/gym	0.170
Laboratory	0.080	Food preparation area	0.131
Operating theatre	0.125	Hall/lecture theatre/assembly area	0.175
Classroom	1.000	Auditoria	0.341
Diagnostic Imaging	0.100	Ice rink	0.225
Generic Ward	0.175	Performance area (stage)	0.049
Office and consulting areas	0.195	Public circulation areas	0.241
Primary Healthcare		Reception	0.126
Reception	0.11	Sales area - general	0.102
Office and consulting areas	0.082	Swimming pool	0.163
Further and Higher Education		Workshop - small scale	0.067
Residents Bedroom	0.120	Generic Office Area	0.116
Classroom	0.203	Display area	0.001
Food preparation area	0.096	Community/day centres	
Hall/lecture theatre/assembly area	0.202	Reception	0.108
Computer lab	0.231	Dry sports hall	0.047
Laboratory	0.106	Food preparation area	0.143
Laundry	0.105	Workshop - small scale	0.064

Building type and function area	Occupant density	Building type and function area	Occupant density
Reception	0.112	Hall/lecture theatre/assembly area	0.169
Workshop - small scale	0.068	Office and consulting areas	0.106
Office and consulting areas	0.098	Other spaces/buildings	
Hotels		Data Centre	0.096
Bedroom	0.094	Server Room	0.096
Food preparation area	0.108	Heavy Plant Room	0.096
Reception	0.105		
Generic Office Area	0.106		

Notes for Table - 17 of default occupancy rates:

1. The net floor area for each function must be multiplied by the equivalent occupant density to determine an overall occupancy for the function area.
2. Not all potential building areas are listed, only those required to reflect estimated building occupancy for the building type. For example, an office building may have a canteen but it will be the staff that predominantly uses the canteen. The office staff numbers will be estimated using the default occupancy rate for the office area; therefore to include the canteen would result in double counting of occupancy.
3. If a building type is not listed, occupancy rates for a similar building type or function area may be used.
4. The above occupancy rates have been sourced from the activity database of the Simplified Building Energy Model (SBEM), valid at the time of this Scheme Document's authoring.

Calculation procedures

None

Other information

None

Tra 05 Travel plan

Number of credits available	Minimum standards
1	No

Aim

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

Assessment Criteria

The following is required to demonstrate compliance for:

One credit

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.
    h. Providing suitable taxi drop-off/waiting areas.
    i. Ensuring that rural buildings are located with appropriate transport access to ensure that they adequately serve the local community (where procured to do so e.g. community centre).

4. Where appropriate to the building type, size and intended operation, the travel plan includes measures tailored to minimise the impacts of operational-related transport e.g. deliveries of supplies, equipment and support services to and from the site.
5. Where the building's final occupier is known, they confirm that the travel plan will be implemented post construction and supported by the building's management during building operation.

Compliance Notes

Ref	Terms	Description
CN1	Shell only See criterion 1	Where the end user/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. The developer must confirm that they will handover a copy of the travel plan to the building's tenant(s), so that it may inform their own travel plan/strategy.
CN2	Building users See criterion 1	Where the term building users is referenced, this refers to the following, as appropriate to building type: 1. Staff (commuter journeys and business travel) 2. Pupils/students 3. Visitors 4. Patients 5. Customers 6. Community users 7. Personnel who make deliveries/collections to and from the development 8. Contractors/service providers, who regularly work at and access the building/development 9. Residents of multi-residential buildings
CN3	Existing Travel Plan See criterion 2a	The credit can be awarded if the assessed building is part of a site that has an existing up-to-date organisational travel plan that is compliant with BREEAM, is applicable to all building users (in existing and assessed new buildings) and accounts for the additional travel resulting from users of the new building.

Schedule of Evidence

Ref	Design stage	Post-construction stage
1-4	A copy of the Travel Plan. A copy of the site-specific transport survey/assessment.	As design stage.
3	Design drawings demonstrating examples of design measures	BREEAM Assessor's site inspection report and photographic evidence

Ref	Design stage	Post-construction stage
	implemented in support the travel plan's findings. OR Where a detailed site plan is not available, a formal letter from the client confirming that measures will be implemented into the final design in support the travel plan's findings.	confirming the installation of measures that support the travel plan.
5	A letter of confirmation from either the building's occupier, or in the case of a speculative development, the developer.	As design stage.

Additional Information

Relevant definitions

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.

Checklists and Tables

None

Calculation procedures

None

Other information

None

Water

Wat 01 Water consumption

Number of credits available	Minimum standards
5	No

Aim

To reduce the consumption of potable water for sanitary use in new buildings from all sources through the use of water efficient components and water recycling systems.

Assessment Criteria

The following is required to demonstrate compliance for:

Up to five credits

1. An assessment of the efficiency of the building's domestic water consuming components is undertaken using the BREEAM Wat 01 calculator.
2. The water consumption (litres/person/day) for the assessed building is compared against a baseline performance and BREEAM credits awarded as follows:

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

Note: for some building types usage data may not be available. In such cases an alternative elemental based approach to compliance should be used to award credits (refer to Compliance notes and Additional Information section).

3. The efficiency of the following 'domestic scale' water consuming components must be included in the calculation (where specified):
    a. WCs
    b. Urinals
    c. Taps (wash hand basins and where specified kitchen taps and waste disposal unit)
    d. Showers
    e. Baths
    f. Dishwashers (domestic and commercial sized)
    g. Washing machine (domestic and commercial/industrial sized)

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

4. Where a greywater and/or rainwater system is specified, its yield (l/person/day) can be used to off-set non potable water demand from components that would otherwise be supplied using potable water.
5. Any greywater systems must be specified and installed in compliance with BS8525-1:2010 Grey-water Systems - Part 1 Code of Practice[1]. Any rainwater systems must be specified and installed in compliance with BS8515:2009 Rainwater Harvesting Systems - Code of practice[2].
6. Report the total net water consumption in m^3/person/yr, via the BREEAM scoring and reporting tool (where total net water consumption can be modelled by the BREEAM Wat 01 calculator for the assessed building type).
7. Healthcare and prison buildings: refer to the relevant Compliance note for additional criteria regarding the specification of particular micro-component controls.

Compliance Notes

Ref	Terms	Description
CN1	Scope of the BREEAM Wat 01 Methodology for New Non Domestic Buildings. See criteria 1,2 & 3	The BREEAM Wat 01 calculator determines a figure for whole building water consumption from domestic scale components. This figure is derived using the actual component specification and default component usage factors for a range of building users/types. The methodology is applicable to the majority of new non-domestic building types assessed using this BREEAM Scheme. There may however be some instances in which data on the usage patterns for certain types of buildings/users, are not available (or those used in the methodology are not appropriate). Where this is the case, it will not be possible to calculate the whole building water consumption and percentage improvement level. In such instances, compliance and the number of credits achieved will need to be assessed using an alternative, elemental approach i.e. comparing the buildings component specification with minimum levels of performance and awarding BREEAM credits accordingly. Details of the alternative approach and how to apply it are provided in the Additional Information section for this issue (see below). Please also refer to the Compliance note below where the building is a mixture of different building types covered by the Water Efficiency Methodology.
CN2	Domestic scale water con-suming com-ponents data. See criterion 1 & 3	Water consumption figures will need to be collected from manufacturers' product information to determine the consumption of each type and specification of domestic scale water consuming component required, as follows: WCs: actual maximum or, where dual flush, effective flush volume in litres/use Urinals: Flush volume in litres/use for single use flush urinals. For cistern fed systems, the flushing frequency/hour and cistern capacity in litres.

Ref	Terms	Description
		Taps: Flow rate of each tap, at full flow rate in litres per minute measured at a dynamic pressure of 3±0.2 bar (0.3±0.02 MPa) for high pressure (Type 1) taps, or at a dynamic pressure of 0.1±0.02 bar (0.01±0.002 MPa) for low pressure (Type 2) taps (BS EN 200:2008, sanitary tapware, single taps and combination taps for supply systems of type 1 and 2. General technical specifications) including any reductions achieved with flow restrictions. Showers: Flow rate of each shower at the outlet using cold water (T 30 C), in litres per minute measured at a dynamic pressure of 3±0.2 bar (0.3±0.02 MPa) for high pressure (Type 1) supply systems, or at a dynamic pressure of 0.1±0.05 bar (0.01±0.005 MPa) for low pressure (Type 2) supply systems (BS EN 1112:2008, Sanitary tapware. Shower outlets for sanitary tapware for water supply systems type 1 and 2. General technical specifications). Kitchen taps: Maximum flow rate litres/min. Baths: capacity to overflow in litres. Taps on baths should not be included in the calculation, as the water consumption from bath taps is taken account of in the use factor for baths. The calculation of water consumption for baths will assume 40% of the capacity to the overflow. This is to reflect that a) users tend not to fill the bath to overflow and b) the displacement affect the user has on the actual volume of water required for a bath. Dishwasher: litres/cycle for domestic applications and/or appliances or litres/rack for commercial applications and/or appliances. Washing machine: litres/use for domestic applications and/or appliances or litres/kg for commercial applications and/or appliances e.g. in hotels. Waste disposal unit: flow rate in litres/minute.
CN3	Greywater and rainwater system data. See criteria 4 & 5	The following information is required where a greywater and/or rainwater system is specified: Rainwater: in accordance with BS8515 'intermediate approach' : 1. Collection area (m^2) 2. Yield co-efficient (%) 3. Hydraulic filter efficiency (%) 4. Rainfall (average mm/year) Rainwater: in accordance with BS8515 'detailed approach': 1. Daily rainfall collection (litres) Greywater: in accordance with BS8525 : 1. Manufacturer or system designer details. 2. The percentage volume of waste water collected (and re-used) from the following (where relevant); wash hand basins, showers, kitchen basins, dishwashers, baths, washing machines and sources of waste water from non domestic components.
CN4	Multiple specifications for the same water con-	Where multiple fittings of the same component are specified, with various different flow rates, the flow rates for each type of fitting will need to be collected by the assessor and entered into the 'Average flow rate calculator worksheet' (contained within the Wat01 calculator) to determine the average flow rate for the

Ref	Terms	Description
	suming component. See criterion 6	component. This figure is then entered in to the relevant section of the Wat01 calculator.
CN5	Using greywater and rainwater systems to off-set performance efficiency of components. See criteria 4 & 5	Where greywater and/or rainwater systems are specified there is a minimum level of component efficiency that must be achieved to award 4 or 5 BREEAM credits and the exemplary level credit. This is to avoid awarding a higher number of BREEAM credits where performance from less efficient fittings is off-set by the specification of a greywater and/or rainwater collection system. The intention being to ensure demand reduction is prioritised before off-setting consumption. Where a greywater/rainwater system is specified/installed, the component specification must achieve a percentage reduction in water consumption (over the baseline specification) equivalent to that required for 2 credits i.e. a 25% improvement. Where this level is achieved, all of the total water demand met by greywater/rainwater sources can contribute to the overall percentage improvement required to achieve BREEAM credits. If it is not achieved, the percentage of greywater/rainwater allowable will be equivalent to the percentage improvement in water consumption achieved for the component specification (i.e. percentage improvement on baseline performance). For example, if only a 20% improvement is achieved, and therefore the building is not meeting the 25% requirement, then only 20% of the water demand met via greywater/rainwater sources can be used to off-set water consumption from the microcomponents. This minimum requirement does not apply where only 1, 2 or 3 credits are sought or where no greywater/rainwater system is specified i.e. percentage improvement is based solely on the water efficiency of the microcomponent specification. BRE Global may allow some exemptions to this rule in instances where a particular fitting type requires a high flow rate due to specialised end-user requirements, and its specification prevents compliance with the 25% improvement level.
CN6	Other permissible component demand for non potable water. See criteria 3,4 & 5	The focus of this BREEAM issue is the performance of the building's permanent domestic scale water consuming components. Where a greywater or rainwater system is specified, the yield from the system should be prioritised for such uses i.e. WC/Urinal flushing. However, where the building demonstrates that it has other consistent (i.e. daily) and equivalent levels of non potable water demand, and such demands are intrinsic to the building's operation, then it is permissible for the demand from these non domestic uses to be counted i.e. the demand for rainwater/greywater yield from such systems/components can be used as well as, or instead of non potable water demand from the buildings WC/Urinal components. Examples of consistent and intrinsic demands could include laundry use in hotels/multi-residential developments or horticultural uses in garden centres, botanical gardens and golf courses. Demand for general landscaping and ornamental planting irrigation are not

Ref	Terms	Description
		considered as equivalent/intrinsic by BREEAM.
CN7	Other permissible source of non potable water. See criteria 3,4 & 5	The methodology allows for the collection and recycling of non potable water from the relevant components listed in the criteria i.e. taps, showers, baths and dishwashers/washing machines. In addition, where non potable water is collected from a non domestic component/source that is intrinsic to the building, then the amount collected can be accounted for in the methodology. This could include for example wastewater from active hygiene flushing, i.e. a regular hygiene flushing programme to minimize poor water quality in a potable cold or hot water system. In order for the method to account for this total, the design team will need to confirm to the assessor the yield from the component/system (in litres) and the frequency of that yield (in days) i.e. if once a week then frequency would be 7 days.
CN8	Building is a mixture of different functional areasSee criterion 1	For the majority of buildings using the standard Wat 01, the BREEAM Wat 01 calculator defines the building type and range of different water consuming activity areas within that building; for example, a retail development with sales area and goods storage or an office that includes a canteen and gym. However, where permitted to conduct a single assessment of a building/development which consists of a diverse mix of activity areas/building types, all of which can be assessed separately within the calculator, the following applies: Determine the building's total water consumption performance by carrying out separate assessments for each relevant activity area/building type. On completion of each assessment, the assessor will need to determine the percentage improvement as follows: $$I = 100 \times \left[1 - \frac{(T_{1\,Act} \times T_{1\,Occ}) + \ldots + (T_{n\,Act} \times T_{n\,Occ})}{(T_{1\,Base} \times T_{1\,Occ}) + \ldots + (T_{n\,Base} \times T_{n\,Occ})} \right]$$ Where: I = Overall improvement (%) Tn_{Act} = the modelled net water consumption (L/person/day) for each building type Tn_{Base} = the modelled baseline water consumption for the corresponding building type Tn_{Occ} = the total default occupancy rate for the corresponding building type. Where greywater/rainwater systems are specified, the assessor should take care to avoid unintended double counting of the yield from such systems and using it to off-set demand for each activity area/building type. This compliance note is likely to become more relevant as the BREEAM Wat01 calculator develops to include more building types within the standard Wat01 method.
CN9	Fixed water	The BREEAM water efficiency calculation includes an allowance for

Ref	Terms	Description
	use. See criterion 6	fixed water use. This includes water consumption for vessel filling (for building user drinking water), cleaning in kitchens and food preparation in buildings with a catering facility. Fixed uses are included to provide greater accuracy in reporting of the building's overall estimated water consumption. As these uses are fixed for both the actual and baseline building models, their totals do not influence the achievement of BREEAM credits.
CN10	Shell only	If a water supply is provided to tenanted areas of the building, but sanitary components will be specified and fitted by future building tenants, then the following options are available to define the efficiency of flow rates for components in the shell only (tenanted) areas of the building: 1. Option 1 – use of a tenancy lease agreement between the developer and tenant(s) which specifies a minimum acceptable level of water efficiency for specified components. 2. Option 2 - N/A 3. Option 3 – whereby the tenant confirms (in writing or via their fit out specification) the efficiency of fittings that will be specified/installed. Alternatively, fittings compliant with the BREEAM baseline level can be used for the purpose of determining the level of performance for the building (see Additional Information section for further detail on the baseline level).
CN11	Components in healthcare facilities. See criterion 7	In addition to meeting an overall percentage improvement level, the flushing control for each WC/urinal in a healthcare facility must be suitable for operation by patients with frail or infirm hands or activated by electronic sensors. Components in clinical areas can be exempt from the calculation. Although exempt, HTM07-04[3] contains guidance on water savings from medical related activities. Furthermore, in some cases, the use of water-efficient fittings and appliances may not be appropriate to the needs of the patient, and inappropriate specification may adversely affect the incidence and propagation of infections. In such instances, the assessor will need to confirm with BRE Global the exemption of components from the relevant building areas. The design team should also consult NHS guidelines concerning appropriate selection of sanitary fittings and fixtures and the control of legionella.
CN12	Components in prison cells on HM Prison developments. See criterion 7	In addition to meeting an overall percentage improvement level, the following requirements apply: Where sanitary components are specified within a prison cell, a volume controller must be specified on the individual fittings or water supply to each cell. A volume controller is an automatic control device to turn off the water supply once the maximum preset volume is reached within a defined period.

Ref	Terms	Description
CN13	Multi-residential developments with CSH assessed dwellings. See criterion 1	The number of credits achieved for Wat 1 of a Code for Sustainable Homes assessment cannot be directly used for this issue due to the differences in the calculation methodology.
CN14	No fittings present	Where a project under assessment contains none of the specified components, the performance specification for components provided in facilities in an adjacent and accessible building must be used in the calculation, i.e. those facilities most likely to be used by the occupants and visitors of the assessed building. This rule also applies where a project under assessment consists solely of an extension to an existing building, i.e. where the extended building contains no new sanitary facilities because there are facilities present within the existing building.

Schedule of Evidence

Ref	Design stage	Post-construction stage
All	Completed copy of the BREEAM Wat 01 calculator Relevant section/clauses of the building specification/ design drawings confirming technical details of; 1. Sanitary components 2. Rainwater and greywater collection system OR where detailed documentary evidence is not available at this stage; Completed BREEAM Wat 01 calculator A letter of instruction to a contractor/supplier or a formal letter from the developer giving a specific undertaking, providing sufficient information to allow the water calculations to be completed.	Where Post Construction Stage assessment only, provide a completed copy of the BREEAM Wat 01 calculator and detailed documentary evidence (as listed for Design Stage) representing the building as built OR Written confirmation from the developer that the appliances/fittings have been installed as specified for the Design Stage or Assessor site inspection report and photographic evidence confirming installation of components in accordance with a compliant specification OR Where only a letter of instruction was provided with calculations at Design Stage, provide revised calculations and detailed documentary evidence (as listed for Design Stage) representing the building as built OR Where different from Design Stage, provide revised BREEAM Wat 01 calculator and detailed

Ref	Design stage	Post-construction stage
		documentary evidence (as listed for Design Stage) representing the building as built.

Additional Information

Relevant definitions

BREEAM Wat 01 calculator for New Non Domestic Buildings

The BREEAM Wat 01 calculator is a method for the assessment of water efficiency in most common types of new non domestic buildings. The calculator assesses the contribution that each internal domestic scale water consuming component (as listed in the criteria) has on whole building water consumption).

The calculator and accompanying guidance on its application is available separately from this Scheme Document.

Please note; the calculator is a compliance tool and not a design tool for water demand and drainage systems. The tool uses default usage and occupancy rates to provide a benchmark of the typical consumption given the specified fittings (in litres/person/day and m^3/person/year) and their impact on the buildings overall water efficiency. Due to the impacts and differences of actual user behaviour and occupancy rates the results of the method will not reflect directly the actual water use during building operation. The results from the methodology should, therefore, not be used for the purpose of comparison with or prediction of actual water consumption from a non domestic building.

Domestic scale components

Domestic scale components include water consumed (potable and non potable) by internal building components including kitchen taps, wash hand basin taps, baths, shower and dishwasher, WCs, urinals, washing machines and waste disposal units.

Effective flush volume

Effective flush volume is the volume of water needed to clear the toilet pan and transport any contents far enough to avoid blocking the drain. The effective flush volume of a single flush WC is the volume of water used for one flush.

The effective flush volume of a dual flush WC is the ratio of full flush to reduced flush. This is taken to be one full flush for every three reduced flushes for non-domestic buildings and one full flush for every two reduced flushes in domestic (residential) buildings/areas. The effective flush volume can therefore be calculated as follows, using a 6/4 litre dual flush volume WC as an example:

- Non-domestic: {(6 litre x 1) + (4 litre x 3)}/4 = 4.5 litre effective flushing volume (for a 6/4 dual flush WC)
- Domestic: {(6 litre x 1) + (4 litre x 2)}/3 = 4.67 litre effective flushing volume (for a 6/4 dual flush WC)

The differing ratio between non-domestic and domestic buildings reflects the different patterns of user behaviour between these building types.

Greywater recycling

The appropriate collection, treatment and storage of domestic wastewater (which is defined as that discharged from kitchens, baths/showers, laundry rooms and similar) to meet a non potable water demand in the building e.g. WC flushing, or other permissible non potable use on the site of the assessed building.

Potable water

Water suitable for human consumption that meets the requirements of Section 67 (Standards of Wholesomeness) of the Water Industry Act 1991[4]. Also referred to as wholesome water.

Non potable water

Any water other than potable water, also referred to as unwholesome water (BS8525, see references).

Rainwater recycling

The appropriate collection and storage of rainwater run-off from hard outdoor surfaces to meet a non potable water demand in the building e.g. WC flushing, or other permissible non potable use on the site of the assessed building.

Clinical areas

Refer to BREEAM issue Hea 01 Visual comfort.

Checklists and Tables

Table - 18 outlines the standards, by component type, used to define the performance levels set in BREEAM. These defined levels of efficiency have been steered by a range of published sources of information (see references[5]) and therefore reflect robust levels of typical, good, best and exemplary practice.

Table - 18: Water efficient consumption levels by component type

Component	Performance Levels						
	Base	1	2	3	4	5	Unit
WC	6	5	4.5	4	3.75	3	Effective flush volume (litres)
Wash hand basin taps	12	9	7.50	4.50	3.75	3	litres/min
Showers	14	10	8	6	4	3.50	litres/min
Baths	200	180	160	140	120	100	litres
Urinal (2 or more urinals)	7.50	6	3	1.50	0.75	0	litres/bowl/hour
Urinal (1 urinal only)	10	8	4	2	1	0	litres/bowl/hour
Greywater/rainwater system	0%	0%	0%	25%	50%	75%	% of WC/urinal flushing demand met using recyded non potable water
Kitchen tap: kitchenette	12	10	7.50	5	5	5	litres/min
Kitchen taps:	10.30	9	8.30	7.30	6.30	6	litres/min

Component	Performance Levels						
	Base	1	2	3	4	5	Unit
restaurant (pre-rinse nozzles only)							
Domestic sized dish-washers	17	13	13	12	11	10	litres/cycle
Domestic sized washing machines	90	60	50	40	35	30	litres/use
Waste disposal unit	17	17	0	0	0	0	litres/min
Commercial sized dishwashers	8	7	6	5	4	3	litres/rack
Commercial/ Industrial sized wash-ing machines	14	12	10	7.50	5	4.50	litres/kg

Please note that specifying components for a building in accordance with the above levels will result, in most cases, in the corresponding number of BREEAM credits being achieved. However, please bear in mind that the component specifications above are thresholds between each level. Therefore caution should be taken when defining a component specification for a BREEAM assessed building using exactly the same levels as the threshold levels. It is recommended that, where Wat 01 BREEAM credits are being targeted, the performance of a particular building's component specification is verified using the BREEAM Wat 01 calculator before committing to a particular specification and ordering/installing components. This will provide greater assurance that the component specification achieves the targeted number of BREEAM credits.

As the methodology and BREEAM credits for water efficiency compare the buildings modelled water consumption performance against the performance of a baseline specification for the same component types, where a component type is not specified it is not accounted for in the methodology i.e. the component is excluded from both the proposed and baseline building. Therefore no benefit is gained in terms of BREEAM performance, which is the % improvement over the baseline building, by deciding not to specify a particular component. However, the methodology will reflect the reduction in overall water consumption (litres/person/day) for the building, as a result of not specifying a particular component.

Calculation procedures

A non domestic building's water-efficient performance is determined using the BREEAM Wat 01 calculator in one of two ways, using either the standard approach (common building types) or alternative (other building type) approach. Each approach is summarised below.

Standard Wat01 method

The standard BREEAM method determines water efficiency (measured in l/person/day and m^3/person/yr) for a building based on the buildings actual component specification and default usage patterns for the building type and its activity areas. This modelled output is compared with the same output for a baseline component specification and the percentage improvement used to determine the number of BREEAM credits achieved.

The baseline component specification is equivalent to the water efficiency of industry standard components (see Table - 18), steered by the minimum levels required by the Water Supply (Water Fittings) Regulations. The BREEAM percentage improvement benchmarks have then been determined based on progressively more efficient standards for water consuming components and, for the higher levels of performance, the specification of greywater and rainwater systems.

The standard approach is the default method for calculating water efficiency of a BREEAM assessed building and is that used for most of the common building types, where usage data is available. For buildings types where usage data is not available, and therefore the standard approach of determining performance cannot be used, an alternative approach to compliance must be used (described below). Refer to the BREEAM Wat 01 calculator for the current list of building types which can be assessed using the standard approach.

Alternative Wat01 method

Where it is not possible to use the standard approach to determine the buildings water consumption total (litres/person/day)the assessment can be completed on an elemental basis, as follows:

1. Using the list of applicable domestic scale water consuming components (see criterion 3), determine those that are specified/present in the assessed building.
2. Compare the actual specification for each component type with the table of water efficient consumption levels by component type (Table - 18) to determine the level of performance for each type. Note that the volumes quoted are maximums for that level and the % WC/urinal flushing demand is a minimum for that level.
3. Define each component's level of performance in the other building type calculator worksheet of the BREEAM Wat 01 calculator.
    a. For the alternative approach, the calculator applies a building type specific weighting to each component level to reflect its 'in-use' consumption relative to the other components present. A component with high 'in-use' water consumption therefore has a larger weighting than one with lower 'in-use' consumption and contributes relatively more or less to the building's overall level of performance.
    b. The weightings are derived from data on actual water consumption per day from non domestic buildings, sourced from BNWAT22[6]. They can be found in the BREEAM Wat 01 calculator.
4. Based upon the performance categorisation of each component type and the component weighting, the calculator will determine an overall component level of performance and award the relevant number of BREEAM credits as follows:

	Greywater/rainwater level achieved		
Overall Component level	-	4	5
Baseline	0 credits	1 credit	2 credits
Level 1	1 credit	2 credits	3 credits
Level 2	2 credits	3 credits	4 credits
Level 3 or 4	3 credits	4 credits	5 credits
Level 5	4 credits	5 credits	

Note:

1. An innovation credit for exemplary level performance can be awarded where the component specification achieves level 5 and >95% of WC/urinal flushing demand is met using recycled non potable water.
2. Due to the use of the weightings, the overall component level achieved will not necessarily be a whole number e.g component level 4. Where this is the case the methodology will always round down to the nearest component level and therefore BREEAM credit(s) level, e.g. if the component specification achieved is 3.6 credits, the actual number of credits awarded is 3 credits (the methodology will not round up to 4 credits because the performance specification for 4 credits has not been achieved).
3. Where the assessed building development has multiple specifications for the same water consuming component type, the number of fittings and component level achieved for each specification can be entered in the Other Building Type calculator. Using this information, the calculator will determine the building's aggregated performance level for that component type.

Please note: Whilst attempts have been made to align the benchmarking of both methodologies described above, they do determine performance in different ways. The number of BREEAM credits awarded by each method may therefore differ for the same water component specification. It is important to be aware of this difference when applying BREEAM New Construction to a number of different building types that form a part of the same overall development.

Other information

Certification of Water Efficient Products

Product certification schemes provide specifiers and clients with greater assurance of manufacturers' claims regarding the water efficiency performance of their products and therefore the potential water savings of different products. Specifying water efficient fittings certified by accredited bodies are encouraged by BREEAM, but at present the scheme does not require components to meet an approved standard to gain BREEAM credits.

---

[1]BS8525-1:2010, Greywater systems – Part 1 code of practice, BSi, 2010
[2]BS8515:2009, Rainwater harvesting systems – Code of practice, BSi, 2009
[3]Health Technical Memorandum 07-04: Water Management and Water Efficiency – best practice advice for the healthcare sector, Department of Health 2008
[4]Great Britain, The Water Industry Act 1991. London: The Stationery Office
[5]AECB Water Standards: Delivering buildings with excellent water and energy performance, vol 2 The water standards, technical background report (version 1), Grant, Thorton, AECB, 2009.
BNWAT22: Domestic water consumption in domestic and non-domestic properties (version 1.1). Market Transformation Programme, 2007.
BNWAT07: Baths - water efficiency performance tests (version 2.0). Market Transformation Programme, 2007.
BNWAT23: Reliability of information on water consumption of appliances (version 1), Market Transformation Programme, 2007.
BS6465-3:2006, Sanitary installations – Part 3: Code of practice for the selection, installation and maintenance of sanitary and associated appliances.
BSi, 2006.CIRIA W10, Key Performance Indicators for water use in hotel, Rachel Waggett and Catherine Arotsky, CIRIA, 2006.
CIRIA W11, Key Performance Indicators for water use in offices, Waggett, Arotsky, CIRIA, 2006.

Conserving water in buildings, a practical guide. Environment Agency, 2007.

Enhanced Capital Allowance Water Technology List criteria: www.eca-water.gov.uk

Report by Entec UK Ltd for CLG: Research to Assess the Costs and Benefits of Improvements to the Water Efficiency of New Non-household Buildings, Final Report, Oct 2009.

SD129: Certification and Listing of Low Flush WC appliances. BRE Global, 2008.

SD174: Certification and Listing of Water Efficient Terminal Fittings. BRE Global, 2008.

SD175: Certification and Listing of Water Efficient Baths. BRE Global, 2008.

The Building Regulations 2000, Part G: Sanitation, hot water safety and water efficiency (2010 edition). HM Government.

Waterwise: www.waterwise.org.uk

Water Efficiency Calculator for New Dwellings. Communities and Local Government, 2009.

Water efficient product labelling scheme: www.water-efficiencylabel.org.uk

Water Supply (water fittings) Regulations 1999, DEFRA.

Sustainable Products 2006: Policy Analysis and Projections, Market Transformation Programme, 2006.

Water UK - Macerators, the impact on sewers: www.water.org.uk/home/policy/positions/waste-macerators-position-paper

Water Efficient Buildings, water and planning, guidance for planners http://www.water-efficient-buildings.org.uk/

[6]BNWAT22: Domestic water consumption in domestic and non-domestic properties (version 1.1). Market Transformation Programme, 2007

Wat 02 Water monitoring

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

Aim

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

Assessment Criteria

The following is required to demonstrate compliance for:

One credit

1. The specification of a water meter on the mains water supply to each building; this includes instances where water is supplied via a borehole or other private source.
2. Water-consuming plant or building areas, consuming 10% or more of the building's total water demand, are either fitted with sub meters or have water monitoring equipment integral to the plant or area (see Compliance notes).
3. Each meter (main and sub) has a pulsed output to enable connection to a Building Management System (BMS) for the monitoring of water consumption.
4. If the site on which the building is located has an existing BMS, managed by the same occupier/owner (as the new building), the pulsed water meter(s) for the new building must be connected to the existing BMS.

Compliance Notes

Ref	Terms	Description
CN1	Water consuming plant or building areas See criterion 2	As a minimum this includes the following (where present); Buildings with a swimming pool and its associated changing facilities (toilets, showers etc.). On sites with multiple units or buildings, e.g. shopping centres, industrial units, retail parks etc. separate sub meters are fitted on the water supply to the following areas (where present): 1. Each individual unit supplied with water 2. Common areas (covering the supply to toilet blocks) 3. Service areas (covering the supply to outlets within storage, delivery, waste disposal areas etc.) 4. Ancillary/separate buildings to the main development with water supply. Laboratory: In any building with a laboratory or containing laboratories, a separate water meter is fitted on the water supply to any process or

Ref	Terms	Description
		cooling loop for 'plumbed-in' laboratory process equipment. Healthcare: for sites with multiple departments e.g. large health centres or acute hospitals, separate sub meters are fitted on the supply to the following areas where present: 1. Staff and public areas 2. Clinical areas and wards 3. Letting areas: On the water supply to each tenant unit 4. Laundries 5. Main production kitchen 6. Hydrotherapy pools 7. Laboratories 8. CSSD/HSDU, pathology, pharmacy, mortuary and any other major process water user 9. Supplementary supply of water from a cold water tank
CN2	10% of water demand See criterion 2	The sub-meter requirement does not necessarily apply in the following cases, where the assessor confirms there will be no additional monitoring benefit resulting from their installation: 1. Where a building has only one or two small sources of water demand (e.g. an office with sanitary fittings and a small kitchen) 2. Where the building has two sources of water demand, one significantly larger than the other, and the water consumption for the larger demand is likely to mask the smaller demand.
CN3	Shell only	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: 1. Option 1 – Use of a tenancy lease agreement between the developer and tenant/s (full value of available credits) 2. Option 2 – A Green Building Guide for tenant fit outs (half the value of the available credits) 3. Option 3 – Developer/Tenant collaboration (full value of available credits) Refer to Appendix D – BREEAM New Construction and shell and core/speculative assessments of this Scheme Document for further description of the above options.
CN4	Extensions to existing buildings See criterion 4	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 following must be provided in the existing building; 1. A water meter for the mains water supply 2. Sub-meters for large water consuming plant or facilities e.g. evaporative cooling, swimming pool etc. (where present). The meters provided must have a pulsed output or connection to existing BMS in accordance with the assessment criteria.
CN5	No water supply to the building/unit	If there is no installed water supply to the assessed building because there will be no water-consuming fittings in the building, then in such instances the guidance given in the above Compliance note for extensions to existing building applies.

Schedule of Evidence

Ref	Design stage	Post-construction stage
All	Relevant section/clauses of the building specification or contract Design drawings	BREEAM Assessor's site inspection report and photographic evidence OR 'As built' drawings

Additional Information

Relevant definitions

Staff areas
Hea 01 Visual comfort.

Clinical areas
Hea 01 Visual comfort.

Patient areas
Hea 01 Visual comfort.

CSSD
Central Sterile Supply Department.

HSDU
Hospital Sterilisation and Disinfection Unit.

Checklists and Tables

None

Calculation procedures

None

Other information

None

Wat 03 Water leak detection and prevention

Number of credits available	Minimum standards
2	No

Aim

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

Assessment Criteria

The following is required to demonstrate compliance for:

One credit

1. A leak detection system which is capable of detecting a major water leak on the mains water supply within the building and between the building and the utilities water meter.
2. The leak detection system is:
    a. Audible when activated
    b. Activated when the flow of water passing through the water meter/data logger is at a flow rate above a pre-set maximum 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.

One credit

3. One of the following types of flow control device is fitted to each WC area/facility to ensure water is supplied only when needed (and therefore prevent minor water leaks):
    a. A time controller i.e. an automatic time switch device to switch off the water supply after a predetermined interval
    b. A programmed time controller i.e. an automatic time switch device to switch water on and/or off at predetermined times.
    c. A volume controller i.e. an automatic control device to turn off the water supply once the maximum preset volume is reached.
    d. A presence detector and controller i.e. an automatic device detecting occupancy or movement in an area to switch water on and turn it off when the presence is removed.
    e. A central control unit i.e. a dedicated computer-based control unit for an overall managed water control system, utilising some or all of the types of control elements listed above.

Compliance Notes

Ref	Terms	Description
CN1	Mains supply shut-off See criteria 1 & 2	There is no requirement for the leak detection system to shut off the water supply when the alarm is triggered (constant water supply may still be required for certain systems/operations).
CN2	Leakage rates See criterion 2	This issue does not specify what the high and low level leakage rates should be however the leak detection equipment installed must have the flexibility to distinguish between different flow rates to enable it to be programmed to suit the building type and owner/occupier's usage patterns.
CN3	System criteria See criterion 2	It is anticipated that the leak detection credit will usually be achieved by installing a system which detects higher than normal flow rates at meters and/or sub-meters. It does not necessarily require a system that directly detects water leakage along part or the whole length of the water supply system.
CN4	Water utilities meters See criterion 3	Where there is a water utilities meter at the site/building boundary, it may be necessary to install a separate flow meter (or alternative measurement system) just after the utility meter to detect leaks; however, if the water utility company agrees to some form of leak detection being installed on their meter, this would also be acceptable.
CN5	Flow control systems See criterion 3	Flow control systems may control combined WC areas, such as male and female toilets within a core, they are not required for each individual sanitary appliance. The criteria are set to encourage the isolation of the water supply to each WC block when it is not being used.
CN6	Single WCs See criterion 3	The flow control criteria for this issue do apply to facilities which have only a single WC (potentially within smaller or low occupancy buildings). In these instances shut-off could be provided via the same switch that controls the lighting (whether proximity detection or a manual switch).
CN7	Ancillary or multiple buildings/units	The criteria apply to the water supply to all buildings falling within the scope of the assessment.
CN8	No water supply to the building/unit See crite-	These credits are still assessed where there are no installed fittings and therefore no water supply to the building. In these instances the facilities likely to be used by the future occupants of

Ref	Terms	Description
	ria 1, 2 & 3	the assessed building must meet the criteria e.g. those facilities within the nearest accessible building.
CN9	Extensions to existing buildings See criteria 1, 2 & 3	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.
CN10	Shell only	Where the installation of facilities within tenanted units/areas will be the responsibility of the future tenant, compliance with the flow control credit within this BREEAM issue can be demonstrated via one of the following means for shell only buildings/areas: 1. Option 1 – Use of a tenancy lease agreement between the developer and tenant/s (full value of available credits) 2. Option 2 – A Green Building Guide for tenant fit outs (half the value of the available credits) 3. Option 3 – Developer/Tenant collaboration (full value of available credits) Refer to Appendix D – BREEAM New Construction and shell and core/speculative assessments of this Scheme Document for further description of the above options.
CN11	Multi-residential buildings and guest accommodation: flow control specification See criterion 3	The credit for the specification of flow control devices in WC areas/facilities does not apply to ensuite facilities in residential areas e.g. ensuite in individual private bedrooms and a single bathroom for a collection of individual private bedrooms in halls of residence, key worker accommodation or sheltered accommodation. The credit and criteria are however applicable to buildings with guest bedrooms with ensuite facilities, e.g. hotel rooms, and communal WC areas/facilities, e.g. communal WC facilities in hotels/hostels and care homes.
CN12	Clinical areas in healthcare buildings	The criteria for this issue do not apply to toilet facilities in clinical areas.

Schedule of Evidence

Ref	Design stage	Post-construction stage
All	Relevant section/clauses of the building specification or contract Design drawings Manufacturers product details	BREEAM Assessor's site inspection report and photographic evidence Manufacturers product details

Additional Information

Relevant definitions

Clinical areas

Hea 01 Visual comfort.

Checklists and Tables

None

Calculation procedures

None

Other information

None

Wat 04 Water efficient equipment

Number of credits available	Minimum standards
1	No

Aim

To reduce unregulated water consumption by encouraging specification of water efficient equipment.

Assessment Criteria

The following is required to demonstrate compliance for:

One credit

1. Where an irrigation method specified for internal or external planting and/or landscaping, it complies with ANY ONE of the following:
    a. Drip feed subsurface irrigation that incorporates soil moisture sensors. The irrigation control should be zoned to permit variable irrigation to different planting assemblages.
    b. Reclaimed water from a rainwater or greywater system. The storage system must be appropriately sized i.e. storage capacity is relative to the size of the soft landscaped area.
    c. External landscaping and planting that relies solely on precipitation, during all seasons of the year.
    d. All planting specified is restricted to species that thrive in hot and dry conditions.
    e. 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.
2. 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.
3. Where a vehicle wash system is specified, it uses a full or partial reclaim unit which contains one or more of the following: a hydro-cyclone, a sand or activated carbon filter, a sump tank(s), three chamber interceptors, and a cartridge filter or bag filter. This is in line with the ECA water technology list[1].

Compliance Notes

Ref	Terms	Description
CN1	Issue is not applicable	Where there is no planting or vehicle wash facilities in the building this issue is not applicable and does not require assessment.
CN2	Microbial con-	Where vehicle wash systems are specified, the design team are to clar-

Ref	Terms	Description
	tamination See criterion 3	ify that the installed system(s) is designed to minimise any legionella risk (refer to BREEAM issue Hea 04).
CN3	Multi-res-idential devel-opments with CSH assessed dwellings	For buildings with self-contained dwellings also being assessed under the Code for Sustainable Homes (CSH), the following applies: Where Wat 2 of the CSH has been achieved, Wat 04 can be achieved for the assessment of the multi-residential aspect of the development, provided the external water collection facility provides sufficient volume for all buildings (multi-residential and self-contained dwellings) within the construction zone.

Schedule of Evidence

Ref	Design stage	Post-construction stage
All	Documentation detailing the planting and irrigation strategy Relevant section/clauses of the building specification or contract AND/OR design drawings (where necessary) Manufacturers product details	BREEAM Assessor's site inspection report and photographic evidence Manufacturers product details

Additional Information

Relevant definitions

Construction zone

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

Unregulated water

Water supply systems whose specification is not regulated by Building Regulations or other relevant legislation. For the purpose of this BREEAM version, this at present includes equipment for irrigation and, for the relevant building types, vehicle wash plant/equipment.

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.

Checklists and Tables

None

Calculation procedures

None

Other information

None

[1] http://www.eca-water.gov.uk/criteria.asp?section=66&sub-technology=000300160001&technology=00030016&tech=000300160001

Materials

Mat 01 Life cycle impacts

Number of credits available	Minimum standards
Building type dependent	No

Aim

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

Assessment Criteria

The following is required to demonstrate compliance:

1. BREEAM awards credits on the basis of the building's quantified environmental life cycle impact through assessment of the main building elements, as set out in Table - 19 below:

Table - 19: Elements assessed by building type

Building type	Element Type Assessed					
	External walls	Windows	Roof	Upper floor slab	Internal walls	Floor finishes/coverings
Office	✓	✓	✓	✓		✓
Retail	✓	✓	✓	✓		✓
Industrial	✓		✓			
Education	✓	✓	✓	✓	✓	✓
Healthcare	✓	✓	✓	✓	✓	✓
Prisons	✓	-	✓	✓	-	✓
Courts	✓	✓	✓	✓	✓	✓
Multi-res-idential	✓	✓	✓	✓	✓	✓
Other build-ings	✓	✓	✓	✓	✓	✓

2. Credits are awarded on the basis of the total number of points achieved, as set out inTable - 20 below, and calculated using the BREEAM Mat 01 calculator. This point's score is based on the Green Guide rating(s) achieved for the specifications that make-up the main building elements (as above).
   Note: Where an independently verified third-party Environmental Product Declaration (EPD), covering part of or the whole life cycle, is available for a material/product that forms part of an assessed building element, this can be used to increase the contribution of that element to the building's Mat 01 performance (refer to Calculation procedures in the Additional Information section for more detail).

Table - 20: Allocation of credits by building type and Mat 01 points

Building type	Total Mat 01 points achieved[1 and 2]						
	≥ 2	≥ 4	≥ 5	≥ 8	≥ 10	≥ 12	≥ 14
	Available BREEAM credits						
Office	1	1	2	3	4	5	-
Retail	1	1	2	3	4	5	-
Industrial	1	2	-	-	-	-	-
Education	1	1	2	3	4	5	6
Healthcare	1	1	2	3	4	5	6
Prisons	1	1	2	3	4	-	-
Courts	1	1	2	3	4	5	6
Multi-residential	1	1	2	3	4	5	6
Other buildings	1	1	2	3	4	5	6

1. Please refer to 'Calculation procedures' in the Additional Information section (below) for a description of the methodology used to determine the number of points and BREEAM credits achieved.
2. Where the total points achieved exceeds the level required for maximum credits see the exemplary level criteria as the building may be eligible for an additional innovation credit.

3. Life cycle Green House Gas emissions ($kgCO_2$ eq.) for each element are also required to be reported based on a 60-year building life. Where specific data is not available for a product or element, generic data should be used. Generic data can be obtained from the online Green Guide for each element and must be entered in to the BREEAM Mat 01 calculator.

Exemplary level criteria

The following outlines the two exemplary level routes available to achieve up to three innovation credits for this BREEAM issue.

Route 1: Using the Green Guide to Specification (elemental approach) - one credit

4. Where assessing four or more applicable building elements, the building achieves at least two points in addition to the total points required to achieve maximum credits under the standard BREEAM criteria (as outlined in the table above) OR
5. Where assessing fewer than four applicable building elements, the building achieves at least one point in addition to the total points required to achieve maximum credits under the standard BREEAM criteria.

Where the assessed building does not specify an element listed above, see the Compliance note regarding the exemplary level benchmark.

Route 2: Using compliant Life Cycle Assessment software tools (Whole Building approach) - two credits

6. Where the design team has used an IMPACT compliant software tool (or equivalent) to measure the environmental impact of the building.
7. Where the design team can demonstrate how the use of an IMPACT compliant software (or equivalent) has benefited the building in terms of measuring and reducing its environmental impact.
8. Where the design team submit the Building Information Model (BIM) from the IMPACT compliant software tool (or equivalent) for the assessed building to BRE Global (via the project's appointed BREEAM assessor).

Further information about IMPACT is provided in the Other information section of this BREEAM issue.

Please note a project can achieve all three innovation credits where it is complying with exemplary level criteria 4 to 8, i.e. one route is not necessarily exclusive of the other, a project can comply with both routes 1 and 2 or choose to comply with only route 1 or only route 2

Compliance Notes

Ref	Terms	Description
CN1	Element not specified. See criteria 1, 2,4 & 5	Where the building does not contain an element listed above, for example there are no upper floors in a single storey building, the BREEAM Mat 01 calculator allows the BREEAM assessor to exclude the element from the assessment. In such instances the BREEAM Mat 01 calculator will re-calculate the standard and exemplary level benchmarks on the basis of the remaining applicable elements.
CN2	Green Guide Online. See criterion 2	www.thegreenguide.org.uk Refer to the Additional Information section below for guidance on using the online Green Guide to Specification and accessing the appropriate ratings for the assessed elements.
CN3	Element consisting of more than one spec-	Where more than one specification is present for a given element, the Green Guide rating and area for each specification should be entered into the BREEAM Mat 01 calculator. The calculator will then

Ref	Terms	Description
	ification. See criterion 2	determine the total points score on the basis of each specifications rating and area as a proportion of the whole element.
CN4	Finding exact Green Guide Ratings. See criterion 2	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 (also see note below 'No Green Guide rating match').
CN5	No Green Guide rating match. See criterion 2	Where a generic Green Guide rating cannot be found for a specification the BREEAM assessor can use the online Green Guide calculator to determine a bespoke Green Guide rating for the specification (for any elements except floor finishes). Licensed BREEAM assessors can access the calculator via www.thegreenguide.org.uk. If a required component is not present via the online Green Guide calculator, the BREEAM assessor will need to submit a Bespoke Green Guide Query proforma, from which BRE Global will calculate the rating and confirm the result to the assessor.
CN6	Environmental Profile Certification of products. See criterion 2	Products with certified Environmental Profiles can be used to demonstrate compliance with this BREEAM issue. Products are certified with a "product specific" Green Guide rating as part of a relevant elemental specification, e.g. a manufacturer's concrete block as part of an external wall specification. This rating can be used in the same way as a generic Green Guide rating for this BREEAM issue (see the Additional Information section for a screenshot example of a product listing from GreenBook Live). Where a certified product forms part of a different specification, for the same or different element type (i.e. different to that described on the Environmental Profile certificate), the guidance within the Calculation procedures (Additional Information section) concerning Environmental Product Declaration types should be followed. This procedure outlines how BREEAM gives additional recognition for materials with robust Environmental Product Declaration types. A copy of the Environmental Profile Certificate and its appendix (which contains characterised data, normalised data and the Ecopoints score) can be sourced from the manufacturer or via the Environmental Profiles listing on www.greenbooklive.com.
CN7	Reporting life cycle GHG emissions See criterion 3	Where the data is available, it is a requirement that the life cycle GHG emissions ($kgCO_2$ eq.) for each specification are gathered and reported, via the BREEAM scoring and reporting tool. BREEAM assessors can source this information as follows: For generic Green Guide ratings the $kgCO_2$ eq. is reported via the online green guide www.thegreenguide.org.uk. Simply click on the relevant specification type (having already defined the building, category and element type) and the $kgCO_2$ eq. are reported along with the individual category ratings for that element, at the bottom

Ref	Terms	Description
		of the page (see screen shot in the Additional Information section). The information is not available at present for bespoke Green Guide ratings. For Green Guide ratings based on a product manufacturer's certified Environmental Profile, Assessors will find the $kgCO_2$ eq. in the product's Environmental Profile Certificate appendix, in the 'Characterised data' section (against the 'Climate Change' issue).
CN8	New elements containing re-used materials. See criterion 2	If a new element is specified e.g. external wall, and part of that element includes a reused material e.g. reclaimed bricks, the BREEAM assessor will need to submit a Bespoke Green Guide Query proforma. BRE Global will then calculate the rating and confirm the result to the assessor.
CN9	Existing elements re-used in the new construction	For new constructions, only new elements need to be assessed, existing in-situ elements adjoining a new construction, e.g. an existing building facade, do not require assessment. If this BREEAM scheme is being used to assess a major refurbishment project, where the assessed building is re-using existing in-situ elements as part of its structure, those elements can be allocated an A+ Green Guide rating. If the existing element will contain substantial new materials the BREEAM assessor will need to submit a Bespoke Green Guide Query proforma. BRE Global will then calculate the rating and confirm the result to the assessor.
CN10	Mixed use developments and roofs. See criterion 1	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.
CN11	Floor finishes and speculative buildings. See criterion 1	Where the floor finishes have not been specified due to the speculative nature of the building, compliance with the criteria can be demonstrated via one of the following means in shell only buildings/areas: 1. Option 1 – Use of a tenancy lease agreement between the developer and tenant/s (full value of available credits) 2. Option 2 – A Green Building Guide for tenant fit outs (half the value of the available credits) 3. Option 3 – Developer/Tenant collaboration (full value of available credits) Refer to the Scope of BREEAM 2011 New Construction section of this scheme document (section 2) for further description of the above options. Office buildings: If the developer has specified floor finishes in a show area only (for compliance with BREEAM issue Wst 04 Speculative floor and ceiling finishes), the area and Green Guide

Ref	Terms	Description
		rating of the show area floor finishes must be accounted for in this issue. This is in addition to accounting for the floor finish specification in the speculative areas of the building (as per the above options).
CN12	Specialist floor finishes in operational areas. See criterion 1	Specialist floor finishes in operational areas of buildings fall outside of the scope of the Green Guide. This is due to specific performance requirements 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 when assessing this BREEAM issue (see also guidance in Additional Information section, below, on floor finishes).
CN13	Roof lights, patio doors and glazed conservatories. See criterion 1	For the purpose of this issue any doors with a large expanse of glazing, such as patio doors, should be assessed as windows. Similarly, glazed areas of conservatories and roof lights should be assessed as windows.
CN14	Where integral insulated cold storage units form a part of the building fabric	Please refer to the Additional Information section for guidance on assessing this issue for buildings with integral cold storage i.e. where the walls, floor and ceiling of that unit form a part of the building's fabric.
CN15	Multi-residential development including CSH assessed dwellings. See criterion 2	For multi-residential developments with self-contained dwellings being assessed under the Code for Sustainable Homes (CSH), the number of credits achieved under the Code assessment are equivalent to the points associated to Green Guide ratings under BREEAM. For example: 1. An A+ rated specification in the CSH achieves 3 credits 2. 3 credits in the CSH are equal to 3 points in BREEAM 3. 3 points in BREEAM achieves approximately 1 credit Therefore, where elemental specifications in the multi-residential building are the same as that used in CSH assessed self-contained dwellings, the information/evidence concerning performance in the CSH can also be used for BREEAM purposes. Please note: assessors must use the BREEAM Mat 01 calculator to determine the actual number of Mat 01 credits achieved. Please also refer to the Additional Information section of this issue for important information about how the BREEAM Mat 01 calculator determines the number of credits achieved.
CN16	Demonstrating benefit (Criterion 6)	This should take the form of a short qualitative statement from the design team providing comments on the following: 1. How and at what stages of the design the tool was utilised.

Ref	Terms	Description
		2. How the tool helped (or did not help) steer the design/design process to optimise cost and mitigate environmental impacts, giving examples of specific changes to the building design/specification that resulted. This statement should be submitted to BRE Global along with the BIM from the IMPACT compliant tool.

Schedule of Evidence

Ref	Design stage	Post-construction stage
All	Specification providing a detailed description of each applicable element and its constituent materials specification. Design drawings or specification detailing the location and area (m^2) of each applicable element. A copy of the output from the BREEAM Mat 01 calculator, including Green Guide rating and element number[1] for each specification assessed. And if relevant: 1. Copies of Environmental Product Declarations 2. A link/reference to the EPD's Product Category Rules 3. Online Green Guide calculator output 4. Environmental Profile certificate(s) (or certificate number) 5. For IMPACT (or equivalent) the Building Information Model and BRE Global email confirmation for receipt of the Model. Where relevant for multi-residential buildings: Evidence in line with the Design stage evidence requirements of the CSH Issue Mat 1 OR A copy of the Design Stage CSH certificate and report from the CSH online reporting system confirming the number of credits achieved for CSH Issue Mat 1.	Assessor's building/site inspection and photographic evidence confirming the specified elements in-situ (where possible) Where relevant, as built drawings and written design team confirmation of any changes to materials specification. Where relevant for multi-residential buildings: Evidence in line with the Post Construction Stage evidence requirements of the CSH Issue Mat 1 OR A copy of the Post Construction Stage CSH certificate and report from the CSH online reporting system confirming the number of credits achieved for CSH Issue Mat 1.

Ref	Design stage	Post-construction stage
1.	Element numbers are unique but the available specifications may change. 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.	

Additional Information

Relevant definitions

BREEAM Mat 01 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. See Calculation procedures below for a description of how BREEAM determines the number of credits achieved for the life cycle impact of the building's main material elements.

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. One hundred Ecopoints is equivalent to the impact of a European Citizen. Green Guide ratings are derived by sub-dividing the range of Ecopoints/m^2 achieved by all specifications considered within a building element.

Environmental Product Declaration

BS EN ISO 14025:2010[1] defines an environmental label or environmental declaration as a claim which indicates the environmental aspects of a product or service. BS EN ISO 14020:2001[2] goes on to state that environmental labels and declarations provide information about a product or service in terms of its overall environmental character, a specific environmental aspect, or any number of aspects. BRE's Environmental Profile Methodology and Green Guide to Specification is an example of an EPD. Life Cycle Assessment (LCA) is the tool underpinning EPD and the LCA should conform to the requirements of the BS ISO 14040 series.

BRE Environmental Profile Methodology

BRE Environmental Profile Methodology and subsequent product certification involves calculating the 'cradle to grave' environmental profile of a building material, product or system, and services. This is a measure of all key environmental impacts, during extraction, processing/manufacture, use (including maintenance and refurbishment) and disposal, over a 60-year study period. Once certified, environmental profiles are reviewed on an annual basis to ensure they remain valid, and are recalculated every three years.

Frequently updated lists of building materials, products and systems assessed and certified under the Environmental Profiles Certification Scheme can be viewed at www.greenbooklive.com. The listing also includes the Green Guide rating for the approved products.

Where a product specified is claiming certification against the BRE Environmental Profiles Methodology, the BREEAM assessor should ask for a copy of the certificate or the certificate number and certifying body from the relevant manufacturer or, alternatively, they can verify the claim via Green Book Live listings. The BREEAM assessor should include a reference to the BRE Global Approved certificate number in their assessment report. An example screenshot of a product specific Environmental Profile listing on GreenBook Live is provided in the Additional Information section of this issue.

Green Guide to Specification

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 generic elemental ratings within the online Guide are based on LCA data generated using the BRE Environmental Profiles Methodology. The Environmental Profiles Methodology has been peer reviewed to comply with BS ISO 14040 and represents the Product Category Rules for BRE Global's environmental labelling scheme (EPD - ISO 14025, Type III) for construction products and elements. www.thegreenguide.org.uk

Green Guide element number

A unique BRE Global reference number given to a Green Guide rating for any particular building element type specification. Both standard Green Guide ratings and those calculated using the Online Green Guide calculator will have an element number.

Online Green Guide calculator

BRE Global have developed the online Green Guide Calculator to enable BREEAM and CSH assessors to quickly and efficiently generate Green Guide ratings for a significant proportion of specifications not listed in the Green Guide Online. The Green Guide Calculator database is based on the components currently used to create specifications within the Green Guide online. These components can be selected and combined to generate instant Green Guide ratings for a multitude of different specifications.

To access the Green Guide Calculator, you must be a licensed BREEAM/EcoHomes/Code for Sustainable Homes Assessor. Please note that, at the time of writing, the Green Guide Calculator is not yet available for public use.

Reused materials

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).

Checklists and Tables

None.

Calculation procedures

Determining the number of BREEAM credits achieved as a result of each element's Green Guide rating

The Green Guide uses an A+ to E rating system, whereby the rating relates to the relative life cycle performance of a specification in comparison with other types of specifications available for a particular building element type e.g. external wall.

Three steps are undertaken to translate the performance of all the separate individual elemental specifications and their Green Guide ratings into an overall building performance score for life cycle impact, against which BREEAM credits can be awarded. Each of these steps is undertaken using the BREEAM Mat 01 calculator and the information collated by the BREEAM assessor. The steps in this process are as follows:

Step 1: Translating the Green Guide rating into points

The first step in the calculation procedure is translating a specification's Green Guide rating into a number of points. The table below illustrates the points available by Green Guide rating.

Green Guide Rating	Mat 01 Points
A+	3.00
A	2.00
B	1.00
C	0.50
D	0.25
E	0.00

The maximum number of points available for an assessed building is a product of the number of elements assessed multiplied by three. For example, for an office building five elements are assessed so there are a maximum of fifteen points available; furthermore twelve of those fifteen points must be achieved to award all five BREEAM credits.

Whilst it may appear that three points are available for each element assessed, and in many assessments this may be the case, the actual maximum number of points available for a particular element will depend on the impact of the element type compared with the other elements present and assessed (refer to step 3 below). This is because this issue assesses the life cycle impact of the whole building, taking in to account the relative performance and therefore contribution of the main building elements towards the building's overall performance.

Step 2: Weighting the performance of individual specifications within an elemental category

Where an element consists of several different specifications, the overall points achieved for that element are weighted according to the relative area and Green Guide rating of each of the individual specifications.

An example of this is provided below for an external wall element consisting of three different types of external wall specification.

Element type	Specification	Area (m^2)	% of element type	Generic Green Guide rating	Points	Area weighted points
External Wall	External wall type 1	280	26%	A+	3	0.78
	External wall type 2	350	33%	C	0.5	0.17
	External wall type 3	435	41%	B	1	0.41
Element Total		1065	100%	-	-	1.36

This adjustment is made to ensure the contribution of points is balanced in accordance with the life cycle performance of each specification.

Step 3: Weighting the performance of individual elements relative to all elements assessed

Step three is completed in two parts:

Part 1: Weights the performance of the building elements based on its area relative to the overall area of the 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.

For example, a 20-storey office block will have a smaller roof area than external wall area, and so the area weighting will take this into account by giving a smaller weighting to the points score for the roof in comparison to the external walls.

Part 2: The range of impacts, measured using Ecopoints, for each of the elements will differ and therefore so will the increments between each Green Guide rating level. 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.

Calculation procedure where a specific Environmental Product Declaration is available for a material

The Green Guide online provides users (design teams and clients) with information on the relative life cycle environmental impacts for a range of different building elemental specifications e.g. external wall, roof, windows etc. Each specification's online Green Guide rating is based on verified LCA data for generic construction products assessed according to BRE's Environmental Profiles Methodology.

There are many different schemes producing EPD for products or services complying with BS ISO 14025 (there is specific construction product and service variant of BS ISO 14025; BS ISO 21930) using LCA according to the BS ISO 14040 series.

Where a third party verified EPD is available for a product that forms part of an assessed element, for example a concrete block used in an external wall, the EPD can potentially be used to uplift the element's BREEAM performance, i.e. points and therefore credits achieved. The degree of uplift available in such instances depends on three factors:

1. The assessed element's existing Green Guide rating
2. The proportion of the total environmental impact of the element that the material with the EPD contributes
3. The manufacturer's Environmental Product Declaration type for the relevant product/material(s)

Using this information, the points achieved for the existing Green Guide rating of the element is adjusted as follows (using the BREEAM Mat 01 calculator):

1. The proportion of the total environmental impact of the assessed element that the material with the EPD contributes is determined using the Online Green Guide Calculator[3] The Online Green Guide calculator will list the relative environmental impact of each constituent material of a defined element as a percentage. Select the percentage for the relevant material and enter this into the BREEAM Mat 01 calculator.

   If an element cannot be defined using the Online Green Guide Calculator the assessor will need to complete a Bespoke Green Guide Query Proforma and submit to BRE Global, who will then confirm the relevant proportional impact of the material(s) in question. This will also be required for a material with a BRE Environmental Profile which is specified as part of an element that

differs from the elemental description on which that profile is based (see also relevant compliance note above).

2. Define the Environmental Product Declaration type and tier level (seeTable - 21below) for the material(s) in question.

Table - 21: The Environmental Product Declaration (EPD) type and tier ranking

EPD Tier level	EPD description
1	A third-party, independently verified EPD covering the whole life cycle (i.e. cradle-to-grave).
2	A third-party, independently verified EPD covering partial life cycle (i.e. cradle-to-gate or cradle-to-gate with options*).

*Partial life cycle EPD can cover:

1. The product stage only. Such an EPD covers raw material supply, transport, manufacturing and associated processes; this EPD is said to be "cradle to gate";
2. The product stage and selected further life cycle stages. Such an EPD is said to be "cradle to gate with options"

In both cases, the above EPD must be produced in accordance with the requirements of the ISO 14020 series, particularly ISO 14025 & ISO 21930[4] (concerning environmental labels and declarations) and ISO 14040[5] and 14044[6] (concerning life cycle assessment).

3. Once the element's Green Guide rating and the relevant material(s) proportional impact and EPD type and tier level have been defined, the points uplift can be calculated (see Table - 22 below). The BREEAM Mat 01 calculator does this by multiplying the material's proportional impact by the maximum points uplift available for the Green Guide rating achieved for the element. The points uplift is then added to the points already achieved for that element's generic Green Guide rating (see worked example below). The BREEAM Mat 01 calculator then continues its calculation procedure, as outlined in steps 2 and 3 above, to determine the number of BREEAM credits achieved.

Table - 22: Green Guide points uplift by EPD type

Existing Green Guide Rating	Generic Green Guide rating Points	EPD Tier 1 Max points uplift	EPD Tier 2 Max. points uplift
A+	3.00	1.00	0.75
A	2.00	1.00	0.75
B	1.00	1.00	0.50
C	0.50	0.50	0.25
D	0.25	0.25	0.125
E	0.00	0.00	0.00

The points uplift for tier 1 has been linked to the points available for achieving generic Green Guide ratings. An element whose constituent materials have each had their life cycle impacts quantified and independently verified i.e. tier 1 EPD, will achieve a points uplift to the next level above that achieved for

the elements generic Green Guide rating. The tier 2 points uplift is set relative to tier 1, based on the fact that a tier 2 EPD covers only part of the material/element life cycle i.e. cradle to gate and not the full life cycle i.e. cradle to grave.

Example: The following is an example of the above calculation for a theoretical external wall specification with a generic Green Guide B rating (which equates to one point).

External wall specification	Proportion of element impact	EPD tier	Points uplift
Load bearing concrete cladding	65%	1	0.65 x 1.0 = 0.65
Limestone finish	17%	None	0
Medium density solid block	10%	1	0.1 x 1.0 = 0.1
Plasterboard & paint	5%	2	0.05 x 0.5 = 0.025
Insulation	3%	None	0
		Total points uplift	0.78
		Total points achieved for element	1.78

In the above example therefore, having product specific Environmental Product Declarations for 80% (by impact) of the Green Guide B rated element's materials results in a points uplift of 0.78 (a 78% uplift on the element's BREEAM performance in this instance). This uplift could make a difference in the number of BREEAM credits achieved for the building.

Other information

Using the online Green Guide to Specification

The Green Guide categorises ratings by building type and element. When using the Green Guide online, (www.thegreenguide.org.uk), the main page asks the user to select a building type from the following options:

1. Domestic
2. Commercial (offices)
3. Health
4. Retail
5. Industrial
6. Education

To obtain the appropriate Green Guide ratings for the assessed building elements, select the category that corresponds to the assessed building type. See below for guidance on which category to select for building types not listed above.

Please note there are a number of common building elements (see below) and therefore Green Guide ratings. As these elements are common, any building type can be selected to determine the appropriate rating (regardless of the actual non-domestic building type being assessed).

Table - 23: Building type and the use of appropriate Green Guide ratings

Building type	Green Guide ratings
Further or Higher Education buildings	When carrying out a BREEAM assessment of a Further or Higher Education building, in most cases the Green Guide ratings listed under the 'Education' category can be used. Alternatively, if the elemental specification of the building/space is more akin to a commercial, retail, industrial or health specification in terms of its Green Guide functional unit, then select and use the Green Guide ratings from the relevant the building type.
Prison buildings	To obtain appropriate ratings for elements that are not common (upper-floors, roofs and floor finishes), select the 'healthcare' category. For prison building types that are more akin to commercial buildings in their construction e.g. visitors' centres, catering buildings, sports halls select the commercial category. These categories include ratings that are most appropriate to the elemental specifications used for these types of prison buildings.
Law court buildings	To obtain appropriate Green Guide ratings for elements that are not common (internal walls, roof, upper floor slab and floor finishes) select the 'schools' category for court buildings. This category includes ratings that are most appropriate to the elemental specifications used for this building type. For floor finishes, it is permissible to select flooring from another building type other than schools, if the function/use in the assessed building is more appropriate to that type.
Multi-residential buildings	For multi-residential buildings please use the Green Guide ratings listed under the 'Domestic' category. Where the Multi-residential building is a high rise building i.e. more than 3 stories high, ratings from the 'commercial' category of the Green Guide must be used for the external walls and window elements. To obtain appropriate Green Guide ratings for floor finishes within Multi-residential development, select the 'healthcare' category for floor finishes fitted in the communal areas and corridors and 'domestic' for those fitted in the over threshold area.
Other buildings	For many other building types assessed it may be clear which category of building type to select for Green Guide purposes (for elements that are not common). If it is not clear the BREEAM assessor will need to contact BRE Global for advice, supplying a description of the building including the relevant function(s). BRE Global will then confirm to the BREEAM assessor the appropriate category to select.
Common elements	The following elements, for the purpose of non-domestic buildings, have common Green Guide ratings irrespective of the building type: 1. External walls 2. Landscaping 3. Windows - commercial The user can therefore search for ratings for the above elements under any building category.

Guidance for the assessment of floor finishes

The Green Guide online, under each building type, has categories of flooring specifications commonly used for the key floor areas for that building type. For example, the Retail category contains ratings for

hard and soft floor finish specifications for public access areas based on the functional unit for that type of space.

However, any given building will normally contain several different floor areas with different wear requirements. Therefore, the BREEAM Assessor will need to refer to floor finishes under other building type categories to find the relevant specification and Green Guide rating for the building (if floor finishes are one of the applicable elements). For example, for 'back of house' office and corridor areas in a retail development, it will be necessary to search the floor finishes specifications and ratings under the 'commercial' category of the Green Guide online. To aid users of the Green Guide online, there is a diagram that will direct you to the appropriate ratings to be used for other floor areas. The diagram is found in the guidance under the Floor Finishes category.

IMPACT (Integrated Material Profile And Costing Tool)

IMPACT is a specification and database for software developers to incorporate into their tools to enable consistent Life Cycle Assessment (LCA) and Life Cycle Costing (LCC). IMPACT compliant tools work by allowing the user to attribute environmental and cost information to drawn or scheduled items in the BIM. IMPACT takes quantity information from the BIM and multiplies this by environmental impact and/or cost 'rates' to produce an overall impact and cost for the whole (or a selected part) of the design. The results generated by IMPACT allow the user to:

- analyse the design to optimise cost and environmental impacts.
- compare whole-building results to a suitable benchmark to assess performance, which can be linked to building assessment schemes.

The benefit of BIM enabled whole-building assessment is that the calculations are based on real design data and accurate quantities, rather than generic specifications for particular building elements. IMPACT compliant tools also allow users to accurately model the life cycle performance of primary structures and substructures, which are not covered by the Green Guide to Specification.

IMPACT was developed by an industry consortium led by BRE. The work was funded by the UK's Technology Strategy Board. Further information about IMPACT and IMPACT compliant software tools (identified by the IMPACT compliant logo) is available from www.impactwba.com

Submission of an IMPACT (or equivalent) BIM

BRE Global requires the submission of the Building Information Model (BIM) from the IMPACT compliant software tool (or equivalent) in order to:

- Facilitate the establishment of robust building level life cycle performance benchmarks in BREEAM. This will enable future BREEAM versions to recognise and reward those designs which achieve above average performance.
- Fulfil BREEAM Quality Assurance requirements
- Conduct further research using data from real life projects.

Any data supplied to BRE Global will be treated in confidence and the use of BIM data for research purposes will ensure individual projects are unidentifiable.

Tools equivalent to but not compliant with IMPACT

Tools that are considered by BRE Global to be equivalent to an IMPACT Compliant tool will be eligible for the same Exemplary credits. Equivalence will be judged by BRE Global based on the following:-

- Suitability of the BIM content for refining benchmarks
- Format in which the BIM is transmitted.

Please contact BRE Global at the earliest opportunity to establish equivalence status of a non-IMPACT compliant software tool.

Indoor Air Quality and the Green Guide flooring category ratings

The Green Guide Online does not cover the potential health and wellbeing issues associated with flooring materials and indoor air quality, this impact is covered in BREEAM issue Hea 02 Indoor Air Quality.

Guidance for the assessment of buildings where insulated cold storage units form an integral part of the building fabric

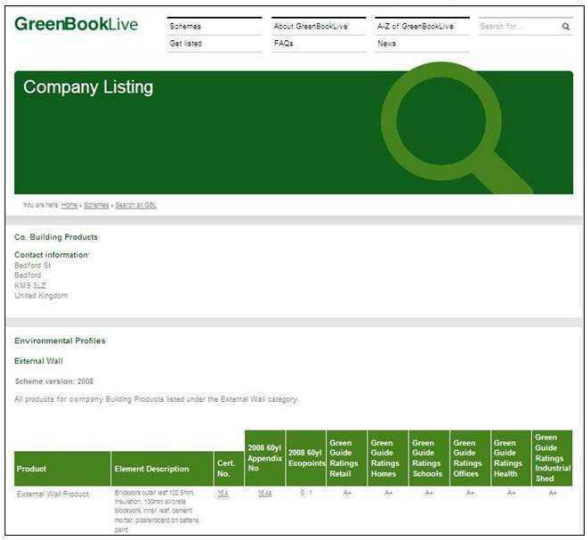
1. Where the cold storage unit forms part of, or is integral to the external wall element:
   As an external wall type the insulated units will be assessed in the Green Guide on the basis that it is a normal temperature building without the extra insulation, so a standard thickness of insulation will 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.
2. 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.
3. 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.

Screenshot of a specification from the BRE Green Guide Online

Green Guide 2008 ratings

Building type >	Commercial
Category >	Roof Construction
Element type >	Low Pitched Roof
Element	Galvanised steel rafters and joists, composite profiled roof cladding (steel inner lining, pentane blown PUR/PIR insulation, coated aluminium outer skin)
Element Number	812560014
Summary Rating	A+
Climate Change	A+
Water Extraction	C
Mineral Resource Extraction	A+
Stratospheric Ozone Depletion	A
Human Toxicity	B
Ecotoxicity to Freshwater	B
Nuclear Waste (higher level)	A
Ecotoxicity to Land	B
Waste Disposal	A+
Fossil Fuel Depletion	A
Eutrophication	A
Photochemical Ozone Creation	B
Acidification	A
Kg of CO_2	98.0

Screenshot of a product specific Environmental Profile listing on GreenBook Live



[1]BS EN ISO 14025:2010, Environmental labels and declarations - Type III environmental declarations, Principles and procedures. BSi, 2010.
[2]BS EN ISO 14020, Environmental labels and declarations - General principles. BSi, 2001.
[3]At the time of publishing the pre-live version of this Scheme Document (March 2011) this Online Green Guide Calculator functionality is not present.
[4]BS EN ISO 21930:2007 Sustainability in building construction. Environmental declaration of building products. BSi, 2007.
[5]BS EN ISO 14040:2006 Environmental management. Life cycle assessment. Principles and framework. BSi, 2006
[6]BS EN ISO 14044:2006 Environmental management. Life cycle assessment. Requirements and guidelines. BSi, 2006

Mat 02 Hard landscaping and boundary protection

Number of credits available	Minimum standards
1	No

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 is required to demonstrate compliance for:

One credit

1. 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

Compliance Notes

Ref	Terms	Description
CN1	Green Guide Online	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.
CN2	Finding exact Green Guide ratings	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.
CN3	Green Guide rating via Environmental Profiles Certification	Where applicable, products with Environmental Profiles Certification can be used to demonstrate compliance within this issue of BREEAM. Products are certified with a "product specific" Green Guide rating and this rating can be used in the same way as a generic Green Guide rating for this BREEAM issue. Environmental profile certification involves calculating the 'cradle to

Ref	Terms	Description
		grave' environmental profile of a building material, product or system. This is a measure of all key environmental impacts, during extraction, processing/manufacture and use, over a typical building lifetime. Once certified, environmental profiles are reviewed on an annual basis to ensure they remain valid, and are recalculated every three years. Frequently updated lists of building materials, products and systems that have been assessed and certified under the Environmental Profiles Certification Scheme can be viewed at www.greenbooklive.com. The listing also includes the Green Guide rating for the approved products. Where a product specified is claiming certification against the BRE methodology the BREEAM Assessor should either ask for a copy of the certificate or the certificate number and certifying body from the relevant manufacturer or alternatively verify the claim via Green Book Live listings. The BREEAM Assessor should include a reference to the BRE Global Approved certificate number in their assessment report/validation.
CN4	Minor alteration of existing elements	Where there is hard landscaping or boundary protection which is to remain as existing, then provided no more than 20% of the total area of the existing hard landscaping and boundary protection elements are subject to minor alterations, repair or maintenance, these elements can be awarded an A+ rating for the purposes of determining compliance with this issue.
CN5	No hard landscaping or boundary protection	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.
CN6	Building façade forming boundary	Any part of an external building elevation (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.
CN7	Existing natural features	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.
CN8	Scope of hard landscaping	For the purpose of assessment, hard landscaping includes parking areas, but excludes access/approach roads and designated vehicle manoeuvring areas.
CN9	Prison buildings - Secure Perimeter Zones/Areas	The criteria for hard surfaces are applicable only to those areas outside of the secure perimeter zone, but within the overall curtilage of the site. The criteria 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 criteria DO NOT apply to the

Ref	Terms	Description
		secure perimeter fence/wall or any other fencing subject to security standards.

Schedule of Evidence

Ref	Design stage	Post-construction stage
All	Relevant section/clauses of the building specification or contract and/or design drawings and calculations confirming: 1. A detailed description of each applicable element and its constituent materials. 2. Location and area (m^2) of each applicable element. The Green Guide rating and element number for the assessed specifications.	BREEAM Assessor's site inspection report and photographic evidence OR 'As built' drawings Written confirmation from the design team or contractor of any changes to the specification and updated calculations.

Additional Information

Relevant definitions

Green Guide

Mat 01 Life cycle impacts

Green Guide Element Number

Mat 01 Life cycle impacts

Checklists and Tables

None

Calculation procedures

None

Other information

None

Mat 03 Responsible sourcing of materials

Number of credits available	Minimum standards
3	Yes (criterion 3 only)

Aim

To recognise and encourage the specification of responsibly sourced materials for key building elements.

Assessment Criteria

The following is required to demonstrate compliance:

1. Each of the applicable specified materials comprising the main building elements are assigned a responsible sourcing tier level and points awarded as follows:

Tier level	Points
1	4.0
2	3.5
3	3.0
4	2.5
5	2.0
6	1.5
7	1.0
8	0

Note:

a. Table - 24 in the Additional Information section for the list of applicable materials and main building elements.
b. The tier rank is determined based on the rigour of responsible sourcing demonstrated by the supplier(s)/manufacturer(s) of that material/element (through responsible sourcing certification schemes).
c. Refer to Table - 25 in the Additional Information section for a list of responsible sourcing certification schemes, their scope and corresponding tier level.

2. The number of BREEAM credits achieved is determined as follows:

BREEAM credits	% of available points achieved
3	≥ 54%
2	≥ 36%
1	≥ 18%

Note:

a. The BREEAM Mat 03 calculator must be used to determine the points and credits achieved for this issue.
b. To achieve points for any given building element, at least 80% of the materials that make-up that element must be responsibly sourced i.e. classified in tier 1-7.
c. The number of building elements present and therefore applicable determines the maximum number of points available e.g. if nine elements are present and assessed the maximum number of available points will be 36.
d. Potential variance in tier levels achieved for materials within any one element will require a pro-rata calculation of the points total for any given element.
e. Refer to the Calculation procedures in the Additional Information section for a description of how the number of points and credits are determined.

3. Confirmation that all timber used on the project is sourced in accordance with the UK Government's Timber Procurement Policy.

Note:

a. It is a minimum requirement of BREEAM certification (for any rating level) that compliance with criterion 3 is confirmed (see Compliance note for further information).
b. In meeting this requirement, there is no minimum number of BREEAM credits that need to be achieved for this assessment issue (the BREEAM credit benchmarks for responsible sourcing are calibrated on the basis of assessing all major building materials and not for any single material).

Exemplary level criteria

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

4. Where 70% of the available responsible sourcing points have been achieved.

Compliance Notes

Ref	Terms	Description
CN1	Government's Policy for UK Timber Procurement. See criterion 3	The UK Government's timber procurement policy requires that all timber and wood-derived products must be from only: 1. Independently verifiable legal and sustainable sources OR 2. FLEGT-licensed timber or equivalent sources Some of the responsible sourcing schemes listed in the Additional Information section of this BREEAM issue will meet this definition. Further information on the UK Timber Procurement Policy and

Ref	Terms	Description
		compliant responsible sourcing certification schemes is available from the CPET (Central Point of expertise for timber procurement) website: www.cpet.org.uk
CN2	Checking responsible sourcing claims See criterion 1c	Confirmation of claims should be sought from the relevant scheme provider. Many of the organisations who administer certification schemes will, via their website, list companies and products that have been certified against their standards, including the scope of any such certification. Some schemes, including BES 6001 via www.greenbooklive.com, will provide downloadable copies of the relevant certificate, which can in turn be used as evidence of compliance with this BREEAM issue.
CN3	Building element not present See criterion 2c	Where an element is not present, e.g. the building has no upper floors because it is a single storey building, it will not require assessment. In such instances, the element can be defined 'not applicable' in the BREEAM Mat 03 calculator and only those elements present contribute towards achieving responsible sourcing points and BREEAM credits.
CN4	Existing elements re-used in the new construction. See criteria 1 & 2	If the building is re-using any existing in-situ elements, those elements do not need to be accounted for in the assessment of this issue. This may be the case where the new development is re-using an existing façade e.g. it is a new-build extension or is a part new-build part refurbishment project. The same applies to site derived masonry where it is used as a base for hard landscaping. The aim of this issue is to focus on the responsible sourcing of new specified materials only.
CN5	Hard landscaping element. See criteria 1 & 2	Hard landscaping is listed as one of the main building elements to be assessed where present. However, where the footprint area of hard landscaping element is smaller in proportion to that of the gross floor area of the building, it must be excluded from the list of applicable elements and materials assessed.
CN6	Fittings element See criteria 1 & 2	The definition of this element includes a number of separate fittings/finishing elements (refer to Table - 24 below). As with the other elements covered by this issue, only the materials that make-up a significant majority (at least 80%) of the finishing elements need to be considered when determining the points contribution (though the option to consider them all is available). This element must be excluded for assessments of shell only projects and industrial buildings/units (as these projects use no or very few materials for fittings/finishes).
CN7	Specified reused materials. See crite-	Reused materials specified for the development are considered equivalent to materials covered by certification schemes that fall within tier 3 of the Responsible Sourcing Tier Levels and Criteria,

Ref	Terms	Description
	rion 1c	Table - 25. See also note below on pre or post consumer waste.
CN8	Pre or post consumer waste. See criterion 1c & 3	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.
CN9	Insulating materials. See criterion 1a	The responsible souring of materials used for insulating the building fabric and services is assessed as part of BREEAM issue Mat 04 Insulation. Therefore insulating materials are not assessed as part of this issue, but they are still subject to the BREEAM responsible sourcing requirements.
CN10	A Government licence. See criterion 3	A Government licence e.g. UK Forestry Commission felling licence certificate, does not comply as a third party timber certification scheme for this issue, but can be used as evidence of legally sourced timber.
CN11	Multi-residential developments with CSH assessed dwellings. See criterion 1,2 & 3	For multi-residential developments that also have self-contained dwellings being assessed under the Code for Sustainable Homes (CSH), the following applies: The CSH and BREEAM have a different number of credits available for this issue. The credits achieved in the CSH cannot therefore be applied directly to a BREEAM assessment of a multi-residential building. However, the assessment criteria for this BREEAM issue is similar to the CSH, so where the building is compliant with issue Mat 2 of the CSH, the building assessment is inherently compliant with this issue (albeit the number of credits that can be awarded may differ). Where this is the case, the construction details of each element and the tiers that each material complies with should be entered into the BREEAM Mat 03 calculator to determine the number of credits achieved for this BREEAM issue.

Schedule of Evidence

Ref	Design stage	Post-construction stage
All	Design plan and/or specification confirming: 1. The building elements. 2. Details of the materials specification for each element. A copy of the output from the BREEAM Mat 03 calculator AND EITHER	Written confirmation that the documentary evidence provided at Design Stage, detailing elements/materials specification have been used as specified. Where different from Design Stage, provide 'as built' drawings/specification.

Ref	Design stage	Post-construction stage
	1. A letter of intent from the design team or other detailed documentary evidence confirming the product shall be sourced from suppliers capable of providing certification to the level required for the particular tier claimed OR 2. A copy of the relevant responsible sourcing scheme certificate(s) for the relevant specifications/products.	Where certified materials were used, copies of all relevant certificates/chain of custody evidence OR Where Post Construction Stage assessment only, provide copy of the BREEAM Mat 03 Calculator and detailed documentary evidence (as listed for Design Stage).
Recycled materials		
	Documentation stating specific recycled materials A letter of intent to use suppliers who can provide an EMS certificate (or equivalent) for the recycling process.	As above.
Timber procurement		
	Written confirmation from the supplier/s that all timber is sourced in compliance with the UK Government Timber Procurement Policy for legal and sustainable sourcing OR Copies of the actual chain of custody evidence in accordance with CPET requirements OR A specification or letter of intent from the design team confirming that all timber will be procured in accordance with the policy.	As above.
Green Dragon Environmental Standard ® 2006 (Safon Amgylcheddol Y Ddraig Werdd ®):		
	Written confirmation from supplier (s) that the Green Dragon Environmental Standard has been completed up to and including Level 4. Confirmation is taken from a Green Dragon Standard certificate stating the company's achievement of Level 4. As company's achieving Level 4 will normally be required to undertake	As above.

Ref	Design stage	Post-construction stage
	annual audits, this certification should be dated within 1 year at the point of the last purchase made from the company. For smaller companies with low environmental impacts, a renewal date of within 2 years is acceptable.	
Small company EMS, (see relevant definitions)		
	Written confirmation from the supplier/s confirming that: 1. The company EMS is structured in compliance with BS 8555 2003 (or equivalent). 2. The EMS has completed phase audits one to four as outlined in BS 8555. This can be found in company documentation demonstrating the process and typical outputs from phase four audits such as an EMS manual/ paperwork and guidance to staff. 3. Where independent certification exists to demonstrate these phases, it can be used as evidence	As above.

Additional Information

Relevant definitions

BREEAM Mat 03 Calculator

A calculator tool used by the BREEAM Assessor to determine the number of BREEAM credits achieved for BREEAM issue Mat 03.

Chain of custody (CoC)

This is a process used to maintain and document the chronological history of the evidence/path for products from forests to consumers. Timber must be tracked from the certified forest to the finished product. All the steps, from the transportation of timber 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 timber from certified forests and avoid confusion with non-certified timber. Chain of custody is established and audited according to the rules of relevant forest certification systems. See also definition of CITES below.

CITES

Convention on International Trade in Endangered Species of wild fauna and flora (extract taken from the CITES website)[1]. 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.

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/countries seeking to protect this species.

Composite material

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 glass reinforced plastic 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.

Green Dragon Environmental Standard ® (Safon Amgylcheddol Y Ddraig Werdd ®)

A stepped standard used to accredit compliance with the Green Dragon Environmental Management Scheme. Dependant on the content of the EMS being assessed, a Level of 1, 2, 3, 4 or 5 may be achieved. At level 4 and above, the Green Dragon Environmental Standard ® can be used as evidence of a compliant EMS for small companies being considered under the assessment of this BREEAM issue. www.greendragonems.com

Green Guide Element Number

Refer to Mat 01 Life cycle impacts.

Hard Landscaping

This includes materials for the surfacing (including sub-bases) of external pedestrian areas and lightly and heavily trafficked areas within the construction zone.

Key processes

The final major aspects of processing that are carried out for the product/material in question. 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 - 26 EMS scope by material type.

Legally Sourced Timber

BREEAM follows the UK Government's definition of legally sourced timber, as outlined in the CPET 2nd Edition report on UK Government Timber Procurement Policy[2], which states that 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.

Online Responsible Sourcing Calculator

A web-based calculator for determining the percentage breakdown of materials that comprise a specific building elemental specification e.g. an external wall. Data is available for all elemental specifications that have a generic Green Guide rating. The calculator is available to licensed BREEAM Assessors via the online BREEAM Assessor Extranet (see the Additional Information section for more detail).

Pre-consumer waste stream

Waste material generated during manufacturing processes, this excludes 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

This is 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.

Supply chain EMS

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:

1. A turnover of not more than £6.5 million ;
2. A balance sheet total of not more than £3.26 million
3. 50 employees or fewer.

This is based on the definition stated in the Companies Act of 2006.

Tier levels

A graded scale to reflect the rigour of the certification scheme used to demonstrate responsible sourcing, forming the basis for awarding points and credits in the BREEAM issue Mat 03 (all as detailed in Table - 25 Responsible sourcing certification scheme and their tier levels).

Checklists and Tables

Table - 24: Applicable building elements and materials

Building elements
1. Structural Frame 2. Ground floor 3. Upper floors (including separating floors) 4. Roof 5. External walls 6. Internal walls 7. Foundation/substructure 8. Fittings: includes stair case, windows (frame and glazing units), doors (internal and external), floor finishes and any other significant fitting or finish present (see also Compliance note). 9. Hard landscaping (see also Compliance note)
Applicable materials
1. Brick (including clay tiles and other ceramics) 2. Pavers (concrete, clay) 3. Resin-based composites and materials, including GRP and polymeric render 4. Concrete (including in-situ and pre-cast concrete, blocks, tiles, mortars, cementitous renders etc.) 5. Glass 6. Plastics and rubbers (including EPDM, TPO, PVC and VET roofing and other membranes and polymeric renders) 7. Metals (steel, aluminium etc.) 8. Dressed or building stone including slate 9. Stone and gravel 10. Timber, timber composite and wood panels (including glulam, plywood, OSB, MDF, chipboard and cement bonded particleboard) 11. Plasterboard and plaster 12. Bituminous materials, such as roofing membranes and asphalt 13. Other mineral-based materials, including fibre cement and calcium silicate 14. Products with recycled content
Excluded materials
1. Insulation (refer to BREEAM issue Mat 04 Insulation) 2. Fixings 3. Adhesives 4. Additives

Building elements
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 Global who will identify the relevant Key Process and Supply Chain Process or Processes.

Table - 25: Responsible Sourcing Certification Schemes and their tier levels

Scheme	Certification level/scope	Tier level
BRE Global, BES6001 Product certification[1]	Excellent	2
	Very Good	3
	Good	4
	Pass	5
BRE Global, BES6001 Standard certification[2]	Excellent	2
	Very Good	3
	Good	4
	Pass	5
Canadian Standards Association's (CSA) Chain of Custody Scheme	Chain of custody certification	3
Environmental Management System (EMS)(certified)[3]	Key process and supply chain extraction process[4]	6
Environmental Management System (EMS) (certified)	Key process	7
Forest Stewardship Council (FSC)	Chain of custody certification	3
Green Dragon Environmental Standard	Level 4 and above	7
Recycled materials	Certified EMS for key process	6
Re-used materials	-	3
Malaysian Timber Certification Council (MTCC)	Chain of custody certification	6

Scheme	Certification level/scope	Tier level
Programme for the Endorsement of Forest Certification (PEFC)	Chain of custody certification	3
Sustainable Forestry Initiative (SFI)	Chain of custody certification	3
Société Générale de Surveillance's (SGS) 'Timber Legality and Traceability' scheme	Timber Legality & Traceability Verification (TLTV)	6
Rainforest Alliance's 'Verification of Legal Origin and Compliance' scheme (supersedes SmartWood Verified)	Verification of Legal Origin and Compliance (VLO/VLC)	6

1. In BES6001:2008 to achieve a 'Pass', level 'a' must, as a minimum, be achieved for clauses 3.3.1, 3.3.2 and 3.3.3. Under clause 3.3.2 level 'a' requires a documented EMS system following the principles of ISO14001, but not formal certification. To achieve higher ratings such as 'Good', 'Very Good' and Excellent a minimum number of points from a combination of clauses 3.3.1, 3.3.2 and 3.3.3 must be achieved. It is possible therefore to get a 'Good' or 'Very good' rating by only complying with level 'a' for clause 3.3.2 and levels 'c' and 'd' for the other two clauses without necessarily having in place a formal independently certified EMS (as required above). If the BES 6001 assessor, in conducting the BES6001 assessment, confirms full compliance with clause 3.3.2 level 'a' then the requirement for an independently certified EMS is deemed to have been met.
2. 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.
3. Where an EMS 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 - 25. 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.
4. For a list of the key process and supply chain (extraction) processes (by material type) that the scope of the EMS must cover see Table - 26.

Table - 26: EMS scope by material type

Material	Key process	Key supply chain processes
Brick (including clay tiles and other ceramics)	Product manufacture	Clay extraction
Resin-based composites and materials (including GRP	Composite product manufacture	Glass fibre production (or other principle matrix material)

Material	Key process	Key supply chain processes
and polymeric render but excluding timber based composites)		Polymer production
In situ concrete (including ready mix and cemetitious mortars and renders)[1]	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	Cement production Timber from certified

Material	Key process	Key supply chain processes
	timber certification, the key supply chain process must also be considered to obtain the relevant tier. Timber from certified sources	sources
Wood panel and wood based composite products such as Oriented Strand Board, plywood, HPL, chip-board/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

1. Where cement and aggregate, or dry mix concrete are mixed on site, (i.e. not concrete previously certified as pre–cast concrete products or wet ready mix concrete), certification must cover the manufacture of the cement as the primary process, and the extraction of the aggregate and limestone used to make the cement as the supply chain process.

Calculation procedures

The following outlines the calculation procedure that determines the number of credits achieved for responsible sourcing:

1. A maximum of 4.0 points are available for each of the building elements assessed. If all nine building elements are present the maximum number of responsible sourcing points available is 36, therefore to achieve at least one credit where all elements apply, at least 6.5 points must be achieved (18% of the available points).
2. To achieve any points for a given building element, at least 80% of the materials that make-up that element must be 'responsibly sourced' i.e. fall within tier levels 1-7. If, for example, one element consists of a single material such as timber and 80% of the timber is certified to a tier 3 scheme, that element will achieve 3.0 points towards its overall target. In reality however, each element will consist of a number of different materials, each of which may be certified by a responsible sourcing scheme within different tier levels.
3. Where an element consists of several different materials, each material will need to be considered and, based on the level of responsible sourcing achieved i.e. tier level, a relative proportion of the points available awarded. An example of this calculation is provided below for an external wall (brick, blockwork cavity wall). As above, to achieve any points for a given element 80% of the materials within the element must meet the definition of 'responsibly sourced'.

Example: External wall element

Material	% of element	Tier level achieved	Points achieved (material)	% of element 'responsibly sourced'	% contribution to responsible sourcing'	Points achieved (element)
Bricks	54%	4	2.50	54%	66%	1.65
Aircrete concrete block	22%	3	3.00	22%	27%	0.80
External cement mortar and screed	13%	8	0.00	0%	0%	0.00
Plaster	6%	5	2.00	6%	7%	0.15
Internal cement mortar and screed	5%	8	0.00	0%	0%	0.00
Element total	100%	-	-	82%	100%	2.60

Note:

Materials that contribute the largest percentage to an element should be prioritised and, once the 80% threshold has been reached, it is not necessary to consider the remaining 20% of materials (particularly if they make-up only a small fraction of the element). However, the assessor and design team should bear in mind that it may be beneficial to include small percentages of materials that are in tiers higher than those materials assessed as part of meeting the 80% threshold. This could make the difference where a project is close to or on the threshold between credit levels.

4. In addition to an element consisting of several different materials, it may also consist of several different specifications, each itself consisting of several different materials with varying tier levels. The responsible sourcing contribution of each material to the building element's overall level of performance must be determined (as above for a single specification). An example of this is provided below for an external wall consisting of two different specifications. As before, to achieve any points for a given element 80% of the materials within the element must meet the definition of 'responsibly sourced'.

Example: External wall element (two specifications)

Material	% of specification	% of element	Tier level achieved	Points achieved (materials)	% of element 'responsibly sourced'	% contribution to 'responsible sourcing'	Points achieved (element)
Specification 1		33%	-	-	-	-	-
Bricks	54%	18%	4	2.50	18%	22%	0.56
Aircrete concrete block	22%	7%	3	3.00	7%	9%	0.26
External cement mortar and screed	13%	4%	8	0.00	0%	0%	0.00
Plaster	6%	2%	5	2.00	2%	2%	0.05
Internal cement mortar and screed	5%	2%	8	0.00	0%	0%	0.00
Total (specification)	100%	33%	-	-	27%	-	0.86

Material	% of specification	% of element	Tier level achieved	Points achieved (materials)	% of element 'responsibly sourced'	% contribution to 'responsible sourcing'	Points achieved (element)
Specification 2		67%	-	-	-	-	-
Medium density concrete block	72%	50%	3	3.00	50%	62%	1.81
Flat glass (coated)	15%	10%	8	0.00	0%	0%	0.00
Internal cement mortar	6%	3%	8	0.00	0%	0%	0.00
Plasterboard	5%	3%	6	1.50	3%	4%	0.06
Aluminium extrusion	2%	1%	3	3.00	1%	1%	0.05
Total (specification)	100%	67%	-	-	54%	-	1.94
Element total	-	100%	-	-	81%	100%	2.81

5. Once all applicable elements and materials have been defined, the point's totals are summed and this total, as a proportion of the maximum number of points available, is determined. This benchmark is then compared with the criteria and the corresponding number of BREEAM credits awarded, as illustrated below.

Example: Total responsible sourcing points and BREEAM credits

Element	Points available	Points achieved
Structural frame	4.0	1.20
Ground floor	4.0	0.00

Element	Points available	Points achieved
Upper floors	4.0	2.15
Roof	4.0	0.75
External walls	4.0	2.80
Internal walls	4.0	3.00
Foundation/substructure	4.0	0.50
Fittings	4.0	0.00
Hard landscaping	4.0	3.00
Element total	36.0	13.40
Percentage of available points achieved		37.22%
BREEAM credits achieved		2 credits

Other information

Determining the percentage material breakdown for a building element specification

There are two ways of determining this for materials and elements where responsible sourcing is assured:

1. Where the specification for any given element matches that of a Green Guide rated elemental specification, its constituent material breakdown can be determined (by percentage) using the BRE Global online Responsible Sourcing Calculator (further detail below).

Or, where the specification does not match a Green Guide rated specification and/or a material breakdown cannot be sourced via the online Responsible Sourcing calculator;

2. An 'applicable materials' breakdown must be provided by the design team (or manufacturer of a proprietary elemental system/product, where specified), by volume or percentage for each appropriate element.

The online Responsible Sourcing Calculator for determining the percentage material breakdown of elemental specifications

BRE Global can, via its online Responsible Sourcing Calculator, provide licensed BREEAM assessors with a percentage breakdown of materials for any elemental specification with a Green Guide rating. Assessors can use the online tool to determine the percentage breakdown in two ways; either by entering an individual Green Guide element number for the required specification (if known) or through a search function, by element and specification type. The online Responsible Sourcing Calculator can be accessed by licensed BREEAM assessors via the BREEAM Assessor Extranet.

Note:
In their certification report the BREEAM assessor must reference the Green Guide element number for any data sourced from the online Responsible Sourcing Calculator.

Calculating timber volumes

When sourcing information from component manufacturers or project estimators, information on areas, lengths and volumes of timber is likely to be available and provided. 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.

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

This is a BRE Global standard that provides a framework for the assessment and certification of the responsible sourcing of construction products. The Standard has been structured so that compliance can be demonstrated through a combination of meeting the requirements of other recognised certification schemes, establishing written policies, setting objectives and targets and engaging with relevant stakeholders.

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 and additional information about the Standard visit: www.greenbooklive.com/

BS 8902:2009 Responsible sourcing sector certification schemes for construction products - Specification

BS 8902:2009 is not included in the tier table as it is not a product standard; rather it is a standard against which other sector standards for responsible sourcing can be assessed. BRE Global recognises that sector schemes compliant with BS 8902:2009 may be developed in the future and should be eligible for inclusion within this Table. Inclusion of schemes deemed as compliant with BS 8902:2009 will be considered by BRE Global on a case-by-case basis to determine their position within the table's Tier hierarchy. A sector scheme deemed compliant with BS 8902:2009 by an appropriate third-party accreditation body will secure more tier points than an equivalent but unaccredited scheme.

FSC and PEFC validity

This CPET document may be helpful to assessors with respect to determining the validity of FSC and PEFC certificates.

http://www.cpet.org.uk/files/CPET-HowtocheckFSC%20and%20PEFC%20certification.pdf

[1] www.cites.org/

[2] UK Government Timber Procurement Policy, Definition of 'legal' and 'sustainable' for timber procurement, Second Edition, CPET, 2006.

Mat 04 Insulation

Number of credits available	Minimum standards
2	No

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

This issue is split into three parts;

- Pre-requisite
- Embodied impact (1 credit)
- Responsible sourcing (1 credit)

The following is required to demonstrate compliance for:

Pre-requisite

1. Any new insulation specified for use within the following building elements must be assessed:
    a. External walls
    b. Ground floor
    c. Roof
    d. Building services

Embodied impact

One credit

2. 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 (please refer to the Compliance notes for guidance where specific insulation has been assessed within an element for BREEAM issue Mat 01).
3. The Insulation Index for the building insulation is the same as or greater than 2.
4. The Insulation Index is calculated using the BREEAM Mat 04 calculator which uses the following calculation methodology:

    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:

    a. (Area of insulation (m^2) x thickness(m))/Thermal Conductivity (W/ m.K) OR
    b. Total volume of insulation used (m^3)/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 to give the Green Guide Rating corrected value:

Table - 27: 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 the Green Guide rating corrected values for all insulating elements is divided by the sum of the volume weighted thermal resistance values (an example calculation is provided in the Additional Information section).

Note: Where an independently verified third-party Environmental Product Declaration (EPD), covering part of or the whole life cycle, is available for an insulating material/product, this can be used to increase the contribution of that material/product to the building's Mat 04 performance (for more detail refer to the Calculation procedures in the Additional Information section).

Responsible sourcing

One credit

5. At least 80% by volume 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 either tier levels 1, 2, 3, 4, 5 or 6 as described in BREEAM issue Mat 03. The table below shows the key processes and supply chain processes required for common insulation products.

Table - 28: EMS criteria for insulation products

Material	Key Process	Supply chain processes
Foam Insulation	Insulation manufacture	Main 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

Material	Key Process	Supply chain processes
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 BREEAM issue Mat 03.
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

Ref	Terms	Description
CN1	Shell only	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: 1. Option 1 – Use of a tenancy lease agreement between the developer and tenant/s (full value of available credits) 2. Option 2 – A Green Building Guide for tenant fit outs (half the value of the available credits) 3. Option 3 – Developer/Tenant collaboration (full value of available credits) Refer to Appendix D – BREEAM New Construction and shell and core/speculative assessments of this Scheme Document for further description of the above options.
CN2	Insulation incorporated as part of an off-site manufactured element	If the insulation is incorporated as a component of an element that has been manufactured offsite (in order to maximise material optimisation) e.g. a wall or roof, and that element has been assessed as part of Mat 01, 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.
CN3	Awarding credits	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-

Ref	Terms	Description
		versa.
CN4	Element consisting of more than one insulation type See criterion 4	Where more than one insulation type is present for a given element, the rating, area and conductivity for each insulation type should be entered into the BREEAM Mat 04 calculator and an average is calculated (by volume).
CN5	Finding exact Green Guide Ratings See criterion 2	Where no similar insulation can be found assessors should seek guidance from BRE on the appropriate rating.
CN6	Environmental Profile Certification of products	Mat 01 Life cycle impacts Compliance Notes.

Schedule of Evidence

Ref	Design stage	Post-construction stage
1-4	Design drawings AND/OR relevant section/clauses of the building specification or contract confirming: 1. The location of insulating materials. 2. The area (m^2) and thickness (m) or volume (m^3) of insulation specified. Manufacturer's technical details confirming the thickness and thermal conductivity of the insulating materials specified. A copy of the output from the BREEAM Mat 04 calculator. The Green Guide rating and element number for the assessed insulation specifications. And if relevant: 1. Copies of Environmental Product Declarations 2. A link/reference to the EPD's Product Category Rules	'As built' drawings and, where relevant, written design team confirmation of any changes to the materials specification.

Ref	Design stage	Post-construction stage
	3. Online Green Guide calculator output 4. Environmental Profile certificate(s) (or certificate number)	
5	Evidence as outlined in BREEAM issue Mat 03 confirming compliance for the insulating materials.	Evidence as outlined in BREEAM issue Mat 03 confirming compliance for the insulating materials.

Additional Information

Relevant definitions

Environmental Product Declaration
Mat 01 Life cycle impacts

Green Guide
Mat 01 Life cycle impacts

Green Guide Element Number
Mat 01 Life cycle impacts

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.

BREEAM Mat 04 calculator
A spreadsheet based tool used by the BREEAM assessor to determine the Insulation Index and therefore, whether the BREEAM credit is achieved.

Materials optimisation
Material optimisation means adopting a resource efficient approach to design which results in less material being used in the design (i.e. lean design), and/or less waste is produced in the construction process, without compromising the design concept. Whilst this assessment issue is focused on the embodied impact and sourcing of the insulation material specified, the design team should consider solutions that optimise the use of the material and therefore minimise construction waste.

Checklists and Tables

None

Calculation procedures

Example calculation as carried out by the BREEAM Mat 04 calculator

The Insulation Index is calculated for a building using the following types of insulation:

Type 1 Walls

Area = 450m^2. Thermal insulation thickness = 100mm. Thermal conductivity = 0.023 W/mK Green Guide rating = A (2 points)

Volume weighted thermal resistance: ((450x0.100)/0.023) = 1956

Green Guide rating correction: 1956 x 2.0 = 3912

Type 2 Building Services

Volume of insulation used = 21m^3. Thermal conductivity = 0.022 W/mK

Green Guide rating = C (0.5 points)

Volume weighted thermal resistance: (21/0.022) = 955

Green Guide rating correction: 955 x 0.5 = 477

Type 3 Roof

Area = 210m^2. Thermal insulation thickness = 120mm. Thermal conductivity = 0.027 W/mK Green Guide rating = A+ (3 points)

Volume weighted thermal resistance: ((210x0.120)/0.027) = 933

Green Guide rating correction: 933 x 3.0 = 2799

Type 4 Ground Floor

Area = 210m^2. Thermal insulation thickness = 120mm. Thermal conductivity = 0.027 W/mK Green Guide rating = B (1 point)

Volume weighted thermal resistance: ((210x0.120)/0.027) = 933

Green Guide rating correction: 933 x 1.0 = 933

Total volume weighted thermal resistance = 1956+955+933+933 = 4777

Green Guide rating correction = 3912 + 477 + 2799 +933 = 8121

Insulation Index: Green Guide Rating Correction/Total volume weighted thermal resistance = 8121/4777 = 1.7 (credit not achieved)

Calculation Procedure where a specific Environmental Product Declaration is available for a material

Please refer to the Calculation procedures in BREEAM issue Mat 01. Note, step 1 of the Calculation procedure outlined in BREEAM issue Mat 01 (the proportion of the total environmental impact of the assessed element) is not applicable for this issue as the insulation is assessed as a single material in BREEAM issue Mat 04 and not as part of a larger building element containing other materials (as in BREEAM issue Mat 01).

Other information

None

Mat 05 Designing for robustness

Number of credits available	Minimum standards
1	No

Aim

To recognise and encourage adequate protection of exposed elements of the building and landscape, therefore minimising the frequency of replacement and maximising materials optimisation.

Assessment Criteria

The following is required to demonstrate compliance for:

One credit

1. Areas of the building have been identified (both internal and external) where vehicular, trolley and pedestrian movement occur.
2. The design incorporates suitable durability and protection measures or design features/solutions to prevent damage to the vulnerable parts of the building. 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

Ref	Terms	Description
CN1	Shell Only	Where the installation of suitable durability measures will form a part of the future tenants fit-out specification and installation, and not the base build, compliance can be demonstrated via one of the following available means: 1. Option 1 – Use of a tenancy lease agreement between the developer and tenant/s (full value of available credits) 2. Option 2 – A Green Building Guide for tenant fit outs (half the value of the available credits) 3. Option 3 – Developer/Tenant collaboration (full value of available credits) Refer to Appendix D – BREEAM New Construction and shell and

Ref	Terms	Description
		core/speculative assessments of this Scheme Document for further description of the above options.
CN2	Suitable durability measures See criterion 2	Suitable durability and protection measures to vulnerable parts of the building can include: 1. Bollards/barriers/raised kerbs to delivery and vehicle drop-off areas 2. Robust external wall construction, up to 2m high 3. Corridor walls specified to Severe Duty (SD) as per BS 5234-2[1] and, for healthcare buildings, Health Technical Memorandum 56 – Partitions[2] 4. Protection rails to walls of corridors 5. Kick plates/impact protection (from trolleys etc) on doors 6. Hard-wearing and easily washable floor finishes in heavily used circulation areas (i.e. main entrance, corridors, public areas etc) 7. Designing out the risk without the need for additional materials specification to protect vulnerable areas.
CN3	Vehicle impact protection See criterion 2c	Any vehicle impact protection measures specified must be positioned at an adequate distance from the building to protect the fabric from impact from any vehicle with a measurable overhang of the body from the wheel track, in particular for any goods delivery areas. In vehicle movement areas only; where the 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.
CN4	Preventing excessive material use	The specification or design measures chosen should reflect the need to balance the additional specification of materials with the need to protect building elements to minimise their replacement, insuring against excessive material use and promoting materials optimisation.
CN5	Public/Common Areas	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.
CN6	Sales areas (retail) See criterion 2	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

Ref	Design stage	Post-construction stage
All	Design drawings illustrating vulnerable areas/parts of the building. Design drawings and/or relevant section/clauses of the building specification or contract confirming the durability measures specified.	BREEAM Assessor's site inspection report and photographic evidence AND/OR 'As built' drawings.

Additional Information

Relevant definitions

Materials optimisation
Mat 04 Insulation

Public areas
Mat 04 Insulation.

Checklists and Tables

None

Calculation procedures

None

Other information

None

[1] BS 5234-2: Partitions (including matching linings) – Specification for performance criteria for strength and robustness including methods of test, BSI 1992.
[2] HTM 56 Partitions,, 3rd Edition, Department of Health, 2005.

Waste

Wst 01 Construction waste management

Number of credits available	Minimum standards
4	Yes

Aim

To promote resource efficiency via the effective management and reduction of construction waste.

Assessment Criteria

This issue is split into two parts:

- Construction resource efficiency (3 credits)
- Diversion of resources from landfill (1 credit)

The following is required to demonstrate compliance for:

Construction resource efficiency

Up to three credits

1. Non-hazardous construction waste (excluding demolition and excavation waste) generated by the building's design and construction meets or exceeds the following resource efficiency benchmarks:

BREEAM credits	Amount of waste generated per 100m^2 (gross internal floor area)	
	m^3	tonnes
One credit	≤13.3	≤11.1
Two credits	≤7.5	≤6.5
Three credits	≤3.4	≤3.2
Exemplary Level	≤1.6	≤1.9

Note - Volume (m^3) is actual volume of waste (not bulk volume)

2. There is a compliant Site Waste Management Plan (SWMP).
3. Where existing buildings on the site will be demolished a pre-demolition audit of any existing buildings, structures or hard surfaces is completed to determine if, in the case of demolition, refurbishment/reuse is feasible and, if not, to maximise the recovery of material from demolition for subsequent high-grade/value applications. The audit must be referenced in the SWMP and cover:
    a. Identification of the key refurbishment/demolition materials.
    b. Potential applications and any related issues for the reuse and recycling of the key refurbishment and demolition materials.

Diversion of resources from landfill

One credit

4. The following percentages of non-hazardous construction and demolition waste (where applicable) generated by the project have been diverted from landfill:

BREEAM credits	Type of waste	Volume	Tonnage
One credit	Non demolition	70%	80%
	Demolition	80%	90%
Exemplary level	Non demolition	85%	90%
	Demolition	85%	95%

5. There is a compliant Site Waste Management Plan (SWMP).
6. Waste materials will be sorted into separate key waste groups see Table - 29(according to the waste streams generated by the scope of the works) either onsite or offsite through a licensed contractor for recovery.

Exemplary level criteria

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

7. Non-hazardous construction waste generated by the building's design and construction is no greater than the exemplary level resource efficiency benchmark (outlined in the above table).
8. The percentage of non hazardous construction and demolition waste (if relevant) diverted from landfill meets or exceeds the exemplary level percentage benchmark (outlined in the above table)
9. All key waste groups are identified for diversion from landfill in the pre-construction stage SWMP.

Compliance Notes

Ref	Terms	Description
CN1	Compliant site waste management plan See criteria 2, 3,5 & 9	A compliant site waste management plan is one that defines: 1. A target benchmark for resource efficiency i.e. m^3 of waste per $100m^2$ or tonnes of waste per $100m^2$ 2. Procedures and commitments for minimising non-hazardous waste in line with the benchmark 3. Procedures for minimising hazardous waste 4. Procedures for monitoring, measuring and reporting hazardous and non-hazardous site waste 5. Procedures for sorting, reusing and recycling construction waste into defined waste groups (see additional guidance section), either on site or through a licensed external contractor 6. The name or job title of the individual responsible for implementing the above.

Ref	Terms	Description
CN2	Diversion from landfill See criteria 4, 8 & 9	Diversion from landfill includes: 1. Reusing the material on site (in-situ or for new applications) 2. Reusing the material on other sites 3. Salvaging or reclaiming the material for reuse 4. Returning material to the supplier via a 'take-back' scheme 5. Recovery of the material from site by an approved waste management contractor and recycled or sent for energy recovery.
CN3	Pre-demolition audit See criterion 3	A pre-demolition audit should be carried out using an appropriate methodology. The ICE has produced guidance on pre-demolition audits, including 'The Demolition Protocol' and the Waste Resources Action Programme (WRAP)[1] also provides guidance.
CN4	SWMP See criteria 2,3,5 & 9	Since April 2008 any construction project in England costing over £300k requires a Site Waste Management Plan. To achieve any of the construction waste management credits the assessed development, regardless of value or locality, must have a SWMP compliant with best practice (see relevant definitions in additional guidance section).
CN5	Multi-residential developments with CSH assessed dwellings See criteria 2,3,5 & 9	For buildings with self-contained dwellings also being assessed under the Code for Sustainable Homes (CSH), the following applies: The number of credits achieved under the CSH assessment cannot be directly applied to a BREEAM assessment of a multi-residential building due to differences in assessment criteria between the two schemes. Where the credits available for issue Was 2 Construction Site Waste management of the CSH has been achieved, the SWMP is also compliant with the requirements of this issue. However, where the project also includes the demolition of existing buildings/elements, the SWMP will need to comply with the Demolition requirement defined above to qualify for credits.
CN6	Limited site space for segregation and storage See criterion 6	Where space on site is too limited to allow 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.
CN7	Where there is no official external waste contractor licensing scheme	A review must be carried out by the contractor, design team, or client of the waste contractor's practices to ensure they are in line with the assessment criteria.

Schedule of Evidence

Ref	Design stage	Post-construction stage
All	A copy of the compliant Site Waste Management Plan and where relevant, a copy of the pre-demolition audit AND/OR Relevant section/clauses of the building specification or contract AND/OR A letter from the client or their representative Where relevant for multi-residential buildings: Evidence in line with the Design Stage evidence requirements of the CSH Issue Was 2 OR A copy of the Design Stage CSH certificate and report from the CSH online reporting system confirming the number of credits achieved for CSH Issue Was 2	A copy of the SWMP summary datasheets or equivalent monitoring records/report Where relevant for multi-residential buildings: Evidence in line with the Post Construction Stage evidence requirements of the CSH Issue Was 2 OR A copy of the Post Construction Stage CSH certificate and report from the CSH online reporting system confirming the number of credits achieved for CSH Issue Was 2.

Additional Information

Relevant definitions

Appropriate targets

Appropriate targets must be set according to best practice and will depend on the type of waste and the opportunities for reuse on site. Further information can be found on the SMARTWaste Plan website on how to set appropriate targets.

Significant Quantity

Defined as meeting at least the percentages required within the Assessment Criteria section of this manual.

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. The aim of a SWMP is to promote resource efficiency and to prevent illegal waste activities. Resource efficiency includes minimising waste at source and ensuring that clients, designers and principal contractors assess the use, reuse and recycling of materials and products on and off the site. A SWMP consists of a combination of commitments to:

1. design out waste
2. reduce waste generated on site
3. develop and implement procedures to sort and reuse/recycle construction waste on and off site (as applicable).

Data obtained from measuring and monitoring site construction waste can then be used to check performance against targets and benchmarks, analyse the effectiveness of any solutions implemented and strive for continual improvement

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.

Best Practice SWMP

Best practice (site waste management) is a combination of commitments to:

1. Design out waste (materials optimisation)
2. Reduce waste generated on site
3. Develop and implement procedures to sort and reuse/recycle construction waste on and off site (as applicable).
4. Follow guidance from:
    a. DEFRA (Department of Environment, Food and Rural Affairs)
    b. BRE (Building Research Establishment Ltd)
    c. WRAP (Waste & Resources Action Programme)

Checklists and Tables

Table - 29: Construction waste groups

European Waste Catalogue	Key Group	Examples
170102	Bricks	Bricks
170101	Concrete	Pipes, kerb stones, paving slabs, concrete rubble, precast and in situ
170604	Insulation	Glass fibre, mineral wool, foamed plastic
1501	Packaging	Paint pots, pallets, cardboard, cable drums, wrapping bands, polythene sheets
170201	Timber	Softwood, hardwood, 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 ceram-	Ceramic tiles, clay roof tiles, ceramic, sanitaryware

European Waste Catalogue	Key Group	Examples
	ics	
1701	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
Most relevant EWC	Liquids	Non-hazardous paints, thinners, timber treatments
Most relevant EWC	Hazardous	Defined in the Hazardous Waste List (HWL) of the European Waste Catalogue (EWC)
Most relevant EWC	Floor coverings (soft)	Carpets, vinyl flooring
Most relevant EWC	Architectural Features	Roof tiles, reclaimed bricks, fireplaces
170904 (Mixed)	Mixed/ other	Efforts should be made to categorise waste into the above categories wherever possible

Calculation procedures

None

Other information

BREEAM construction resource efficiency benchmarks

The resource efficiency benchmarks used in BREEAM have been derived using data collected from hundreds of real life projects using BREs SMARTWaste system. The BREEAM credits are aligned to the benchmarks as follows:

1. One credit: Performance in the top 50% of projects (better than standard practice)
2. Two credits: Performance in the top 25% of projects (good practice)
3. Three credits: Performance in the top 10% of projects (best practice)
4. Exemplary level: Performance in the top 5% of projects (exemplary practice)

For more information please go to www.smartwaste.co.uk

Why does BREEAM exclude demolition and excavation waste from the resource efficiency benchmarks?

BREEAM does not include demolition and excavation (D&E) waste in its resource efficiency benchmark, despite it often being the largest tonnage of waste on site, because the amount of D&E waste produced is site-dependant. Furthermore, it is not necessarily possible to reduce the amount of demolition waste (unless a decision is taken not to demolish in the first place).

Including D&E waste in an overall construction resource efficiency benchmark would:

1. Not encourage sites with unavoidably large amounts of D&E waste to focus on reducing waste arising from construction materials (which would have further knock-on environmental impacts); and
2. Mean that sites with little or no D&E waste would find compliance with the benchmark more straight forward, which would weaken the drivers for reducing construction waste resulting from the specification and use of new building materials.

BREEAM aims to ensure that, where D&E waste is generated, it is diverted from landfill and where possible reused for high grade use on site to reduce the volume of new materials produced/required in the supply chain (which themselves may go on to generate additional waste).

Tools for preparing, implementing and reviewing a SWMP

SMARTWaste Plan 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 and links to BREMAP. Under the SMARTWaste membership scheme, energy and water consumption and the procurement of certified timber can also be monitored. A carbon calculator and economic assessment of waste will also be added to the system.

BREMAP is a geographical information system of waste management facilities. See www.bremap.co.uk

[1] A Report on the Demolition Protocol, commissioned by London Remade prepared by EnviroCentre Ltd.

Wst 02 Recycled aggregates

Number of credits available	Minimum standards
1	No

Aim

To recognise and encourage the use of recycled and secondary aggregates, thereby reducing the demand for virgin material and optimising material efficiency in construction.

Assessment Criteria

The following is required to demonstrate compliance for:

One credit

1. The total amount of recycled and/or secondary aggregate specified is greater than 25% (by weight or volume) of the total high-grade aggregate specified for the development.
2. To contribute to the total amount, the percentage of high-grade aggregate specified per application (where present) that is recycled and/or secondary aggregate, must meet the following minimum levels (by weight or volume):

Application	Min. % One credit	Min. % Exemplary performance
Structural frame	25%	50%
Floor slabs including ground floor slabs	25%	50%
Bitumen or hydraulically bound base, binder, and surface courses for paved areas and roads	50%	75%
Concrete road surfaces	25%	50%
Pipe bedding	50%	100%
Building foundations	25%	50%
Granular fill and capping (see Compliance notes)	75%	100%
Gravel landscaping	100%	100%

3. The aggregates are EITHER:
    a. Obtained on site OR
    b. Obtained from waste processing site(s) within a 30km radius of the site; the source will be principally from construction, demolition and excavation waste (CD&E) – this includes road plannings OR
    c. Secondary aggregates obtained from a non-construction post-consumer or post-industrial by-product source (see Compliance notes).

Exemplary level criteria

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

4. Where the total amount of recycled and/or secondary aggregate specified is greater than 35% (by weight or volume) of the total high-grade aggregate specified for the project.
5. To contribute to the total amount, the percentage of high-grade aggregate specified per application (where present) that is recycled and/or secondary aggregate, must meet the exemplary minimum levels (by weight or volume), as defined in the table above.

Compliance Notes

Ref	Terms	Description
CN1	Secondary aggregates	Recognised non-construction post-consumer or post-industrial by-products include: 1. China clay waste 2. Slate overburden 3. Pulverised Fuel Ash (PFA) 4. Blast Furnace Slag 5. Air-cooled blast furnace slag 6. Steel slag 7. Furnace bottom ash (FBA) 8. Incinerator bottom ash 9. Foundry sands 10. Recycled glass 11. Recycled plastic 12. Tyres 13. Spent oil shale 14. Colliery spoil 15. Municipal Solid Waste Treatment Residues
CN2	Defining granular fill and capping as a high grade use	For granular fill to be considered a 'high grade aggregate', it must conform to the one of the following classes under the Specification for Highway Works (SHW) Series 600 Earthworks: 1. Class 6A, 6I & 6N - Selected well graded granular material 2. Class 6B - Selected coarse granular material 3. Class 6C, 6D, 6J & 6L - Selected uniformly graded granular material 4. Class 6E, 6G, 6H, 6K, 6M, 6P & 6R - Selected granular material 5. Class 6F - Selected coarse and fine graded material 6. Class 6Q – Well graded, uniformly graded or coarse graded material If the application is capping, then granular materials should conform to one of following classes under the Specification for Highway Works (SHW) Series 600 Earthworks:

Ref	Terms	Description
		1. Class 6F – Selected coarse and fine graded material 2. Class 6S – Selected well graded granular material If the application is capping, then stabilised materials should conform to one following classes under the Specification for Highway Works (SHW) Series 600 Earthworks: 1. Class 9A - Cement stabilised well graded granular material 2. Class 9B - Cement stabilised silty cohesive material 3. Class 9C - Cement stabilised conditioned pulverised fuel ash cohesive material 4. Class 9D – Lime stabilised cohesive material 5. Class 9E – Lime and cement stabilised cohesive material 6. Class 9F – Lime and cement stabilised well graded material.

Schedule of Evidence

Req	Design Stage	Post Construction Stage
All	Relevant section/clauses of the building specification or contract Project team calculations Documentation confirming the source of recycled/secondary aggregates and that the required amount can be provided	Calculations detailing the weights (or volumes) and types of aggregate provided for each application Delivery notes (or confirmation from supplier) of the types and quantities of aggregates provided on site

Additional Information

Relevant definitions

Low grade aggregate uses

Crushed masonry used as fill material for general landscaping is not considered to be high grade. This practice is now common place on construction sites due to landfill costs.

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

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.

Materials optimisation

Mat 04 Insulation

Checklists and Tables

None

Calculation procedures

None

Other information

None

Wst 03 Operational waste

Number of credits available	Minimum standards
1	Yes

Aim

To recognise and encourage the provision of dedicated storage facilities for a building's operational-related recyclable waste streams, so that this waste is diverted from landfill or incineration.

Assessment Criteria

The following is required to demonstrate compliance for:

One credit

1. There is dedicated space(s) to cater for the segregation and storage of operational recyclable waste volumes generated by the assessed building/unit, its occupant(s) and activities.
2. The dedicated space(s) must be:
    a. Clearly labelled, to assist with segregation, storage and collection of the recyclable waste streams
    b. Accessible to building occupants / facilities operators for the deposit of materials and collections by waste management contractors
    c. Of a capacity appropriate to the building type, size, number of units (if relevant) and predicted volumes of waste that will arise from daily/weekly operational activities and occupancy rates.
3. Where the consistent generation in volume of the appropriate operational waste streams is likely to exist, e.g. large amounts of packaging or compostable waste generated by the building's use and operation, the following facilities are provided as part of its waste management strategy:
    a. Static waste compactor(s) or baler(s); situated in a service area or dedicated waste management space.
    b. Vessel(s) for composting suitable organic waste resulting from the building's daily operation and use OR adequate space(s) for storing segregated food waste and compostable organic material prior to collection and delivery to an alternative composting facility.
    c. Where organic waste is to be stored/composted on site, a water outlet is provided adjacent to or within the facility for cleaning and hygiene purposes.

Additionally for healthcare buildings only (criterion 4.)

4. The specified/installed operational waste facilities are compliant with HTM 07-01: Safe management of healthcare waste[1] (England, Wales and Northern Ireland) or SHTM 3 Guidance EWC Coding guide for Healthcare Wastes[2], Health Protection Scotland, 2007 (Scotland).

Additionally for pre-schools, schools & sixth form colleges only (criterion 5.)

5. There is a school recycling policy and an outline of the procedures that are in operation or that will be in place when the building is complete. As a minimum, the policy should cover:
    a. Paper and magazines, cardboard, plastics, metals, printer & toner cartridges.
    b. Where composting facilities are provided, the policy must also cover the collection of the compost unless the compost can be used on site.

Additionally for multi-residential buildings with self contained dwellings / bedsits only (criteria 6 and 9.)

6. Each dwelling/bedsit has a provision of three internal storage containers, as follows:
    a. A minimum total capacity of 30 litres
    b. No individual container smaller than 7 litres
    c. All containers in a dedicated non obstructive position
    d. The storage containers for recycling are provided in addition to non-recyclable waste storage.

Additionally for multi-residential buildings with individual bedrooms and communal facilities only (criteria 7, 8 and 9)

7. The above storage requirements (criterion 6.) for self contained dwellings/bedsits are met for every six bedrooms
8. The recyclable storage is located in a dedicated non obstructive position in either:
    a. Communal kitchens or,
    b. Where there are no communal kitchens present, in a communal space such as communal lounges or utility areas.
9. Home composting facilities and a home composting information leaflet is provided within the kitchen area or communal space for each self contained dwelling, bedsit or communal kitchen.

Compliance Notes

Ref	Terms	Description
CN1	Determining if the dedicated space complies See criteria1 & 2	The design team demonstrates that the provision of waste management facilities for the assessed building is adequate given the building type, occupier (if known), operational function and likely waste streams and volumes to be generated. The following information can be used as a default guide for determining the validity of the provision, where it is unclear what is justifiable for the building type/use: 1. At least 2m^2 per 1000m^2 of net floor area for buildings < 5000m^2 2. A minimum of 10m^2 for buildings ≥ 5000m^2 3. An additional 2m^2 per 1000m^2 of net floor area where catering is provided (with an additional minimum of 10m^2 for buildings ≥ 5000m^2). Alternatively, sizes should be in accordance with those identified in the relevant section of the Metric Handbook, planning and design data, 2007[3]
CN2	Extensions to existing buildings	Where there are facilities within the existing building, these can be used to assess compliance. The scope of these facilities must be adequate to cater for the total volume of predicted recyclable waste arising from the new and existing buildings.
CN3	Shell only	There are no additional or different criteria to those outlined above specific to shell-only assessments, except for the compactor/baler and composting facility requirements, where the following applies: End user/occupier known

Ref	Terms	Description
		1. As common criteria OR 2. The end user/occupier commits to providing a dedicated space for a compactor/baler and/or composting vessel installation (or storage space for compostable material) including: a. A suitable concrete standing for a future installation b. A three phase power supply c. Good access for vehicle collections and manoeuvring End user/occupier not known 1. Criterion not applicable where the building design/type (and therefore end use) is unlikely to result in large packaging or compostable waste streams e.g. where there is no commercially sized catering area, retail and/or large commercial storage or production areas within the speculative building OR 2. Facilities to be provided as detailed above for a known end user committing to provide the necessary facilities. This would be in instances where a compactor/baler and/or compost facilities may be appropriate given the building design/type and therefore end use.
CN4	Multiple building assessments and buildings that form part of a wider estate See criterion 2c	Where the assessment applies to one or more buildings/units that are part of a wider estate or campus, the design team can choose to demonstrate compliance through using dedicated centralised storage space and waste management facilities with the capacity to accommodate the recyclable waste material generated from all buildings and their activities.
CN5	Accessible See criterion 2b	Typically 'accessible' 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 for the facilities to be within 20m of a building entrance. If, in the opinion of the BREEAM Assessor it is not feasible for the facilities to be within 20m of a building entrance, then Assessor's judgement should be exercised to determine if the facility is deemed to be 'accessible' to the building occupants and vehicle collection.
CN6	Limited space or vehicle access for a compactor/baler See criterion 3	For developments that have limited space for static installations, compliance can be assessed on the basis of the provision of adequate space for a smaller portable compactor or baler.
CN7	Individual recycling bins See criterion 2a	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.

Ref	Terms	Description
CN8	Internal storage areas	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.
CN9	General waste	The area for storage of recyclable materials must be provided in addition to areas and facilities provided for dealing with general waste and other waste management facilities, e.g. compactors, balers and composters.
CN10	School recycling policy & procedures See criterion 5	The person(s) providing this information may vary; it could typically be the head teacher/principal, school governors, premises manager, waste contractors or other relevant authorised body/individual.
CN11	Shopping centres & retail parks See criterion 2	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.
CN12	Home composting information leaflet (multi-residential buildings) See criteria 6,7,8 & 9	The leaflet must provide information on: — How composting works and why it is important — The materials that can be composted (e.g. raw vegetable peelings and fruit, shredded paper, teabags, etc.); and — Details of the operation and management plan for the communal composting scheme Where a green/kitchen waste collection scheme is in operation, the information leaflet provided by the Local Authority is sufficient to meet the information leaflet criteria.
CN13	Multi-residential developments with CSH assessed dwellings See criteria 6 & 9	For buildings with self-contained dwellings also being assessed under the Code for Sustainable Homes (CSH), the following applies: Where a minimum of two credits have been awarded for the CSH issue Was 1, compliance with criteria 6, 7 and 8 of BREEAM issue Wst 03 will also have been demonstrated for the purpose of a Multi-residential assessment, provided that all other areas (not covered by the CSH assessment) also meet the criteria. Where the available credit for the CSH issue Was 3 has been awarded, compliance with criteria 3b, 3c and 9 of BREEAM issue Wst 03 will also have been demonstrated for the purpose of a Multi-residential assessment provided that all other areas (not covered by the CSH assessment) also meet the criteria. In addition, where four credits have been achieved under the CSH

Ref	Terms	Description
		issue Was 1, the criteria 1 & 2 under BREEAM issue Wst 03 will also have been demonstrated for the purpose of a Multi-residential assessment, provided that the recyclable storage capacity is sufficient for the whole building (not just the self contained dwellings).
CN14	Small industrial units See criterion 2	For an industrial building/development consisting of a number of smaller units, each ≤200m^2 floor area, shared facilities that meet the above criteria for the building as a whole are sufficient to achieve this credit.
CN15	Multi-residential: Supported living facility	Where it is not possible to locate the recycling bins within a communal area, which is accessible to residents, for safety reasons (e.g. where the residents have mental health problems and free access to these facilities would pose significant risk of self harm or harm to others) it is acceptable to locate them within a dedicated non-obtrusive position accessible to staff only but in close proximity to the areas where recyclable waste material is generated.

Schedule of Evidence

Ref	Design stage	Post-construction stage
1-3	Design drawings and/or relevant section/clauses of the building specification or contract confirming provision and scope of dedicated facilities. Project team meeting minutes / letter confirming likely building waste streams and indicative volumes.	As design stage BREEAM Assessor's site inspection report and photographic evidence confirming compliant installation.
4	Documentary evidence from the design team confirming compliance with the relevant Healthcare Technical Memorandum (e.g letter or relevant signed meeting minutes).	As design stage
5	The school's recycling policy and a description of their waste management procedures OR A written commitment from the school, or relevant authorising body,	The school's recycling policy and a description of their waste management procedures

Ref	Design stage	Post-construction stage
	to develop and implement a recycling policy and appropriate operational procedures.	
6-9	As for criteria 1-3 AND where relevant Evidence in line with the Design Stage evidence requirements of the CSH issue Was 1 and Was 3. OR A copy of the Design Stage CSH certificate and report from the CSH online reporting system confirming the number of credits achieved for CSH issue Was 1 and Was 3.	As for criteria 1-3 AND where relevant Evidence in line with the Post Construction Stage evidence requirements of the CSH issue Was 1 and Was 3. OR A copy of the Post Construction Stage CSH certificate and report from the CSH online reporting system confirming the number of credits achieved for CSH issue Was 1 and Was 3.

Additional Information

Relevant definitions

Clinical Waste

Waste derived from medical practices and defined as bodily fluids and wastes, drugs and medical equipment; and other waste which, unless rendered safe, may prove hazardous or infectious to persons coming into contact with it.

Dedicated non-obstructive position

Ideally this would be in an easily accessible cupboard under the sink or any other cupboard in the kitchen, next to the storage or likely area for storing non-recyclable waste, where practical. Where a kitchen cupboard location is not possible the bins can be located near to the kitchen, in a utility room or connected garage for example.

Flagship or anchor tenant

The largest and primary tenant within a retail development, typically department store-type retailers.

Waste compactor or baler

A machine that is designed to compress waste streams in order to improve storage and transport efficiency

Checklists and Tables

None

Calculation procedures

None

Other information

Recyclable storage: The following footprint dimensions (informed by the Metric handbook, Planning and design data) can act as a guide when determining size and accessibility criteria for the recyclable

storage space:

1. Compactor dimensions: about the size of one car parking bay; 4.8 x 2.4m
2. Skip: The footprint of an 8 and 12 cubic yard skip measures 3.4m x 1.8m, therefore allow a minimum of 2.0m width and 4.0m length or 8m^2 area for the storage and access of such containers
3. Wheeled bins: 360 litre = 0.86m x 0.62 / 660L = 1.2m x 0.7m / 1100L = 1.28m x 0.98m
4. Roll-on-roll-off containers: allow a minimum of 6.1m x 2.4m.
5. Vehicle access: The following are dimensions for lorry types that are typically used to collect waste. Therefore gate height/widths should not be smaller than these measurements:
    a. Dustcart: medium capacity; length = 7.4m Height = 4m width 3.1m
    b. Skip lorry: length = 7m Height = 3.35m width 3.1m

Consideration must also be given to any other types of vehicle requiring access to this area, e.g. lorries for roll on/off containers.

---

[1]HTM 07-01: Safe management of healthcare waste, Department of Health, 2011
[2]SHTM 3 Guidance EWC Coding guide for Healthcare Wastes, Health Protection Scotland, 2007
[3]Metric handbook – Planning and design data, Adler, Architectural Press, 3rd Ed., 2007.

Wst 04 Speculative floor and ceiling finishes

Number of credits available	Minimum standards
1	No

Aim

To encourage the specification and fitting of floor and ceiling finishes selected by the building occupant and therefore avoid unnecessary waste of materials.

Assessment Criteria

The following is required to demonstrate compliance for:

One credit

Office building types only

1. For tenanted areas (where the future occupant is not known), prior to full fit-out works, carpets, other floor finishes and ceiling finishes have been installed in a show area only.
2. In a building developed for a specific occupant, that occupant has selected (or agreed to) the specified floor and ceiling finishes.

Compliance Notes

Ref	Terms	Description
CN1	Show area See criterion 1	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

Req	Design Stage	Post Construction Stage
All	Design drawings and/or relevant section/clauses of the building specification or contract	As design stage and/or the BREEAM Assessor's site inspection report and photographic evidence

Req	Design Stage	Post Construction Stage
	AND/OR A letter from the client, project team or building user where the future occupant is known	

Additional Information

Relevant definitions

None

Checklists and Tables

None

Calculation procedures

None

Other information

None

Land Use and Ecology

LE 01 Site selection

Number of credits available	Minimum standards
2	No

Aim

To encourage the use of previously developed and/or contaminated land and avoid land which has not been previously disturbed.

Assessment Criteria

This issue is split into two parts:

- Previously developed land (1 credit)
- Contaminated land (1 credit)

The following is required to demonstrate compliance for:

Previously developed land

One credit

1. 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.

Contaminated land

One credit

2. The site is deemed to be significantly contaminated as confirmed by a contaminated land specialist's site investigation, risk assessment and appraisal, which has identified:
    a. The degree of contamination
    b. The contaminant sources/types
    c. The options for remediating sources of pollution which present an unacceptable risk to the site.
3. The client or principal contractor confirms that remediation of the site will be carried out in accordance with the remediation strategy and its implementation plan.

Compliance Notes

Ref	Terms	Description
CN1	Temporary works See criterion 1	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 there-

Ref	Terms	Description
		fore included in the calculations unless they have been defined as 'land of low ecological value' (Ecological value and protection issue, LE 02).
CN2	Developed more than 50 years ago See criteria 1 & 2	Where a site has been previously developed (more than 50 years ago) but is now considered undeveloped, the credit for re-use of land may only be awarded if the site is deemed to be contaminated (as defined by the above criteria).
CN3	Infill development See criterion 1	New buildings developed within the boundary of existing sites do not automatically comply with the re-use of land criteria. The land on which at least 75% of the new building will be sited must meet the definition of previously developed.
CN4	Prison buildings See criterion 1	All land within a secure perimeter fence on an existing prison site can be classified as previously developed land. Therefore assessments of buildings located within this area will achieve the credit. If the secure perimeter fence of a prison is being extended to accommodate the proposed building, or the proposed building is located on a completely new site, then the building must comply with the assessment criteria defined above.
CN5	Schools: Playing fields See criterion 1	Development of a playing field within the construction zone can be counted as development on previously developed land only if an equivalent area of playing field is reinstated within one year of the completed construction works; and where such reinstatement will not encroach on land of high ecological value as defined in BREEAM issue LE 02, Ecological value and protection.
CN6	Prior decontamination See criteria 2 & 3	The credit for use of contaminated land can only be awarded where remediation has taken place to enable development of the site for the assessed building, or a larger phased development that includes the assessed building (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.
CN7	Large sites split into smaller plots See criteria 2 & 3	Where contamination of a large site has been remediated and has then been packaged up into smaller plots of land for individual buildings (possibly as part of a phased development strategy), the credit can be awarded regardless of the plot location of the assessed building within the wider development plan. This is on the condition that the whole site could not have been developed without remediation work taking place.
CN8	Health and	Contaminated land that has been decontaminated solely for health and safety reasons (rather than for the specific purpose of

Ref	Terms	Description
	safety related decontamination See criteria 2 & 3	re-development) does not comply.
CN9	Asbestos See criteria 2 & 3	Where the only remediation required is the removal of asbestos within an existing building fabric, the site cannot be classified as contaminated land. However, where asbestos is found to be present in the ground this will be classed as contamination for the purposes of assessing this issue.

Schedule of Evidence

Ref	Design stage	Post-construction stage
1	Design drawings (including existing site plan), report or site photographs confirming: 1. Type and duration of previous land use. 2. Area (m^2) of previous land use. Proposed site plan showing; 3. Location and footprint (m^2) of proposed development and temporary works.	BREEAM Assessor's site inspection report and photographic evidence or 'as built' drawings confirming the footprint or orientation of the developed area has not altered from that confirmed in the design stage evidence. Where alteration has occurred the % must be re-calculated using 'as built' plans.
2	A copy of the specialist's land contamination report. Design drawings (including existing site plan) showing contaminated areas and areas to be remediated in relation to any proposed development.	As design stage.
3	A letter from the principal contractor or remediation contractor confirming: 1. The remediation strategy for the site. 2. Summary details of the implementation plan. If a contractor has not yet been appointed, a letter from the client, or their representative confirming that the appointed contractor will undertake necessary remediation works to mitigate the risks identified in the specialist report.	A copy of the professional report (or relevant sections of the report) confirming: 1. Description of remedial works undertaken. 2. Description of relevant pollution linkages addressed*. * This may not be applicable where the contaminant is a non-native invasive plant species.

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.

Contaminant

A contaminant is defined as any solid, liquid or gaseous material in, or on the ground to be covered by the building, which is classed as a hazard and therefore presents an unacceptable risk to human health and the environment. The definition also includes land significantly infested by non-native invasive plant species (see definition below).

Non-native invasive plant species

are non-indigenous species that adversely affect the habitats they invade economically, environmentally or ecologically. For the purposes of the BREEAM UK New Construction scheme this currently includes Japanese Knotweed and Giant Hogweed only. Further information on control and disposal together with legislative requirements 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.

Proposed development

Any development (building, hard landscaping, car park and access roads) that falls within the boundary of the assessed site.

Previously developed land

For the purposes of this issue BREEAM uses the definition from Planning Policy Statement 3[1] which 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:

1. Defence buildings

The definition excludes:

1. Land that is or has been occupied by agricultural or forestry buildings.
2. Land that has been developed for minerals extraction or waste disposal by landfill purposes where provision for restoration has been made through development control procedures.
3. Land in built-up areas such as parks, recreation grounds and allotments which, although may feature paths, pavilions and other buildings, have not been previously developed.
4. 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).

Remediation

Activity undertaken to prevent, minimise, remedy or mitigate the risk caused by contaminated land to human health or the environment.

Significant contamination

For the purposes of this issue, significant contamination is contamination compliant with the above definition and that which without remediation, development of the site is not possible.

Checklists and Tables

None

Calculation procedures

None

Other information

None

---

[1] Planning Policy Guidance (PPG) 3: Housing. www.planningportal.gov.uk

Scottish Planning Policy Guidance (SPPG) 3: Housing. www.scotland.gov.uk/

LE 02 Ecological value of site and protection of ecological features

Number of credits available	Minimum standards
1	No

Aim

To encourage development on land that already has limited value to wildlife and to protect existing ecological features from substantial damage during site preparation and completion of construction works.

Assessment Criteria

The following is required to demonstrate compliance for:

One credit

1. Land within the construction zone is defined as 'land of low ecological value' using either:
    a. The BREEAM checklist for defining land of low ecological value (see Additional Information section below) OR
    b. 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.
2. 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:
    a. 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.
    b. Trees are protected from direct impact and from severance or asphyxiation of the roots.
    c. 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.
    d. 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).
3. In all cases, the principal 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

Ref	Terms	Description
CN1	No features of ecological value See criterion 1	This credit can be awarded where the construction zone is defined as 'land of low ecological value' and where the surrounding site contains no features of ecological value,.
CN2	Use of a suitably qualified ecologist See criterion 1	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 the BREEAM checklist for defining land of low ecological value. 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 not visited the site at the appropriate times the credit cannot be awarded (except in the circumstances indicated below in the Compliance note 'Site clearance prior to purchase of the site'). See Additional Information for the BREEAM definition of a Suitably Qualified Ecologist.
CN3	Features of little or no ecological value See criterion 1	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.
CN4	Removal of features of ecological value	If features of ecological value have been removed as part of the site clearance then the development cannot achieve this credit, even if they are to be replaced as part of a new landscaping strategy.
CN5	Site clearance prior to purchase of the site See criterion 1	For sites cleared prior to purchase of the site and less than five years before assessment, a suitably qualified ecologist should estimate the site's ecological value immediately prior to clearance using 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 i.e. where there is no evidence and therefore justification for awarding the credit. For sites cleared more than five years ago, the ecological value of the site is to be based on the current situation on the basis that within five years, ecological features would have started to re-establish themselves and

Ref	Terms	Description
		therefore act as an indicator of the site's ecological value.
CN6	Multi-residential development with CSH assessed dwellings	For buildings with self-contained dwellings also being assessed under the Code for Sustainable Homes (CSH), the following applies: Where CSH issues Eco 1 and Eco 3 have been achieved for the site and compliance with Eco 1 has been demonstrated using a Suitably Qualified Ecologist, then the credit available for this assessment issue can also be awarded. Where Eco 1 has been awarded in the CSH assessment on the basis of compliance with the CSH checklist for Eco 1 Land of Low Ecological value, the credit for this issue in the BREEAM assessment cannot automatically be awarded, as the BREEAM checklist differs from that used in the CSH. Compliance must be demonstrated using the BREEAM checklist.
CN7	Verification of a report written by an ecologist not meeting the BREEAM SQE criteria See criterion 1b	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: 1. represent sound industry practice 2. report and recommend correctly, truthfully and objectively 3. be appropriate given the local site conditions and scope of works proposed 4. avoid invalid, biased and exaggerated statements. Additionally, written confirmation from the third party verifier that they comply with the definition of a Suitably Qualified Ecologist is required.

Schedule of Evidence

Ref	Design stage	Post-construction stage
All	A completed copy of Table - 30signed and dated by the client or a design team member AND EITHER Plans, site photographs and specifications confirming presence, or otherwise, of ecological features and the protection measures specified. OR Ecologist's report highlighting information required in accordance with the Appendix F – Guidance for relating ecologist's report to BREEAM. Where relevant for multi residential buildings:	As design stage BREEAM Assessor's site inspection report and photographic evidence OR ecologist's report confirming: 1. The boundary of the site and the construction zone has not been altered. 2. Where applicable, all existing ecological features still remain. Where relevant for multi residential buildings: Evidence in line with the Post Construction Stage evidence requirements of the CSH Issues Eco 1 and Eco 3, OR A copy of the Post Construction Stage CSH certificate and report.

Ref	Design stage	Post-construction stage
	Evidence in line with the Design stage evidence requirements of the CSH Issues Eco 1 and Eco 3 OR A copy of the Design Stage CSH certificate and report.	

Additional Information

Relevant definitions

Appendix F - Relating Ecology Reports to BREEAM

A guidance document to help assessors relate the contents of a Suitably Qualified Ecologists report to the land use and ecology criteria of BREEAM. The document takes the form of a questionnaire which can be given to an SQE to complete, therefore giving the BREEAM Assessor the necessary information required to complete their assessment of the building.

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.

Mature tree or semi mature trees

Contact BRE for guidance on this.

Suitably qualified ecologist (SQE)

An individual achieving all the following items can be considered to be "suitably qualified" for the purposes of compliance with BREEAM:

1. Holds a degree or equivalent qualification (e.g. N/SVQ level 5) in ecology or a related subject.
2. Is a practising ecologist, with a minimum of three years relevant experience (within the last five years). Such experience must clearly demonstrate a practical understanding of factors affecting ecology in relation to construction and the built environment; including, acting in an advisory capacity to provide recommendations for ecological protection, enhancement and mitigation measures. Examples of relevant experience are: ecological impact assessments; Phase 1 and 2 habitat surveys and habitat restoration.
3. Is covered by a professional code of conduct and subject to peer review.Full members of the following organisations, who meet the above criteria, are deemed suitably qualified ecologists for the purposes of BREEAM:
    a. Chartered Institution of Water and Environmental Management (CIWEM)
    b. Institute of Ecology and Environmental Management (IEEM)
    c. Institute of Environmental Management and Assessment (IEMA)
    d. Landscape Institute (LI)
    e. The Institution of Environmental Sciences (IES)
4. 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:
    a. Biologists, botanists, entomologists etc
    b. Arboriculturalists
    c. Nature conservationists

   d. Landscape engineers/architects
   e. Environmental engineers/scientists
5. 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.
6. 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.
7. Additionally, written confirmation from the third party verifier that they comply with the definition of a Suitably Qualified Ecologist is required.'

Peer review

A peer review is defined as the process employed by a professional body to demonstrate that potential or current full members maintain a standard of knowledge and experience required to ensure compliance with a code of conduct and professional ethics.

Ecology related subject

Depending on the ecological content (minimum 60%), the following degrees might be considered relevant: Ecology, Biological Sciences, Zoology, Botany, Countryside Management, Environmental Sciences, Marine and Freshwater Management, Earth Sciences, Agriculture, Forestry, Geography, Landscape Management.

Checklists and Tables

BREEAM checklist for defining land of low ecological value

If the answer to all questions in the checklist is 'no', the land can be defined as having a low ecological value and the credit awarded. Should any of the questions be answered 'yes', the credit can only be awarded on confirmation from a Suitably Qualified Ecologist that the site is of low ecological value.

The checklist should be completed by either the BREEAM Assessor, using appropriate evidence submitted by the design team or completed by the design team and submitted to the Assessor along with appropriate supporting evidence. The answers to the checklist must be based on an evaluation of the site prior to any site clearance or construction activities (refer to Compliance notes for further detail).

Table - 30: BREEAM checklist for defining land of low ecological value

ID	Question	Yes	No
Q1	Has the Planning Authority required that an ecological survey or statement be prepared?	☐	☐
Q2	Is the development within 2 km of a Special Area of Conservation (SAC), Special Protection Area (SPA) or Ramsar site? 1. www.natureonthemap.org.uk/ 2. www.magic.gov.uk 3. Local Plan Proposals Map	☐	☐
Q3	Is the development within 500m of a Site of Special Scientific Interest (SSSI) 1. www.natureonthemap.org.uk 2. www.magic.gov.uk 3. Local Plan Proposals Map	☐	☐
Q4	Are any of the following habitats present on, or within 100m of the construction zone? 1. Broad-leaved woodland* 2. Water courses (rivers, streams or canals)** 3. Wetlands (ponds, lakes, marshland, fenland) 4. Flower-rich meadow/grassland 5. Heathland (habitat/plants that thrive on acidic soils, such as heather and gorse)	☐	☐
Q5	Are any of the following features present within or on the boundary of the construction zone? 1. Trees more than 10 years old 2. Mature Hedgerow (field hedgerows over 1m tall and 0.5m wide)*** 3. Existing buildings (occupied or derelict) with either pitched tile, slate or shingle roofs, lofts, wall hanging tiles, weatherboarding or dense climbing plants, soffits and cellars/basements/ice houses etc.	☐	☐
Notes:			

ID	Question	Yes	No
	* The Countryside Survey defines woodland as 'having over 25% canopy cover of trees and shrubs, over a metre high'. Broad-leaved woodland should be taken to mean broad-leaved, mixed and Yew woodland. ** The Countryside Survey defines the broad habitats of rivers and streams as running watercourses ranging from small headwater streams to large rivers. This broad habitat, along with wetlands, includes the open water itself and the vegetation along the water's edge. *** The Countryside Survey defines a hedge as 'a line of woody vegetation that has been subject to management so that trees no longer take their natural shape.' www.countrysidesurvey.org.uk/index.html		

Calculation procedures

None

Other information

Very often there is the potential for a site to increase its biodiversity value through appropriate design and management, regardless of whether enhancing biodiversity is required to gain Planning Consent. This BREEAM assessment issue provides the opportunity to reward those projects that contribute to protecting and enhancing biodiversity, improve living environments and meet environmental objectives.

Whilst not mandatory, BREEAM recommends that a Suitably Qualified Ecologist is appointed to ensure that a project maximizes biodiversity gains. Although a large number of developments are not required to undertake formal ecological assessments as part of the planning process because of the nature of the existing site, they may have potential to be of biodiversity value. Verification of this is best achieved by the appointment of a Suitably Qualified Ecologist.

Organisations and Institutes, including the Institute of Ecology and Environmental Management (IEEM) and the Association of Wildlife Trust Consultancies (AWTC), provide lists of ecologists working within a particular region that may meet the SQE requirements.

LE 03 Mitigating ecological impact

Number of credits available	Minimum standards
2	Yes

Aim

To minimise the impact of a building development on existing site ecology.

Assessment Criteria

The following is required to demonstrate compliance for:

One credit

1. The change in ecological value of the site is less than zero but equal to or greater than minus nine i.e. a minimal change, using the methods outlined in either (a) or (b) below:
    a. Determine the following information and input this data in to the BREEAM LE 03/LE 04 calculator:
        i. The broad habitat type(s) that define the landscape of the assessed site in its existing pre-developed state and proposed state (see checklists and tables in the Additional Information section).
        ii. Area (m^2) of the existing and proposed broad habitat types.

    OR

    b. Where a suitably qualified ecologist (SQE) has been appointed and, based on their site survey they confirm the following and either the assessor or ecologist inputs this data in to the BREEAM LE 03/LE 04 calculator:
        i. The broad habitat types that define the landscape of the assessed site in its existing pre-developed state and proposed state.
        ii. Area (m^2) of the existing and proposed broad habitat plot types.
        iii. Average total taxon (plant species) richness within each habitat type.

One credit

2. Where the change in ecological value of the site is equal to or greater than zero i.e. no negative change, using the methods outlined in either (a) or (b) above.

Compliance Notes

Ref	Terms	Description
CN1	Average total taxon (plant species richness)	BREEAM uses plant species richness as an indicative measure of ecological value of the assessed site and therefore an indication of ecological impact resulting from its development. The ecological value is expressed as an area weighted average of plant species

Ref	Terms	Description
		richness for a site's broad habitat types. Where a suitably qualified ecologist has been appointed the actual number of surveyed and specified plant species (before and after construction) must be used to calculate the change in ecological value (using the BREEAM LE 03/LE 04 calculator). Alternatively, the BREEAM Assessor may calculate the change by defining the broad habitat types (before and after construction) for the assessed site within the BREEAM LE 03/LE 04 calculator. Using this information a default number of average plant species is determined for the purpose of the calculation. These figures are based on national data collated for the 2007 Countryside Survey (see Table - 32).
CN2	Derelict Sites	The ecological value of derelict sites in Table - 32 is time dependent; a linear scale has been used to determine intermediate values between zero ecological value where development occurs within 5 years from dereliction/demolition, to a value at 30 years based on the full species richness for that particular broad habitat. This presents a minimum figure which can be amended on the advice of a suitably qualified ecologist's and their site survey.
CN3	Assessment of a single development on a larger site	Where the assessment is of a single building that forms part of a larger development and the landscaping and ecological features form a common part of the whole site, for the purpose of assessing this issue the plot types and areas for the entire site must be used.
CN4	Infill developments on existing occupied site	Where a new building is an infill on an existing occupied site, then the construction zone for the new building would be the area of site assessed for the purposes of this issue.
CN5	Site clearance prior to purchase of the site	Refer BREEAM issue LE 02 Ecological value of site and protection of ecological features (Compliance notes).
CN6	Green Roofs See criterion 1b	The contribution of plant species on a Green roof can only be incorporated within the calculation where a suitably qualified ecologist has been appointed to advise on suitable plant species for the roof.
CN7	Multi-residential developments with CSH assessed dwellings	For buildings with self-contained dwellings also being assessed under the Code for Sustainable Homes (CSH), the following applies: The number of credits achieved under the CSH assessment of issue Eco 4 cannot be directly applied to this issue for assessment of a multi-residential building due to the difference in number of credits available and respective benchmarks. However, where a suitably qualified ecologist has been used to calculate the change in ecological value in the CSH assessment, the data/information used can be used

Ref	Terms	Description
		to determine the number of credits for this BREEAM issue (and vice-versa, BREEAM to CSH), provided compliance with all requirements of the BREEAM/CSH technical guide are met.

Schedule of Evidence

Ref	Design stage	Post-construction stage
All	Design drawings including proposed and existing (pre-development) site plan/survey. AND EITHER 1. A completed copy of the BREEAM LE 03/LE 04 calculator OR 2. Ecologist's report highlighting information required in Appendix F OR a copy of Appendix F completed by the ecologist AND written confirmation from the client/design team detailing how the ecologist's recommendations will be implemented. Where relevant for multi-residential buildings; Evidence in line with the Design stage evidence requirements of the CSH Issues Eco 4 OR A copy of the Design Stage CSH certificate and CSH compliance report confirming the change in ecological value for the site.	As design stage AND BREEAM Assessor's site inspection report and photographic evidence confirming planting in accordance with design stage plan. Relevant section/clauses of the building specification or contract or a letter from the client or principal contractor confirming any planting will be completed within 18 months from completion of the development*. * This is only for large mixed-use/multi-building developments, where the whole site has not been completed and ecological enhancements have not yet been added, or where features are being added at a later date in an appropriate planting season. Where relevant for multi-residential buildings; Evidence in line with the Design stage evidence requirements of the CSH Issues Eco 4 OR A copy of the final post construction CSH certificate and CSH compliance report confirming the change in ecological value for the site.

Additional Information

Relevant definitions

Construction zone

Refer to BREEAM issue LE 02 Ecological value of site and protection of ecological features.

Suitably qualified ecologist (SQE)

Refer to BREEAM issue LE 02 Ecological value of site and protection of ecological features.

Checklists and Tables

Table - 31 : Broad habitat types

Broad habitat name	Description
Acid Grassland	Vegetation dominated by grasses and herbs on a range of lime-deficient soils which have been derived from acidic bedrock or from superficial deposits such as sands and gravels. They characteristically include a range of calcifuge or 'lime-avoiding' plants.
Arable and Horticultural	Includes all arable crops such as different types of cereal and vegetable crops, together with orchards and more specialist operations such as market gardening and commercial flower growing. Freshly ploughed land, fallow areas, short-term set-aside and annual grass leys are also included in this category.
Boundary and Linear Features	This habitat includes a diverse range of linearly arranged landscape features such as hedgerows, lines of trees (whether they are part of a hedgerow or not), walls, stone and earth banks, grass strips and dry ditches. These features may occur separately or in combinations forming multi-element boundaries. This habitat type also includes some of the built components of the rural landscape, including roads, tracks and railways. The narrow strips of semi-natural vegetation along verges or cuttings are also included.
Bracken	Stands of vegetation greater than 0.25 ha in extent which are dominated by a continuous canopy cover (>95% cover) of bracken (Pteridium aquilinum) at the height of the growing season.
Built-up and Gardens	Covers urban and rural settlements, farm buildings, caravan parks and other man-made built structures such as industrial estates, retail parks, waste and derelict ground, urban parkland and urban transport infrastructure. It also includes domestic gardens and allotments. This category has been split in to three individual broad habitat categories for the purpose of BREEAM: 1. Gardens, allotments and urban parkland 2. Built-up (maintained buildings and infrastructure) 3. Derelict land (where the land was previously used for major historical industrial use or development). This split is to reflect the differing impact of development in these types of habitats.
Broadleaved, Mixed and Yew Woodland	This form of woodland is dominated by trees that are more than 5m high when mature, which form a distinct, although sometimes open, canopy with a cover of greater than 20%. It includes stands of native broadleaved trees (such as oak, ash and beech), non-native broadleaved trees (such as sycamore and horse chestnut), and yew trees, where the percentage cover of these trees in the stand exceeds 20% of the total cover of the trees present. Scrub vegetation, where the woody component tends to be mainly shrubs (usually

Broad habitat name	Description
	less than 5m high), is included if the cover of woody species is greater than 30%.
Calcareous Grassland	Vegetation dominated by grasses and herbs on shallow, well-drained soils, which are alkaline, as a result of the weathering of chalk, limestone or other types of base-rich rock. They characteristically include a range of calcicoles or 'lime-loving' plants.
Coniferous Woodland	Dominated by trees that are more than 5m high when mature, which form a distinct, although sometimes open, canopy which has a cover of greater than 20%. It includes stands of both native conifers (Scots pine but not yew) and non-native conifers (such as larch and Sitka spruce) where the percentage cover of these trees in the stand exceeds 80% of the total cover of the trees present.
Mixed wood-land	This is not a category in its own right, but has been included separately by BRE Global for clarification; Many areas of woodland contain both broadleaved and coniferous trees. There is not a separate Broad Habitat for mixed woodland. Instead where mixtures occur they are assigned to the Broadleaved, Mixed and Yew Broad Habitat type if the proportion of conifers is less than 80%. The separation of coniferous from Broadleaved, Mixed and Yew habitat is applied at a stand or sub-compartment level within large woodlands to avoid areas that are predominantly coniferous being treated as mixed because they are part of a larger wood, of which 20% consists of pure broadleaved trees. Therefore, most areas of mixed woodland that are assigned to the Broadleaved, Mixed and Yew Broad Habitat would normally have much more than 20% broadleaved or yew trees.
Dwarf Shrub Heath	Vegetation that has a greater than 25% cover of plant species from the heath family or dwarf gorse species. It generally occurs on well-drained, nutrient-poor, acid soils.
Improved Grassland	Occurs on fertile soils and is characterised by the dominance of a few fast-growing species, such as rye-grass and white clover. These grasslands are typ-ically used for grazing and silage, but they can also be managed for rec-reational purposes. They are often intensively managed using fertiliser and weed control treatments, and may also be ploughed as part of the normal rotation of arable crops but if so, they are only included in this Broad Habitat type if they are more than one year old.
Inland Rock	Habitat types that occur on both natural and artificial exposed rock surfaces, such as inland cliffs, caves, screes and limestone pavements, as well as various forms of excavations and waste tips, such as quarries and quarry waste.
Neutral Grass-land	Found on soils that are neither very acid nor alkaline. They support different types of vegetation communities compared to Acid and Calcareous Grass-

Broad habitat name	Description
	lands in that they do not contain calcifuge ('lime-avoiding') plants which are found on acid soils, or calcicole (lime-loving) plants which are found on calcareous soils. Unimproved or semi-improved Neutral Grasslands may be managed as hay meadows, pastures or for silage. They differ from Improved Grassland in that they are less fertile and contain a wider range of herb and grass species. Usually the cover of rye grass is less than about 25%.

Table - 32: Inclusive analysis of Average Total Taxon Richness by broad habitat in 'Fields and Other Main Land Cover Parcels plots' in Great Britain.

Habitat type	Previously Undeveloped Land	Previously Developed Land (within Broad Habitat type)[2] (Time period that the site has been unoccupied/unmaintained and therefore derelict)			
	Average Total Taxon (plant species) Richness[1]				
Acid Grassland	19.58	0	5.87	14.69	19.58
Arable and Horticultural Land	10.25	-	-	-	-
Boundary and Linear Features	15.42	-	-	-	-
Bracken	19.29	-	-	-	-
Built-up (buildings and infrastructure)[3]	-	0	-	-	-
Calcareous Grassland	43.02	0	12.91	32.27	43.02
Coniferous Woodland	14.05	-	-	-	-
Derelict land[3]	-	0	6.00	14.99	19.99
Gardens, allotments and urban parkland[3]	19.99	0	6.00	14.99	19.99
Dwarf Shrub	15.87	0	4.76	11.90	15.87

Habitat type	Previously Undeveloped Land	Previously Developed Land (within Broad Habitat type)[2] (Time period that the site has been unoccupied/unmaintained and therefore derelict)			
	Average Total Taxon (plant species) Richness[1]				
Heath					
Improved Grassland	14.28	0	4.28	10.71	14.28
Inland Rock	16.74	-	-	-	-
Mixed, Broad-leaved and Yew Woodland	20.91	-	-	-	-
Neutral Grass-land	20.44	0	6.13	15.33	20.44
		<5 Years	5-10 Years	10 - 20 Years	20 - 30+ Years

Source: Acknowledgement - Countryside Survey data owned by NERC – Centre for Ecology & Hydrology. Countryside Survey © Database Right/Copyright NERC– Centre for Ecology & Hydrology. All rights reserved.

1. Total taxon richness is higher plant species only, no bryophytes (non flowering plants). Figures are based on the average species richness per 200m^2 plot.
2. The derelict land and built-up figures are not from the Countryside survey data (see Additional information).
3. BRE Global have split the "Built-up and gardens" Countryside survey category into these headings to reflect the differing impact of building on this types of land.

Calculation procedures

Calculating the change in ecological value for a site

The change in ecological value is determined using the diversity (species richness and cover) of plants on the site immediately before site clearance/preparation and after construction of the assessed development. The ecological value is expressed as an area-weighted average of plant species richness for the site's broad habitat types. This enables BREEAM to use plant species as an indicator of the 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^2 existing site consists of the following types of land and, using data from the table above, plant species richness:

   a. 1865m^2 hard landscaping = 0 species
   b. 200m^2 urban parkland = 19.99 species

   The ecological value of the site in its existing condition 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 species x (1865m^2/2065m^2)} = 0
b. Urban parkland: {(19.99 species x (200m^2/2065m^2)} = 1.94
c. Ecological value of the existing site = 0 + 1.94 = 1.94

2. Calculate the ecological value of the site in its proposed, post-developed state:

The 2065m^2 post-construction site consists of the following types of land:

a. 1375m^2 of building = 0 species.
b. 550m^2 of hard landscaping = 0 species
c. 140m^2 has remained as urban parkland = 19.99 species

The ecological value of the proposed site is as follows:

a. Building: {(0 species x (1375m^2/2065m^2)} = 0
b. Hard landscaping: {(0 species x (550m^2/2065m^2)} = 0
c. Urban parkland: {(19.99 species x (140m^2/2065m^2)} = 1.36
d. Ecological value of the proposed site = 0 + 0 + 1.36 = 1.36

The ecological impact is the difference between the two ecological values:

a. Change in ecological value: 1.36 (after) – 1.94 (before) = - 0.58

Therefore, as the ecological value has decreased by no less than minus nine, for this example one credit can be awarded.

Other information

BREEAM recommendation

Very often there is the potential for a site to increase its biodiversity value through appropriate design and management, regardless of whether enhancing biodiversity is required to gain Planning Consent. This BREEAM assessment issue provides the opportunity to reward those projects that contribute to protecting and enhancing biodiversity, improve living environments and meet environmental objectives.

Whilst not mandatory, BREEAM recommends that a Suitably Qualified Ecologist is appointed to ensure that a project maximizes biodiversity gains. Although a large number of developments are not required to undertake formal ecological assessments as part of the planning process, because of the nature of the existing site they may have potential to be of biodiversity value. Verification of this is best achieved by the appointment of a Suitably Qualified Ecologist.

Countryside Survey (2007) data

The data used in this BREEAM issue has been obtained from the Countryside Survey 2007 tables; http://www.countrysidesurvey.org.uk/data_access/Graphs/SummaryResults.aspx

Broad habitat definitions have been sourced from; http://www.countrysidesurvey.org.uk/archiveCS2000/Report_pdf/appen.pdf

Some of the Countryside Survey broad habitat data has not been used within this BREEAM issue either because the broad habitat supports no taxon richness or because it is unlikely that buildings will be constructed within these habitat types e.g. bog, fen etc.

BREEAM assumptions

In order to use the Countryside survey data within BREEAM, BRE Global have made the following assumptions;

1. Built-up (maintained buildings and hard landscaping) have a plant species richness of zero.
2. The previously developed land category is relevant for derelict sites within a broad habitat type where plant species found in that habitat are likely to reclaim the site if left to do so over a defined period of time. BRE have assumed this is the case for land found within the grassland, heath, derelict, gardens, allotments and urban parkland habitats. It has not been assumed for other categories as BRE Global are unable to confirm an appropriate period over which planting will re-establish itself on derelict land within these other broad habitat types.
3. A period of five to ten, ten to twenty and twenty to thirty year's dereliction is used; the species richness figures against each period for a particular habitat type are based on a re-establishment rate of 30% of richness, 75% and 100% respectively.
4. BRE have split the 'Built up and gardens' category from the Countryside survey into 'Gardens, allotments and urban parkland', 'Derelict' and 'Built-up' habitat types. This split is to reflect the differing impact of building on this type of land.

LE 04 Enhancing site ecology

Number of credits available	Minimum standards
Building type dependent	No

Aim

To recognise and encourage actions taken to maintain and enhance the ecological value of the site as a result of development.

Assessment Criteria

The following is required to demonstrate compliance for:

One credit (except buildings on HM Prison sites where two credits are available for compliance with criteria 1 and 2)

1. A suitably qualified ecologist (SQE) has been appointed to report on enhancing and protecting the ecology of the site and:
    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 (see also compliance note 'timing of ecologist's survey and report').
2. The general recommendations of the Ecology Report for enhancement and protection of site ecology have been, or will be, implemented.

One credit (all building types except those on HM Prison sites)

3. Criteria 1 and 2 are 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 an increase in ecological value of the site up to (but not including) 6 plant species.
5. The increase in plant species has been calculated using the BREEAM LE03/LE04 calculator, using actual plant species numbers.

Two credit (all building types except those on HM Prison sites)

6. The requirements of the first credit are achieved.
7. 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 an increase in ecological value of the site of 6 plant species or greater.
8. The increase in plant species has been calculated using the BREEAM LE 03/LE 04 calculator, using actual plant species numbers.

Compliance Notes

Ref	Terms	Description
CN1	Timing of ecologist's survey and report See criterion 1	The suitably qualified ecologist must be 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 design brief stage (RIBA Stage B or equivalent) in order to facilitate and maximise potential ecological enhancement.
CN2	General recommendations See criterion 2	'General' recommendations for enhancing and protecting the ecological value of the site are to include, and go beyond, compliance criteria for all current EU and UK legislation relating to protected species and habitats. These 'general' recommendations may include ecological recommendations as detailed in the definitions.
CN3	Guidance for ecologists and assessors	Please refer to Appendix F – Guidance for relating ecologist's report to BREEAM.
CN4	Plant species See criteria 5 & 8	Only native floral/plant speciescontributing to a local or UK Biodiversity Action Plan (or as specified by the SQE) can be considered for the purpose of increasing the number of species on site, as well as general enhancement. The planting area, density and mixture of different species must be specified by the SQE, to give the best possible chance of long term establishment and survival of the species within the habitat. The Natural History Museum has an online Postcode Plants Database which generates lists of native plants and wildlife for any specified postal district in the UK. http://www.nhm.ac.uk/nature-online/life/plants-fungi/postcode-plants/index.html
CN5	No ecological survey completed or construction works have commenced See criterion 1	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 second and third credits cannot be achieved. Note: This guidance is not applicable to assessments of buildings on HM Prison sites.
CN6	Infill construction on existing sites with limited space for ecological enhancements or	Where it is not possible to implement ecological enhancements within the construction zone due to overriding security issues, or where space for ecological enhancements within the zone is severely limited, ecological enhancements made to other areas of the site can be taken into account and used to determine the

Ref	Terms	Description
	overriding security requirements See criterion 1	number of BREEAM credits achieved. These enhancements must be made within the boundary of the wider existing development and be planned and commissioned on a similar timescale to the assessed development. Example's of instances where this Compliance note may apply include new 'infill' building development within existing HM Prison sites, further and higher education campuses, retail or business parks.
CN7	Multi-residential developments with CSH assessed dwellings	For buildings with self-contained dwellings also being assessed under the Code for Sustainable Homes (CSH), the following applies: The number of credits achieved under the CSH assessment of issue Eco 4 cannot be directly applied to this issue for an assessment of a multi-residential building due to the difference in number of credits available and respective benchmarks. However, the data/information and output used in CSH assessment to calculate the change in ecological value can be used to determine compliance with the second and third credits of this BREEAM issue (and vice-versa, BREEAM to CSH, provided compliance with all requirements of the CSH technical guide is met).

Schedule of Evidence

Ref	Design stage	Post-construction stage
All	Ecologist's report highlighting information required inAppendix F – Guidance for relating ecologist's report to BREEAM or a copy of Appendix F – Guidance for relating ecologist's report to BREEAM completed by the ecologist. Design drawings including proposed and existing (pre-development) site plan/survey. Written confirmation from the client/design team confirming how the ecologist's recommendations will be implemented. Where relevant for multi residential buildings: Evidence in line with the Design stage evidence requirements of the CSH Issues Eco 4 OR A copy of the Design Stage CSH	As design stage requirements BREEAM Assessor's site inspection report and photographic evidence confirming planting in accordance with design stage plan. Relevant section/clauses of the building specification or contract or a letter from the client or principal contractor confirming the planting will be completed within 18 months from completion of the development*. * This is for large mixed-use/multi-building developments, where the whole site has not been completed and ecological enhancements have not yet been added, or where features are being added at a later date in an appropriate planting season. Where relevant for multi residential

Ref	Design stage	Post-construction stage
	certificate and CSH compliance report confirming the change in ecological value for the site.	buildings: Evidence in line with the Design stage evidence requirements of the CSH Issues Eco 4 OR A copy of the final post construction CSH certificate and CSH compliance report confirming the change in ecological value for the site.

Additional Information

Relevant definitions

Suitably qualified ecologist (SQE)

Refer to BREEAM issue LE 02 Ecological value of site and protection of ecological features.

Checklists and Tables

None

Calculation procedures

None

Other information

Ecological recommendations are defined as measures adopted to enhance the ecology of the site, which may include:

1. The planting of native species or those with a known attraction or benefit to local wildlife
2. The adoption of horticultural good practice (e.g. no, or low, use of residual pesticides)
3. The installation of bird, bat and/or insect boxes at appropriate locations on the site
4. Development of a full Biodiversity Management Plan including avoiding clearance/works at key times of the year (e.g. breeding seasons)
5. 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.

LE 05 Long term impact on biodiversity

Number of credits available	Minimum standards
Building type dependent	No

Aim

To minimise the long term impact of the development on the site and the surrounding area's biodiversity.

Assessment Criteria

The following is required to demonstrate compliance:

Pre-requisite

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 UK and EU 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:
    a. Management of any protected features on site
    b. Management of any new, existing or enhanced habitats
    c. A reference to the current or future site level or local Biodiversity Action Plan.

Additional criteria

4. There is a commitment to achieve the pre-requisite criteria and appropriate number of additional criteria 5-10 (both listed below) as follows:

Building type	No. of credits	No. of additional criteria
All building types except prisons	1	2
	2	4
Prison buildings	1	2
	2	3
	3	4

Where the Suitably Qualified Ecologist (SQE) confirms that some of the additional criteria listed below are not applicable to the assessed development, the credits can be awarded as follows:

		Applicable additional criteria				
		All	4	3	2	1
Building type	Credits	Number of additional criteria to achieve				
All building types except prisons	1	2	2	2	2	1
	2	4	4	3		
Prison buildings	1	2	2	1	2	1
	2	3	3	2		
	3	4	3	3		

5. The principal contractor nominates a 'Biodiversity Champion' with the authority to influence site activities and ensure that detrimental impacts on site biodiversity are minimised in line with the recommendations of a suitably qualified ecologist.
6. The principal contractor trains the site workforce on how to protect site ecology during the project. Specific training must be carried out for the entire site workforce to ensure they are aware of how to avoid damaging site ecology during operations on site. Training should be based on the findings and recommendations for protection of ecological features highlighted within a report prepared by a suitably qualified ecologist.
7. The principal contractor records actions taken to protect biodiversity and monitor their effectiveness throughout key stages of the construction process. The requirement commits the principal contractor to make such records available where publicly requested.
8. 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 UK Biodiversity Action Plan (UK BAP)[1], Local Biodiversity Action Plan (LBAP), those protected within statutory sites (e.g. SSSIs), or those within non-statutory sites identified in local plans.
9. 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.

Additionally for Education building types only (criterion 10.)

10. A partnership has been set up by the design team with a local group that has wildlife expertise (e.g. local wildlife trust or similar local body) and the group has:
    a. Provided advice early in the design process regarding protecting and/or providing habitat for species of local importance on the site.
    b. Provided advice to ensure the design is in keeping with the local environment. In particular this should draw on their local knowledge of any features or species of ecological interest on or near the site.
    c. Provided or will continue to provide ongoing support and advice to the educational establishment to help them manage, maintain and develop the outdoor space in the longer term.

A suitable starting point for discussion with the local wildlife group would be to ask for advice on how to take account of the Local Biodiversity Action Plan (LBAP) in the school/college landscape design.

Compliance Notes

Ref	Terms	Description
CN1	Biodiversity Champion. See criterion 5	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.
CN2	Local biodiversity expertise See criterion 8	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.
CN3	Where additional criteria are not applicable. See criterion 1,2,3 & 4	In all cases it is necessary to employ a suitably qualified ecologist to achieve these credits. As a minimum the ecologist must provide the following in writing; 1. Confirmation that mandatory criteria 2 and 3 have been achieved 2. Clarification on whether mandatory criterion 4 is applicable and if so that it has been achieved 3. Clarification on how many of the additional criteria are applicable and have been achieved 4. Guidance on how to achieve additional criterion 8 (where possible) Where the suitably qualified ecologist confirms that mandatory criterion 4 and all additional criteria are not applicable (due to the nature of the site and its surroundings) full credits can be awarded for demonstrating compliance with mandatory criteria 2 and 3.
CN4	Prison Service Biodiversity Action Plan (PSBAP). See criterion 8	The additional criterion 8 'creation of a new ecologically valuable habitat' should consider the Prison Service Biodiversity Action Plan (PSBAP) [2] in lieu of, or as well as, the UKBAP.
CN5	Existing prison sites	For assessments of buildings on existing HM Prison sites, the assessor should determine which classification of the PSBAP the site falls into (see Additional Information). The classification of the site will affect the measures required to maintain any new ecologically valuable habitat and protect long-term biodiversity.
CN6	Ground maintenance &	The management plan should include guidelines for ground maintenance. Without this there may be a tendency for grounds main-

Ref	Terms	Description
	management plan. See criterion 4	tenance staff to pursue a largely unchanging maintenance routine. This may not be favourable to biodiversity on site, and may reduce scope for involvement of building users (e.g. pupils in schools) in the management of and engagement with site biodiversity.
CN7	Additional criterion 10: Education buildings only:Ongoing support and advice	This could take the form of meetings several times a year with a staff/pupils/students working party to help them plan conservation/ecological enhancement work, or activities relating the ecology in or near the school/college grounds.
CN8	Additional criterion 10: Education buildings only:Local Wildlife Trust	The local wildlife trust would be a suitable body to set up a partnership with. Alternative groups may also be appropriate. The design team should investigate wildlife projects that these groups have been involved with locally, in order to make a decision on their suitability before entering into discussions about setting up a partnership.

Schedule of Evidence

Ref	Design stage	Post-construction stage
1-4	Ecologist's report highlighting information required in Appendix F – Guidance for relating ecologist's report to BREEAM Appendix F AND EITHER A copy of the site's landscape and habitat management plan. OR Relevant section/clauses of the building specification or contract confirming its development and scope. OR A letter from the client confirming a commitment to produce the management plan and its' scope.	A letter from the SQE confirming that all relevantUK and EUlegislation relating to protection and enhancement of ecology has been complied with. A copy of the site's landscape and habitat management plan.
Additional criteria		
5	Relevant section/clauses of the building specification or contract or an appointment letter from the	Assessor inspection of, or a copy of the relevant sections of the site log book confirming the details of any

Ref	Design stage	Post-construction stage
	Contractor.	action/events taken by the biodiversity champion. If no actions required/taken, this should be confirmed in the log book.
6	Training schedule or letter of confirmation from the principal contractor committing to provide relevant training. OR A copy of the specification clause requiring the training of the site's workforce by the principal contractor.	A record of training undertaken including the necessary details.
7	A letter from the principal contractor confirming monitoring and reporting criteria for the development. OR A copy of the specification clause requiring the principal contractor to undertake monitoring and reporting.	Assessor inspection of, or a copy of the relevant sections of the site log book confirming: 1. Records of monitoring and actions taken to protect bio-diversity. 2. Records and outcome of any requests to view such information.
8	A copy of the proposed site plan highlighting the new ecologically valuable habitat. A SQE's report or letter confirming that the habitat supports the relevant biodiversity action plan(s).	BREEAM Assessor's (or SQE's) site inspection report and photographic evidence confirming the existence of the proposed habitat.
9	The SQE's report or letter confirming actions required with respect to programming site works to minimise disturbance. The principal contractor's programme of works. OR Relevant section/clauses of the building specification or contract confirming that the programme of site works will minimise disturbance to wildlife in accordance with the SQE's recommendations.	A letter from the SQE, or a copy of their report confirming site works were executed in a manner that minimised disturbance to wildlife in accordance with their recommendations.
10	Documentary evidence from the design team or wildlife group confirming: 1. Scope of the partnership. 2. Details and remit of the wild-	Documentary evidence from the design team or wildlife group detailing as a minimum meetings, actions, advice given, framework for

Ref	Design stage	Post-construction stage
	life group. 3. A description of the process for ongoing support that the group commit to give to the partnership. 4. Details of meetings and actions to date	future support including a timetable for meetings and events.

Additional Information

Relevant definitions

Suitably qualified ecologist (SQE)

Refer to LE 02 Ecological value of site and protection of ecological features

Biodiversity

Biodiversity is defined as the variety of life on earth. It includes all species, animal, plants, fungi, algae, bacteria and the habitats that they depend upon.

Historic building

Refer to Ene 01 Reduction of emissions.

Biodiversity Action Plan

A plan which sets specific, measurable, achievable, realistic and time bound conservation targets for species and habitats. The UKBAP website www.ukbap.org supports the implementation of the UK Biodiversity Action Plan (UK BAP) on behalf of the UK Biodiversity Partnership and the UK Government.

Steps to produce a BAP are outlined in the UK Business and Biodiversity Resource Centre website, hosted by Earthwatch Institute Europe http://www.businessandbiodiversity.org under 'your sector'

Prison Service BAPs

In March 2003 HM Prison Service produced a Strategy Statement of Action for a Prison Service biodiversity action plan. The Prison Service BAP comprises three stages, the first of which involves managing SSSI sites. The second stage addresses the management of sites that are not designated, but which may have land which has local, county or regional importance on biodiversity. The third stage addresses the rest of the prison estate, principally comprising urban prisons.

Checklists and Tables

None

Calculation procedures

None

Other information

None

[1] UK BAP: www.ukbap.org.uk
[2] Statement of Action and Strategy for a Prison Service Biodiversity Action Plan, HMPS, 2003.

Pollution

Pol 01 Impact of refrigerants

Number of credits available	Minimum standards
3	No

Aim

To reduce the level of greenhouse gas emissions arising from the leakage of refrigerants from building systems.

Assessment Criteria

The following is required to demonstrate compliance for:

Three credits

1. Where the building does not require the use of refrigerants within its installed plant/systems.

OR alternatively, where the building does require the use of refrigerants, the three credits can be awarded as follows:

Two credits

2. Where the systems using refrigerants have Direct Effect Life Cycle CO_2 equivalent emissions (DELC CO_{2e}) of ≤100 kgCO_{2e}/kW cooling capacity. To calculate the DELC CO_{2e} the following information is sourced from the design team and entered into the BREEAM Pol 01 calculator:
    a. Global Warming Potential (GWP) of the specified system refrigerant(s)
    b. Total refrigerant charge (kg)
    c. Cooling capacity of the system(s) (kW)
    d. Sectoral release factors:
        i. Annual refrigerant leakage rate (% of refrigerant charge):
        ii. Annual purge release factor (% of refrigerant charge):
        iii. Annual service release factor (% of refrigerant charge):
        iv. Probability factor for catastrophic system failure (%)
        v. Recovery efficiency (% of refrigerant charge):

    For further detail refer to the Relevant definitions and Calculation procedures sections within Additional Information.
    OR

3. Where air-conditioning or refrigeration systems are installed the refrigerants used have a Global Warming Potential (GWP) ≤10.

OR

One credit

4. Where the systems using refrigerants have Direct Effect Life Cycle CO_2 equivalent emissions of (DELC CO_{2e}) of ≤1000 kgCO_{2e}/kW cooling capacity.

One credit

5. Where systems using refrigerants are contained in a moderately air tight enclosure (or a mechanically ventilated plant room), and an automated permanent refrigerant leak detection system is installed covering high-risk parts of the plant OR where a refrigerant leakage/charge loss

detection system is specified, which is not based on the principle of detecting or measuring the concentration of refrigerant in air.

6. The automatic shutdown and pump down of refrigerant occurs on the detection of refrigerant leakage/charge loss.
7. 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.
8. The alarm threshold that triggers automatic pump down upon detection of refrigerant in the plant room/enclosure is set to a maximum of 2000ppm (0.2%), but lower levels can be set.
9. Use a robust and tested automated permanent refrigerant leak detection system, normally defined as that included on the Enhanced Capital Allowance (ECA) Energy Technology Product List[1] (or an equivalent list).

Compliance Notes

Ref	Terms	Description
CN1	Scope of this issue	The criteria of this issue apply to air conditioning and refrigeration systems installed in the building for the following uses, regardless of the systems refrigerant charge (kg), including: 1. Comfort cooling and/or space heating (including assessment of refrigerants in heat pumps). 2. Cold storage, including commercial food/drink display cabinets but excluding domestic white goods e.g. fridges and freezers 3. Process based cooling loads e.g. servers/I.T equipment. For installations of small multiple hermetic systems only: Where the refrigerant charge in each unit is less than 5kg the credit for leak detection and containment can be awarded by default. This is on the basis that the risk of a large refrigerant leak due to system failure is minimised, as individual leaks from each system will be small where leakage occurs, and therefore there is little life cycle benefit of requiring leak detection equipment on each small system.
CN2	Specification of multiple systems	Where a building is installing multiple air conditioning/refrigeration systems the assessor must source the relevant technical data for each system and enter it in to the Pol 01 calculator. The calculator will then determine the weighted average DELC for the multiple installation and the BREEAM credits can be awarded or withheld accordingly.
CN3	Shell only	If the building is designed to be fully naturally ventilated, and therefore no 'refrigerant using' building services or systems will be specified for the fit out, then the available credits 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: 1. Option 1 – Use of a tenancy lease agreement between the developer and tenant/s (full value of available credits) 2. Option 2 – A Green Building Guide for tenant fit outs (half the value of the available credits)

Ref	Terms	Description
		3. Option 3 – Developer/Tenant collaboration (full value of available credits) Refer to the Scope of BREEAM 2011 New Construction section of this scheme document (section 2) for further description of the above options.
CN4	Industrial buildings without offices & with untreated operational areas See criterion 1	This issue will be filtered from the scope of assessment for industrial units designed without offices and where the operational area will be untreated, i.e. not designed to be air-conditioned or contain a cold storage facility with refrigeration plant.
CN5	Solid refrigerant See criteria 2, 3 & 4	Systems using solid refrigerants are likely to meet the above requirements by default as no or very little refrigerant will escape to the atmosphere in the event of system failure and leakage. Where this is confirmed by the project's mechanical and electrical engineer (or refrigeration system manufacturer) via the relevant sectoral release factors, the three available credits can be awarded without the need for a calculation.
CN6	Leak detection and pump down See criteria 5,6,7,8 & 9	The refrigerant leak detection and pump down criteria are still applicable in instances where any type of non-solid refrigerant is present, i.e. even if the refrigerant meets BREEAM's DELC CO_{2e} benchmark(s). Exceptions to this are systems that use natural and environmentally benign refrigerants, such as air and water (for example lithium bromide/water absorption chillers) and installations of small multiple hermetic systems, where the refrigerant charge in each unit is less than 5kg (as outlined above).
CN7	CO_2 as a refrigerant See criteria 2, 3 & 4	Where CO_2 is used as a refrigerant and the design team confirm the system/installation complies with the requirements of BS EN 378:2008[2] and the Institute of Refrigeration Carbon Dioxide as a Refrigerant Code of Practice[3], compliance with the refrigerant recovery system criteria is not required (criteria 6 & 7).
CN8	Ammonia as a refrigerant See criteria 2, 3 & 4	Where ammonia is used as a refrigerant, the refrigerant recovery system credit/requirements can be awarded/met without the need for a recovery system, provided that the design team confirm the system/installation complies with the requirements of BS EN 378:2008 and the Institute of Refrigeration Ammonia Refrigeration Systems Code of Practice[4]
CN9	High-risk	High-risk parts of refrigeration plant typically include the pipe

Ref	Terms	Description
	parts See criterion 5	work/pipe joints connected and close to the compressor. Evaporator or condenser coils can be omitted from the coverage of the system.
CN10	Manual refrigerant recovery system	The provision of any manual system, including manual storage cylinders on site, does not comply with the criteria.

Schedule of Evidence

Ref	Design stage	Post-construction stage
1	Documentary evidence confirming the absence of refrigerant in the development	As design stage, plus assessor's building/site inspection and or as built drawings confirming the presence of compliant refrigeration plant, or absence of plant.
2 - 9	A copy of the specification clause or letter from the M&E engineer/system manufacturer confirming relevant refrigeration type and system information. A completed copy of the BREEAM Pol 01 Calculator.	

Additional Information

Relevant definitions

Direct Effect Life Cycle (DELC) Carbon Dioxide Equivalent

A measure of the effect on global warming arising from emissions of refrigerant (in the case of this BREEAM assessment issue) from the equipment to the atmosphere over its lifetime (units: kgCO_2eq.). The calculation involves estimating the total refrigerant release over the period of operation and subsequent conversion to an equivalent mass of CO_2. Should the system use several different refrigerants, e.g. a primary refrigerant and a secondary coolant, or a cascade system, individual calculations will have to be made for all refrigerants which may contribute to the direct effect (see below for a description of how DELC is calculated)

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).

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 leak detection

An automated permanently installed multi-point sensing system, designed to continuously monitor the atmosphere in the vicinity of refrigeration equipment and, in the event of detection, raise an alarm. The system may be aspirated or have multiple sensor heads linked to a central alarm unit or BMS. Various sensor types are available including infra-red, semi-conductor or electro-chemical.

Refrigerant recovery

The process of removing refrigerant from a system and storing it in an airtight container.

Refrigerant pump down

The specification of automatic refrigerant pump down can further limit potential losses and damage to the environment and have subsequent economic benefits to the building owner. Under the United Kingdom 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.

Global Warming Potential GWP

GWP is defined as the potential for global warming that a chemical has relative to 1 unit of carbon dioxide, the primary greenhouse gas. In determining the GWP of the refrigerant, the Intergovernmental Panel on Climate Change (IPCC) methodology using a 100-year Integrated Time Horizon (or ITH) should be applied.

Refrigerant

There are three main make-ups of refrigerants:

1. Hydrogenated Fluorocarbon Refrigerants (HFCs) are made up of hydrogen, fluorine, and carbon. Because they do not use a chlorine atom (which is used in most refrigerants) they are known to be one of the least damaging to our ozone.
2. Hydrogenated Chlorofluorocarbon Refrigerants (HCFCs) are made up of hydrogen, chlorine, fluorine, and carbon. These refrigerants contain minimal amounts of chlorine; they are not as detrimental to the environment as some other refrigerants.
3. Chlorofluorocarbon Refrigerants (CFCs) contain chlorine, fluorine and carbon. These refrigerants carry high amounts of chlorine so they are known for being the most hazardous to the ozone layer.

The use of CFCs and HCFCs as refrigerants has been addressed under the Montreal protocol. Phase out programmes have been agreed resulting in these substances no longer being used as refrigerants in all new 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.

The United Nations Environment Programme (UNEP) hosts a HCFC Help Centre which contains information about the management and phase out of HCFCs and alternatives to HCFCs in the refrigeration and air conditioning sector http://www.uneptie.org/ozonaction/topics/hcfc.asp

Checklists and Tables

Table - 33: List of some common refrigerant types with low GWP

R-Number	Chemical name	GWP 100-yr
R-30	Dichloromethane	8.7
R-170	Ethane	5.5
R-290	Propane	3.3
R-600	Butane	4
R-600a	Isobutane	3
R-702	Hydrogen	5.8
R-717	Ammonia	0
R-718	Water	0.2 ±0.2
R-729	Air (Nitrogen, oxygen, argon)	1
R-744	Carbon dioxide	1
R1216	Ethylene	3.7
R-1234yf	2,3,3,3-Tetrafluoropropene	4
R-1270	Propylene	1.8
Source: The United Nations Environment Programme (UNEP) '2006 Report of the Refrigeration, Air conditioning and Heat Pumps Technical Options Committee' (page 32-34): http://ozone.unep.org/teap/Reports/RTOC/index.shtml Appendix A of the Department of Trade and Industry guidance 'Refrigerant and Air Conditioning CFC and HCFC Phase Out: Advice on Alternatives and Guidelines for Users' http://www.berr.gov.uk/files/file29101.pdf		

Calculation procedures

The Direct Effect Life Cycle CO_{2e} emissions (DELC) per kW of cooling capacity are calculated using the following equation:

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

Where:

Refrigerant loss operational: $(Ref_{charge} \times Sys_{op\text{-}life} \times (L1 + L2 + S1 + S2)) / 100$

Refrigerant loss system retirement = $Ref_{charge} \times (1 - Ref_{RecEff}/100)$

Where:

1. Ref_{charge}: Refrigerant charge
2. $Sys_{op-life}$: System operational lifetime (years) - use default value of 10 years
3. Ref_{RecEff}: Refrigerant Recovery Efficiency factor (%)
4. L1: Annual Leakage Rate (units: % refrigerant charge)
5. L2: Annual Purge Release factor (% Refrigerant charge)
6. S1: Annual Service Release (% Refrigerant charge)
7. S2: Probability factor for catastrophic failure (% refrigerant charge loss/year)
8. GWP: Global Warming Potential of refrigerant
9. Cooling capacity (kW)

With the exception of system operational life, which is a fixed default for the purpose of the BREEAM assessment, the information above should be sourced from the design team's mechanical and electrical engineer and/or system manufacturer. The following default values can be used, where system specific data is not available:

1. Annual service release: 0.25%
2. Probability factor for catastrophic failure: 1% (based on a failure rate of 1 in 100 systems)
3. Annual leakage rate: see Table - 34

Table - 34: Average annual leakage rates for the UK

System type	Annual leakage rate (% of charge per annum)
Cold storage and display systems	
Integral cabinets	3%
Split/condensing units	18%
Centralised	19%
Air conditioning systems	
Unitary split	16%
Chillers	10%
Heat pumps	6%
These figures are based on those reported in Table 2 of the Market Transformation Programmes Briefing Note for Commercial Refrigeration no. 36, 'Direct Emission of Refrigerant Gases', (version 1.2). The figures are based on the average of the leakage rates from the four separate studies reported in Table 2 (where a range is reported the higher value was used).	

Other information

The formula used to calculate the Direct Effect Life Cycle CO_{2e} emissions in BREEAM is based on the Total Equivalent Warming Impact (TEWI) calculation method for new stationary refrigeration and air conditioning systems. TEWI is a measure of the global warming impact of equipment that takes into account both direct emissions (as assessed in this BREEAM issue) and indirect emissions produced through the energy consumed in operating the equipment (which is assessed in the BREEAM energy section).

Refer to BS EN 378-1[5] and the British Refrigeration Association's (BRA) Guideline Methods of Calculating TEWI[6] for further detail. The BRA publication also includes sectoral release factors for new systems designed to best practice standards.

REAL Zero

The refrigeration and air-conditioning sector supported by the Carbon Trust is working across all sectors of business and industry, to help achieve significant reductions in carbon emissions due to refrigerant leakage from installed systems. The Institute of Refrigeration led initiative, Real Zero, is building a clearer understanding of where and why leakage occurs as well as how to prevent it.

For further information including guidance notes, calculators/tools and case study information visit: www.realzero.org.uk

Ozone Depleting Potential refrigerants

Both CFC's and HCFC's are now tightly controlled or due to be phased out in the foreseeable future in all signatory countries to the Montreal Protocol on Substances That Deplete the Ozone Layer, BREEAM only recognises refrigerants that have an ODP of zero. Table - 35 gives current ODP figures for a range of common refrigerants; assessors should use this to verify the ODP of the specified refrigerant.

Table of refrigerants and their Ozone Depleting Potentials. This table includes available substances that are capable of acting as refrigerants. Substances not on this list should be referred to the BREEAM office so that an appropriate figure can be established.

NOTE: This table omits substances that are not typically used as refrigerants in buildings.

Table - 35: Ozone depleting potential of refrigerants

Refrigerant type	Ozone Depleting Potential
R11 (CFC-11)	1.0
R12 (CFC-12)	1.0
R113 (CFC-113)	0.8
R114 (CFC-114)	1.0
R115 (CFC-115)	0.6
R125 (CFC-125)	0
Halon-1211	3.0
Halon-1301	10.0
Halon-2402	6.0
Ammonia	0
R22 (HCFC-22)	0.05

Refrigerant type	Ozone Depleting Potential
R123 (HCFC-123)	0.02
R134a(HFC-134a)	0
R124 (HCFC-124)	0.02
R124 (HCFC-124)	0.11
C R142b (HCFC-142b)	0.07
R143a (HFC-143a)	0
R32 (HCFC-32)	0
R407C (HFC-407)	0
R152a (HFC-152a)	0
R404A (HFC blend)	0
R410A (HFC blend)	0
R413A (HFC blend)	0
R417A (HFC blend)	0
R500 (CFC/HFC)	0.74
R502 (HCFC/CFC)	0.33
R507 (HFC azeotrope)	0
R290 (HC290 propane)	0
R600 (HC600 butane)	0
R600a (HC600a isobutane)	0
R290/R170 (HC290/HC170)	0
R1270 (HC1270 propene)	0

Leak detection systems/devices

1. Handheld detectors (which include semi-conductor and corona discharge types) do not comply with BREEAM criteria.

2. Corona discharge detectors are not suitable where flammable refrigerants are used, or in potentially explosive atmospheres.
3. 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.
4. 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.
5. Electronic leak detectors: these must be designed to detect a certain type of, or multiple types of, refrigerant, i.e. CFC, HFC, HCFC, etc.
6. 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).
7. 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) are now commercially available.

---

[1] www.eca.gov.uk
[2] BS EN 378:2008 Refrigerating systems and heat pumps. Safety and environmental requirements, BSI.
[3] Carbon Dioxide as a Refrigeration Code of Practice, Institute of Refrigeration, 2009.
[4] Ammonia Refrigeration Systems Code of Practice, Institute of Refrigeration, 2009.
[5] BS EN 378-1 Refrigerating systems and heat pumps - Safety and environmental requirements Part 1: Basic requirements, definitions, classification and selection criteria. BSi, 2008
[6] Guideline Methods of Calculating TEWI Issue 2, (2006), BRA Specification.

Pol 02 NO_x emissions

Number of credits available	Minimum standards
Building type dependent	No

Aim

To encourage the supply of heat from a system that minimises NO_x emissions, and therefore reduces pollution of the local environment.

Assessment Criteria

The following is required to demonstrate compliance:

1. Where the plant installed to meet the building's delivered heating demand has, under normal operating conditions, a dry NO_x emission level (measured at 0% excessO_2) as follows:

Building types and emission levels	Credits
Court, office, retail and other building types	
≤ 100 mg/kWh (space heating)	1 credit
≤ 70 mg/kWh (space heating)	2 credits
≤ 40 mg/kWh (space heating)	3 credits
Education, healthcare, multi-residential, prison building types	
≤ 100 mg/kWh (space heating)	1 credit
≤ 70 mg/kWh (space heating)	2 credits
≤ 40 mg/kWh (space heating) ≤ 100 mg/kWh (water heating)	3 credits
Industrial buildings	
Office and associated areas 70 mg/kWh (space heating)	≤ 1 credit
Office and associated areas (space heating) 70 mg/kWh	≤ 1 credit

2. Report via the BREEAM scoring and reporting tool the direct and indirect NOx emissions in mg/kWh and energy consumption in kWh/m^2/yr from meeting the building's heating, cooling

and hot water demands.

Compliance Notes

Ref	Terms	Description
CN1	New build extensions to existing buildings	If the heating demand for the new extension is being met by an existing system, then the NO_x emission level for the existing system must be assessed against the criteria of this issue.
CN2	Shell only	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 be demonstrated via one of the following means in shell only buildings/areas: 1. Option 1 – Use of a tenancy lease agreement between the developer and tenant/s (full value of available credits) 2. Option 2 – A Green Building Guide for tenant fit outs (half the value of the available credits) 3. Option 3 – Developer/Tenant collaboration (full value of available credits) Refer to Appendix D – BREEAM New Construction and shell and core/speculative assessments of this Scheme Document for further description of the above options.
CN3	Multi-residential developments with CSH assessed dwellings	For buildings with self-contained dwellings also being assessed under the Code for Sustainable Homes (CSH), the following applies: If the heating/cooling/hot water system, and therefore NO_x emissions, used to demonstrate compliance in the CSH assessment for the self contained dwellings, is of the same specification as that used to provide heating for the other residential/communal areas of the building, the credits achieved, and information demonstrating compliance for CSH issue Pol 2 can be used for the purpose of the assessment and compliance of BREEAM issue Pol 02. If separate systems are used, then data/information from the CSH assessment can be used in part to demonstrate compliance. To demonstrate full compliance the NO_x emissions from the heating system used to serve the parts of the building not falling within the scope of the CSH assessment will need to be factored in to the assessment.
CN4	Industrial buildings, no office area	Where the assessed building is designed without an office area, the first credit does not apply. One credit is therefore available where compliance with the operational area benchmark is met. Where there is no office area and no heating in the operational area, this issue does not require assessment.
CN5	Untreated operational	Where the operational area of the assessed building is designed to be untreated, the second credit does not apply. One credit is there-

Ref	Terms	Description
	area in industrial buildings	fore available where compliance with the office area benchmark is met. Where there is no office area and no heating in the operational area, this issue does not require assessment.
CN6	Highly insulated building	Where the heating load for a highly insulated building is less than or equal to 7% of the heat load for a Building Regulations compliant building of the same size and type, one credit can be awarded regardless of the NO_x emission level. Figures used for calculations of the percentage of total heat demand must be based on the output from approved energy modelling software.
CN7	NO_x data provided in different units	Where NO_x data is provided in different units or at a level of excess oxygen greater than zero, the manufacturer/supplier will need to be asked to convert this to comply with the BREEAM criteria. Alternatively, the assessor may adjust the figure using the relevant correction factors provided in the Additional Information section.
CN8	Grid electricity	Where electricity used by the heating system is sourced from a zero emission renewable source such as PVs, wind etc, there are no resulting emissions. This source of heating can therefore be counted as having zero NO_x emissions.
CN9	Heat pumps	Heat pumps powered by grid electricity are likely to indirectly produce emission rates higher than those required by BREEAM and are therefore typically unable to achieve any credits under this issue. However, there is a formula for determining NO_x emissions from heat pumps in the Additional Information section below. Please note, the energy saved by using certain types of heat pumps is recognised in BREEAM issue Ene 01 and Ene 04.
CN10	District heating	District heating systems that incinerate waste usually have NO_x emission rates higher than the levels set to achieve any BREEAM credits.
CN11	Heat recovery	Heat recovery can be considered as having zero NO_x emissions for the purpose of this issue.
CN12	Open flues	No credits may be awarded for open flue heating or hot water systems.
CN13	Combined Heat & Power	Refer to the additional guidance section for guidance on calculating NO_x emission levels from CHP.
CN14	Biomass	Biomass systems are recognised as reducing the impact of fossil fuel depletion, by employing a renewable fuel source (provided it is sustainably sourced). However, biomass can produce a significant amount of NO_x and so may not achieve this credit. They may, however, gain recognition in the energy section of BREEAM.

Ref	Terms	Description
CN15	Water heating benchmark and point of use heaters	The benchmark requirement for water heating is intended to apply only to buildings with a large demand for hot water (and therefore a substantial proportion of NO_x emissions resulting from hot water heating). Where building types required to assess NO_x emissions from water heating do not have a large demand for hot water and as a result they are installing point-of-use electric hot water heaters only (grid sourced electricity), such installations may be exempt from the water heating NO_x emissions requirement. This is on the provision that the design team (M&E engineer) confirm that energy demand for electric hot water heating is less than 10% of total energy demand for space and hot water heating.
CN16	More than one heating system	Where more than one heating system is specified refer to the Additional Information section for guidance on calculating NO_x emission levels.
CN17	Green Tariff	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.
CN18	Assessment and reporting of a buildings NOx emissions from cooling	At present the Pol02 issue does not benchmark and award credits for NOx emission levels associated with a buildings cooling demands. To facilitate possible future benchmarking of this kind and alignment with European Standards on the Sustainability of Construction Works, BREEAM does require, as a condition of achieving any credits for this issue, the reporting of both direct and indirect NO_x emissions resulting from meeting the buildings heating, cooling and hot water demands. In the case of indirect emissions, this refers primarily to emissions associated with grid electricity, where grid electricity is a/the source of energy for the building's heating, cooling and/or hot water demands. Direct NO_x emissions are those resulting from the burning of fuel on site or in the assessed building to meet heating, cooling and/or hot water demands, for example via a gas/oil fired/biomass boiler.
CN19	Other building type: Residential institutions	When assessing a building defined by the scope of BREEAM as an 'Other - Residential Institution', apply the NO_x emission benchmarks for a multi-residential building type (and not the 'other building type' benchmarks). This guidance applies in particular to hotels, hostels, boarding and guest houses, secure training center, residential training center.

Schedule of Evidence

Ref	Design stage	Post-construction stage
All	Relevant section/clauses of the building specification or contract. Manufacturer's product details. Calculations from the project team. Where relevant for multi residential buildings: Evidence in line with the Design Stage evidence requirements of the CSH Issue Pol 2 OR A copy of the Design Stage CSH certificate and report from the CSH online reporting system confirming the number of credits achieved for CSH Issue Pol 2.	Confirmation from the project team that there have been no changes to the specification and updated calculations where necessary. BREEAM Assessor's site inspection report and photographic evidence Where relevant for multi-residential buildings: Evidence in line with the Post Construction Stage evidence requirements of the CSH Issue Pol 2. OR A copy of the Post Construction Stage CSH certificate and report from the CSH online reporting system confirming the number of credits achieved for CSH Issue Pol 2.

Additional Information

Relevant definitions

Approved energy modelling software

Refer to BREEAM issue Ene 01 Reduction of emissions.

Appropriate statutory body

Refer to the definition in credit LE 02 Ecological value of site and protection of ecological features.

NO_x emissions

NO_x emissions are pollutant gases produced by the combustion of fossil fuels. NO_x reacts with heat and sunlight to produce ozone that can cause serious respiratory problems. It also reacts with water to produce acid rain which has a detrimental effect on ecosystems.

Dry NO_x Levels

The NO_x emissions (mg/kWh) resulting from the combustion of a fuel at 0% excess oxygen levels.

Conversion factors

Manufacturers should be asked to supply dry NO_x 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^3 or wet NO_x.

It should be noted that these conversion factors assume worst case efficiencies and are likely to give conservative answers. This could have the effect of lowering the number of credits achieved.

1. Figures in mg/m^3 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).
2. 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)
3. Figures in mg/MJ should be multiplied 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).
4. This Issue's criteria are based on dry NO_x values – almost all manufacturers will quote emissions in dry NO_x. However if wet NO_x figures are supplied, these should be converted to dry NO_x. This can be done by multiplying the wet NO_x figure by 1.75.

Excess Oxygen Correction

If a NO_x emission rate is quoted by the manufacturer in mg/m^3 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_x. 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_2	Conversion (c)
3%	x 1.17
6%	x 1.40
15%	x 3.54

Checklists and Tables

None

Calculation procedures

Calculating NO_x emission levels from Combined Heat & Power (CHP) systems

Where CHP systems are specified, it is only necessary to consider the heat related NO_x emissions for the assessment of this issue.

NO_x emissions are allocated to heat and electricity in line with the respective power outputs. A NO_x emission rate equivalent to the current rate for grid electricity should be assumed for the electrical output (i.e.750 mg/kWh supplied), and the remaining NO_x should be allocated to the heat output. Only the heat-related component is then compared with the benchmark scale. The following formula should be used to determine this:

X = (A - B)/C

Where:

Term	Description
X	NO_x emissions per unit of heat supplied (mg/kWh heat)
A	NO_x emissions per unit of electricity generated (mg/kWh^{elec}) i.e. the NO_x emitted by the CHP system per unit of electricity generated. This figure

Term	Description
	should be obtained from the installer/supplier of the system
B	NO_x emissions per unit of electricity supplied from the grid (mg/kWh^{elec}) this should be assumed to be 750mg/kWh
C	Heat to Electricity Ratio of the CHP scheme

The above methodology determines the net NO_x emissions from CHP-generated electricity compared with central generation of electricity and allocates this amount to the heat production. Where x is calculated to be negative, it should be assumed to be zero.

Calculating the average NO_x emission levels from multiple systems

Where the CHP or other heating system type operates in conjunction with another system, an average NO_x emission rate should be used based on the ratio of power outputs from each source, i.e. multiply the emissions of each system 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 for such cases:

$$Average\ \ NO_X = (N_1 \times (H_1 / H_T) + N_2 \times (H_2 / H_T)) \ldots + (N_n \times (H_n / H_T))$$

Where:

Term	Description
N_1	NO_x emissions rate for source 1
N_2	NO_x emissions rate for source 2
N_n	NO_x emissions rate for source n
H_T	Total heat output from all sources
H_1	Heat output from source 1
H_2	Heat output from source 2
H_n	Heat output from source n

Calculating NO_x emission levels from heat pumps

For the purpose of assessing this BREEAM issue, either of the formulas below can be used to determine the contributing NO_x emissions from a heat pump:

$$M_{Heat} = \frac{M_{Elec} \times W_{Elec}}{W_{Heat}} \quad OR \quad M_{Heat} = \frac{M_{Elec}}{EER}$$

Where:

Term	Description
M_{Heat}	NO_x emission per unit of heat generated in mg/kWh_{Heat}
M_{Elec}	NO_x emissions from UK grid electricity mg/kWh, this should be assumed to be $750mg/kWh_{Elec}$
W_{Elect}	Total quantity of electricity consumed by heat pump kWh_{Elec}
W_{Heat}	Total quantity of heat or coolth produced by heat pump kWh_{Heat}
EER	Energy Efficiency Ratio (also referred to as Co-efficient of Performance)

Other information

None

Pol 03 Surface water run off

Number of credits available	Minimum standards
5	No

Aim

To avoid, reduce and delay the discharge of rainfall to public sewers and watercourses, therefore minimising the risk of localised flooding on and off site, watercourse pollution and other environmental damage.

Assessment Criteria

This issue is split into three parts;

- Flood risk - (1-2 credits)
- Surface water run off - (2 credits)
- Minimising water course pollution - (1 credit)

Flood risk

Two credits

1. Where the assessed development is situated in a flood zone that is defined by the relevant planning, policy and technical guidance documents, as having a low annual probability of flooding.
2. A site specific Flood Risk Assessment (FRA) confirms that there is a low risk of flooding from all sources.

One credit

3. Where the assessed development is situated in a flood zone that is defined by the relevant planning, policy and technical guidance documents, as having a medium or high annual probability of flooding and is not within the Functional Floodplain AND
4. A site specific Flood Risk Assessment (FRA) confirms to the satisfaction of the local authority andstatutory body that the development is appropriately flood resilient and resistant from all sources of flooding AND
5. The ground level of the building and access to both the building and the site, are designed (or zoned) so they are at least 600mm above the design flood level of the flood zone in which the assessed development is located (see Compliance notes for further guidance).

Surface water run off

Pre-requisite

6. An appropriate consultant is appointed to carry out, demonstrate and/or confirm the following criteria:

One credit

7. Where drainage measures are specified to ensure that the peak rate of run-off from the site to the watercourses (natural or municipal) is no greater for the developed site than it was for the pre-development site. This should comply at the 1 year and 100 year return period events.

8. Calculations include an allowance for climate change; this should be made in accordance with current best practice planning guidance.

One credit

9. Where flooding of property will not occur in the event of local drainage system failure (caused either by extreme rainfall or a lack of maintenance) AND

EITHER

10. The post development run-off volume, over the development lifetime, is no greater than it would have been prior to the assessed site's development.
11. Any additional predicted volume of run-off for the 100 year 6 hour event must be prevented from leaving the site by using infiltration or other SuDS techniques

OR (only where criterion no. 11 for this credit cannot be achieved)

12. Justification from the Appropriate Consultant indicating why the above criteria cannot be achieved i.e. where infiltration or other SuDS techniques are not technically viable options.
13. The post development peak rate of run-off is reduced to a limiting discharge. The limiting discharge is defined as the following and the option with the highest flow rate must be achieved;
    a. The pre development 1-year peak flow rate OR
    b. The mean annual flow rate Qbar OR
    c. 2l/s/ha

    Note that for the 1-year peak flow rate the 1 year return period event criterion applies (as described in the peak run off criteria above).

14. For either option above calculations must include an allowance for climate change; this should be made in accordance with current best practice planning guidance.

Minimising water course pollution

One credit

15. The AppropriateConsultant confirms that there is no discharge from the developed site for rainfall up to 5mm.
16. Specification of Sustainable Drainage Systems (SUDs) or source control systems such as permeable surfaces or infiltration trenches where run-off drains are in areas with a relatively low risk source of watercourse pollution.
17. Specification of oil/petrol separators (or equivalent system) in surface water drainage systems, where there is a high risk of contamination or spillage of substances such as petrol and oil (see Compliance notes for a list of areas).
18. All water pollution prevention systems have been designed and detailed in accordance with the recommendations of Pollution Prevention Guideline 3[1] and where applicable the SUDS manual[2]
19. A comprehensive and up-to-date drainage plan of the site will be made available for the building/site occupiers.
20. Where the building has chemical/liquid gas storage areas, shut-off valves are fitted to the site drainage system to prevent the escape of chemicals to natural watercourses (in the event of a spillage or bunding failure).
21. Where present, all external storage and delivery areas designed and detailed in accordance with .the recommendations of the Environment Agency's publication Pollution Prevention Pays Guidance[3] and, if relevant to the building type, PPG25 Hospitals and Healthcare establishments.[4]

Compliance Notes

Ref	Terms	Description
General		
CN1	Multi-residential developments with CSH assessed dwellings	For buildings with self-contained dwellings also being assessed under the Code for Sustainable Homes (CSH), the following applies: Where credits have been assessed and awarded for CSH issues Sur 1 (additional SUDS credit) and Sur 2 (Flood risk credits), the equivalent BREEAM credits may be awarded, provided that compliance can be demonstrated for the whole site. Compliance with issue Sur 1 & 2 of the CSH must be in line with the CSH Technical Guide.
CN2	Alternative standards and recommendations from an appropriate statutory body. See criteria 1, 2 & 4	None of the credits can be awarded where the assessed development has proceeded against the recommendation of the statutory body on the basis that the flooding implications are too great (this includes a recommendation given by the statutory body even where such a recommendation cannot or is not statutorily enforced). Where the local authority (or other statutory body) has set more rigorous criteria than those above these must be met in order to achieve the credit.
CN3	Contaminated sites. See criterion 12	Drainage designs for sites must take into account legislation relating to contaminated sites, such as the Water Resources Act 1991, the Environmental Protection Act 1990, the Groundwater Directive (2006/118/EC) and, more recently, the Groundwater (England and Wales) Regulations 2009. Where the site risk assessment confirms that infiltration SuDS techniques are not appropriate, SuDS techniques that do not allow infiltration, such as swales lined with an impermeable membrane, can be used. It may be the case that only some areas of the site are contaminated and therefore infiltration SuDS techniques can be used elsewhere on the site. There may also be a requirement to remediate the contaminated soils, creating opportunities for the use of infiltration SuDS post-remediation.
Flood risk		
CN4	Definition of flood zones and relevant planning policy and technical guidance See criteria 1, 2, 3 & 4	Please refer to Flood zones in the Additional Information section.

Ref	Terms	Description
CN5	Sources of flooding See criteria 2 & 4	If the development is in an area of low flood risk the FRA must demonstrate that there is a low risk of flooding from the following sources: 1. Fluvial (rivers) 2. Tidal 3. Surface water: sheet run-off from adjacent land (urban or rural) 4. Groundwater: most common in low-lying areas underlain by permeable rock (aquifers) 5. Sewers: combined, foul or surface water sewers 6. Reservoirs, canals and other artificial sources
CN6	Functional flood plain See criterion 3	The BREEAM credit for locating in a flood zone of 'medium or high annual probability' cannot be awarded where the building is located in the functional flood plain. PPS25[5] defines the functional flood plain as 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 at BRE Global for guidance on assessing this BREEAM issue.
CN7	Current national planning guidance See criteria 1 & 2	These are current at the time of publication; 1. Planning Policy St atement 25 – England 2. Planning Policy Statement 15 – Northern Ireland 3. Scottish Planning Policy 7 - Scotland 4. Technical Advice Note - Wales
CN8	Environment Agency flood maps See criteria 1, 3 & 5	The Environment Agency flood map and associated information is intended for guidance, and cannot provide details for individual properties. In addition the EA map only covers the likelihood of flooding from the rivers or sea and not all sources of flooding (listed above). On their own, EA flood maps cannot therefore be used as evidence to demonstrate compliance with the assessment criteria.
CN9	Pre-existing flood defences See criteria1, 2, 3 & 4	In an area protected by existing flood defences (designed to withstand a certain magnitude of flooding) the appropriate number of flood risk credits can be awarded where the defences reduce the risk to 'low' or 'medium' and the following conditions are met: 1. The development is not located in an area where new flood defences have to be, or have been, constructed to minimise the risk of flooding to the site and its locality purely for the purpose of the development and/or its wider master plan 2. The development is located on previously developed land (as defined by the criteria in BREEAM issue LE 01 Site selection. 3. The relevant agency confirms that, as a result of such defences, the risk of a flood event occurring is reduced to

Ref	Terms	Description
		low or medium risk. If firm confirmation is not provided then the credit cannot be awarded. 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.
CN10	600mm threshold See criterion 5	It is accepted that, for buildings located in a medium 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. 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. For buildings located in medium or high flood risk zones, any areas used to store sensitive, historical, hazardous, valuable and perishable materials, e.g. radioactive materials, microbiological facilities, server rooms, libraries, etc., must be located above the 600mm threshold.
CN11	Third-party defences See criteria 1, 2, 3 & 4	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 such embankments will remain in place for the lifetime of the development, unless the assessor or project team have reason to believe otherwise. For walls, assurance must be sought that the wall is likely to remain for the design life of the building.
CN12	Level of detail required in the FRA for smaller sites See criteria 2 & 4	For smaller sites e.g. less than 1 ha (10,000m^2), the level of detail required in an acceptable FRA will depend on the size of the site and the arrangement of buildings on that site. For a small site with a relatively simple arrangement of buildings this might consist of a brief report. For larger sites with a higher density of buildings a more detailed assessment would be appropriate. For small simple sites (2000m^2 and less), an acceptable FRA could be a brief report carried out by the contractor's engineer confirming the risk of flooding from all sources of flooding, including information obtained from the Environment Agency, water company/sewerage undertaker, other relevant statutory authorities, site investigation and local knowledge.
CN13	Areas that historically have a low	For developments in areas that historically have a low risk of flooding (e.g. desert/mountain regions), may still experience a

Ref	Terms	Description
	flood risk	significant risk of infrequent flash flooding. The level of detail required in an acceptable flood risk assessment will vary. This could range from a brief report for developments in Köppen climate zone B (arid), to a more detailed assessment for a development in climate zone C (warm temperate). For example, a development in climate zone B or E, an acceptable FRA could be a brief report carried out by the design team confirming the risk of flooding from all sources of flooding, including information obtained from the local authority/statutory body, site investigation, and local knowledge.
Surface water run off		
CN14	Sites with many buildings See criteria 7, 10,11 & 13	Where the assessed building is part of a larger development of buildings, there are a number of options for assessment of the surface water run-off credits: 1. The individual building can be assessed independently where the run-off is being dealt with on a building by building basis (i.e. each building has its own dedicated sub-catchment that serves only that building). 2. Where assessing the run-off from a number of buildings (including Code for Sustainable Homes andBREEAM assessed buildings) the assessment must take into account the drainage from the local sub-catchment serving all those dwellings/buildings. Note that proportioning cannot be used to calculate the percentage of run-off discharging into the local sub-catchment resulting from just the assessed building. 3. Alternatively the whole development can be assessed for compliance. Whichever approach is taken to demonstrate compliance, it must be consistent when completing both the rate of run-off and volume of run-off calculations.
CN15	Calculating peak rate of run-off See criteria 7 &13	Key publications that should be referred to for guidance on calculating the peak rate of run-off include; 1. The SuDS Manual 2. Preliminary rainfall runoff management for developments [6] 3. Development and Flood Risk, Planning Policy Statement 25 (or where available equivalent national planning policy guidance/statement) along with the latest version of the practice guide. 4. IH Report 124, Flood estimation for small catchments (Marshall and Bayliss, 1994)[7] 5. Flood Estimation Handbook (Centre for Ecology & Hydrology, 1999)[8] The assessor is not required to perform any calculation as this should be provided by the appropriate consultant to demonstrate that they have sized the drainage facilities

Ref	Terms	Description
		appropriately. Further guidance on calculating peak rate run-off for different sites and situations can be found in the Additional Information section for this issue.
CN16	Discharge to the sea or estuaries See criteria 7, 10, 11 & 13	The peak rate of run off and volume run off criteria can be deemed to be met by default if the site discharges rainwater directly to a tidal estuary or the sea.
CN17	No change in impermeable area See criteria 7 &13	Where the impermeable area draining to the watercourse (natural or municipal) has decreased or remains unchanged post-development, the peak and volume rate of run-off requirements for the surface water run off credits will be met by default. Flow rate calculations will not need to be provided. Instead, drawings clearly showing the impermeable areas of the site draining to the watercourse should be provided for the pre- and post-development scenarios. Figures must also be given (ideally on the drawings) to show a comparison between the areas of drained impermeable surfaces pre- and post-development. In this instance a Flood Risk Assessment must be carried out and any opportunities identified to reduce surface water run-off are implemented.
CN18	Discharge point - blockages	For the surface water run off credits, where the limiting discharge flow rate would require a flow rate of less than 5 l/s at a discharge point, a flow rate of up to 5 l/s may be used where required to reduce the risk of blockage. Discharge points are points of discharge into rivers, streams, ditches, drains, cuts, culverts, dykes, sluices, sewers and passages through which water flows.
CN19	Designing for system failure See criterion 9	CIRIA publication C635 (2006) Designing for exceedence in urban drainage – good practice [9] should be referred to for guidance.
CN20	Highways and impermeable areas See criteria 7 &13	Where new non-adoptable highways are built, including those for developments with a mixture of buildings, all of the new impermeable surfaces must be included in calculations to demonstrate compliance with the peak rate of run-off and volume of run-off criteria. Where buildings are built beside existing highways or where adoptable highways are built, the impermeable area of the highway does not need to be included in the calculations.
CN21	Derelict sites See criteria 7, 10,11 &	If the site has been derelict for over five years, the Appropriate Consultant must assess the previous drainage network and

Ref	Terms	Description
	13	make reasonable assumptions to establish probable flow rates and volumes. The Wallingford Procedure Modified Rational Method should be used. To complete the calculations, a site visit prior to development will be required unless accurate data already exist from a previous survey. The resultant professional report can then be used to determine the pre-development volumes and rates of run-off. Without this professional input, the site must be deemed greenfield pre-development, assuming Soil Type 5 for the calculation of the pre-development site run-off.
CN22	Using computer software	Reputable computer drainage software can be used to demonstrate compliance. However, where hydrograph tables are provided as output, the relevant calculations should be highlighted.
CN23	Rainwater harvesting	BS 8515 Rainwater harvesting systems: Code of Practice, Annex A[10] should be followed where rainwater harvesting systems are specified for stormwater control. To ensure flood risk is not increased if the rainwater harvesting system is, for some reason, unavailable, the exceedance flow route capacity provided in accordance with CIRIA report C635 should ignore the beneficial effect of the rainwater harvesting system.
Watercourse pollution		
CN24	5mm discharge for minimising watercourse pollution See criterion 15	A range of SuDS techniques can be used to prevent discharge from the site for rainfall depths of up to 5 mm, however, end-of-pipe solutions, such as ponds and basins, will only be deemed to comply where the principal run-off control to prevent discharge from the first 5 mm of a rainfall event, is achieved using source control and site control methods. Green roofs can be deemed to comply with this requirement for the rain that falls onto their surface. However evidence is still required to demonstrate that the 5 mm rainfall from all other hard surfaces on site is being dealt with, to allow this credit to be awarded
CN25	Extensions to existing buildings	For the minimising water course pollution credit please refer to the Compliance note below regarding 'infill building on an existing site'.
CN26	Areas that are a source of pollution See criteria 17 & 18	For the purpose of assessing the watercourse pollution credit, an area that presents a risk of watercourse pollution includes vehicle manoeuvring areas, car parks, waste disposal facilities, delivery and storage facilities or plant areas.
CN27	Areas where oil	For the purpose of assessing the watercourse pollution credit,

Ref	Terms	Description
	separators are required See criteria 17 & 18	Pollution Prevention Guide 3 Use and design of oil separators in surface water drainage systems (2006) defines the type of areas on a development where separators are required. PPG3 is produced on behalf of the Environment and Heritage Service (Northern Ireland), Scottish Environment Protection Agency and Environment Agency (England and Wales). 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. Refer to PPG3 for additional guidance.
CN28	Infill building on existing site	Where the assessment is of an individual building on an existing site, i.e. infill development, the watercourse pollution criteria apply to areas within the construction zone that present a risk of pollution, as well as any areas external to the construction zone that are affected by the new works i.e. drainage onto or from the proposed development.
CN29	Suitable level of treatment See criteria 16 to 21	In all cases the assessor should determine the operational use of the site in order to determine if the proposed strategy for minimising watercourse pollution is suitable.
CN30	Roof plant See criteria 17,18 & 20	Roof top plant space must be considered where there is a risk from substances such as petrol or oil. Refrigerants are not assessed under the pollution aspect of this issue, as the only risk of pollution is to air and not the watercourse.
CN31	Permeable paving system See criteria 16 & 18	Where it can be demonstrated that a permeable paving system designed to retain silts and degrade oils has been used, then this will meet the assessment criteria for minimising water-course pollution for car parks and access roads.
CN32	Drainage plan See criterion 19	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.

Schedule of Evidence

Ref	Design stage	Post-construction stage
Flood risk credits		
1-5	Flood risk assessment Design drawings	Flood risk assessment updated as necessary.

Ref	Design stage	Post-construction stage
	Where appropriate, correspondence from the appropriate statutory body confirming reduced annual probability of flooding due to existing flood defences. Where relevant for multi residential buildings: Evidence in line with the Design or Post Construction Stage requirements of the CSH Issue Sur 2 or certificate demonstrating compliance.	'As built' drawings Confirmation that the basis of the Flood Risk Assessment has not changed where more than five years have passed since the Flood Risk Assessment was carried out. Where relevant for multi residential buildings: Evidence in line with the Post Construction Stage requirements of the CSH Issue Sur 2 or certificate demonstrating compliance
Surface water run off credits		
6-14	Statement from the appropriate consultant confirming that they are qualified in line with the BREEAM definition. Consultants report containing all information necessary to demonstrate compliance including. 1. Type and storage volume (l) of the drainage measures 2. Total area of hard surfaces (m^2) 3. Peak/Volume flow rates (l/s) pre and post development for the return period events 4. Additional allowance for climate change designed in to the system 5. Impact on the building of flooding from local drainage system failure Where relevant for multi residential buildings: Evidence in line with the Design or Post Construction Stage requirements of the CSH Issue Sur 1 or certificate demonstrating compliance.	Evidence to confirm that maintenance responsibilities have been defined for any SuDS solutions installed. AND EITHER Written confirmation from the developer or appropriate consultant that the solutions assessed at the design stage have been implemented OR Where the design has changed the evidence identified for the design stage assessment is provided for post construction/'as built' details Evidence in line with the Post Construction Stage requirements of the CSH Issue Sur 1 or certificate demonstrating compliance.
Minimising watercourse pollution		
15	The consultants report detailing the design specifications, calculations and drawings to support the 5mm rainfall discharge criteria.	Assessor's building/site inspection and photographic evidence AND EITHER Written confirmation from the developer or appropriate

Ref	Design stage	Post-construction stage
		consultant that the solutions assessed at the design stage have been implemented OR Where the design has changed the evidence identified for the design stage assessment is provided for post construction/'as built' details
16-17 & 20	Design drawings and/or relevant section/clauses of the building specification or contract indicating 1. High and low risk areas of the site 2. Specification of SUDS, source control systems, oil/petrol separators and shut-off valves as appropriate	
18-19 & 21	A letter or other formal correspondence from the project team: 1. Confirming water pollution prevention systems are designed in accordance with PPG3 and the SUDS manual (where appropriate) 2. Outlining indicative examples of compliance with PPG3 and the SUDS manual 3. Confirming a copy of the drainage plan will be produced and handed over to the building occupier. 4. Confirming design of all external storage and delivery areas is in compliance with relevant Pollution Prevention Guidance 5. Outlining indicative examples of compliance with the PPG.	

Additional information

Please note this section will be revised when the National Standards for Sustainable Drainage and associated regulations come into force.

Relevant definitions

Appropriate consultant

A consultant with qualifications and experience relevant to designing SUDS and flood prevention measures and completing peak rate of run-off calculations. Where complex flooding calculations and prevention measures are required, this must be a specialist hydrological engineer.

Appropriate statutory body

This refers to either the Environment Agency in England & Wales, the Environment Agency, Department of the Environment, and the Rivers Agency in Northern Ireland, the Scottish

Environment Protection Agency in Scotland or the local authorities and internal drainage boards.

Catchment

The area contributing surface water flow to a point on a drainage or water course. It can be divided into sub-catchments.

Control devices

Any drainage structure or unit designed to control the runoff of stormwater. Examples of SuDS control devices are check dams within swales and basins, and combined weir/orifice controls for ponds. Examples of traditional control devices are throttles constructed with pipes and vortex controls. The control devices must be capable of regular inspection and maintenance, and the system should be fail-safe so that upstream flooding does not result from blockage or other malfunction. For guidance on control devices, refer to The SuDS manual (CIRIA C697, 2007) and other best practice guidelines.

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.

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) or other appropriate national planning guidance.

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 zones

Flood zones are defined in the relevant planning, policy and technical guidance documents for each country in the UK: PPS25 (England), TAN15 (Wales), SPP7 (Scotland), PPS15 (N. Ireland). Please note, PPS15 does not categorise flood risk zones and there are no similar publicly available flood maps covering Northern Ireland. Assessments in NI will therefore need to rely on site-specific flood risk assessments, or other relevant date/surveys, to determine the extent of flood risk for a specific development, and use the same definitions as those outlined for England (Table - 36). The Northern Ireland Department of Environment or Rivers Agency may offer further advice or recommendations in this respect www.doeni.gov.uk/ and www.riversagencyni.gov.uk/

Whilst the definitions of flood zones and probabilities of flooding are generally the same throughout the UK, there are some differences. The definitions are outlined in Table - 36.

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.

Limiting discharge

The limiting discharge is based upon the calculated pre-development flow rate at a discharge point.

Low risk areas (with respect to watercourse pollution)

Low risk areas can be defined as areas where the risk of contamination or spillage of substances such as petrol and oil is reduced. For the purpose of this credit, roofs and small car parks may be considered as low risk areas.

Peak run-off rate (referred to as Qp [m^3/sec])

This is the highest rate of flow from a defined catchment area assuming that rainfall is uniformly distributed over the drainage area, considering the entire drainage area as a single unit and estimation of flow at the most downstream point only.

Pre-development

The state of the site under assessment immediately prior to purchase of the site by the client/developer (or, where the client has owned/occupied the site for a number of years, its current state).

Qbar

An estimation of the mean annual flood flow rate from a catchment (see Report IH124 Flood estimations for small catchments).

Rainwater discharge

Rainwater discharge is the rainwater which flows from the development site to watercourses and sewers. It is also referred to as run-off.

Run-off

This is usually rainwater, but can also be groundwater or overspill from sewers and other sources.

Sewerage undertaker

This is a Body, typically a water company, with statutory responsibility for sewerage and sewerage disposal and also surface water from roofs and yards of premises.

Soakaways

A 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.

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.

Treatment

Improving the quality of water by physical, chemical and/or biological means.

Types of Oil Separator

Class 1 Separators

These are designed to achieve a concentration of less than 5mg/l oil under standard test conditions. They should be used when the separator is required to remove very small oil droplets, such as those arising from car park run-off.

Class 2 Separators

These are designed to achieve a concentration of less than 100mg/l oil under standard test conditions. They are suitable for dealing with discharges where a lower quality requirement applies and/or for trapping large spillages.

Both classes can be produced as 'full retention' or 'by pass' separators:

Full retention separators

These treat the flow that can be delivered by the drainage system, which is normally equivalent to the flow generated by a rainfall intensity of 50mm/hr.

Bypass separators

These fully treat all flows generated by rainfall rates of up to 5mm/hr. Flows above this rate are allowed to bypass the separator. These separators are used when it is an acceptable risk not to provide full treatment for high flows.

Pollution Prevention Guideline 3 contains more detailed guidance on the selection and sizing of an appropriate type of separator.

Volume of run-off

The volume of run-off that is generated by rainfall occurring on the site. This is typically measured in cubic metres. Additional predicted volume of run-off is the difference between the volumes of run-off pre- and post-development.

Checklists and Tables

Table - 36: Definition of flood zones by country

Definition	England	Wales	Scotland
Low annual probability of flood-ing	Zone 1 Less than 1 in 1000 chance of river and sea flooding (< 0.1%).	Zone A Considered to be at little or no risk. Zone B If site levels are greater than the flood levels used to define adjacent extreme flood outline.	Little or no risk area As defined for England.
Medium annual probability of flood-ing	Zone 2 Between 1 in 100 and 1 in 1000 chance of river flooding (1% – 0.1%) and between a 1 in 200 and 1 in 1000 chance of sea flooding (0.5% – 0.1%).	Zone B If site levels are not greater than the flood levels used to define adjacent extreme flood outline. Zone C Equal to or greater* than 0.1% (river, tidal or coastal flooding). * For the purposes of BREEAM assume upper probability of flooding no greater than that specified for England.	Low to medium risk area Watercourse, tidal or coastal flooding in the range 0.1% – 0.5% (1:1000 – 1:200).
High annual probability of flood-ing	Zone 3a High Probability 1 in 100 or greater chance of river flooding (>1%) and a 1 in 200 or greater chance of flooding from the sea (>0.5%). Zone 3b The Functional Floodplain Land where water has to flow or be stored in times of flood.	Zone C1 & C2 * For the purposes of BREEAM assume the same lower and upper probability of flooding as that specified for England.	Medium to high risk areas Annual probability of watercourse, tidal or coastal flooding: greater than 0.5% (1:200).

Calculation procedures

Calculating peak rate of run-off

Greenfield sites of less than 50 ha

The calculation of greenfield run-off rates must be in accordance with IH Report 124, Flood estimation for small catchments (Marshall and Bayliss, 1994). The pro-rata method on the size of catchment detailed in Table 4.2 in The SuDS Manual, CIRIA C697 (2007) must be followed.

Greenfield sites of 50 ha to 200 ha

The calculation of greenfield run-off rates must be in accordance with IH Report 124, Flood estimation for small catchments (Marshall and Bayliss, 1994). Flood Estimation Handbook (Centre for Ecology &

Hydrology, 1999) can be used for these sites as an alternative, where there is a preference to do so, but only if the catchment is considered to be suitable for its application.

Greenfield sites of more than 200 ha

The calculation of greenfield run-off rates must be in accordance with the Flood Estimation Handbook (Centre for Ecology & Hydrology, 1999) and any subsequent updates. Where the Flood Estimation Handbook is not considered appropriate for the development IH Report 124 can be used.

Brownfield sites

The calculation of brownfield run-off rates should be as follows:

1. If the existing drainage is known then it should be modelled using best practice simulation modelling, to determine the 1 year and 100 year peak flow rates at discharge points (without allowing surcharge of the system above cover levels to drive greater flow rates through the discharge points).
2. If the system is not known, then the Brownfield run-off should be calculated using the greenfield run-off models described above but with a Soil Type 5.

Limiting discharge rate

The limiting discharge for each discharge point should be calculated as the flow rates from the pre-developed site. The calculation should include the total flow rate from the total area of site feeding into the discharge point (this should include both BREEAM assessed and non BREEAM assessed parts of the development, if applicable). The discharge point is defined as the point of discharge into the watercourse/sewers (including rivers, streams, ditches, drains, cuts, culverts, dykes, sluices, public sewers and passages through which water flows, see Definitions). Where this calculation results in a peak flow rate of less than 5 l/s, the limiting discharge rate may be increased up to a level of no more than 5 l/s at the point of discharge from the site to reduce the risk of blockage.

For example, if the flow rate for the 1 year and 100 year events were 4 l/s and 7 l/s respectively, then the limiting discharges would be 5 l/s and 7 l/s. Similarly, if it was calculated to be 2 l/s and 4 l/s, then a maximum of 5 l/s limiting discharge rate could be applied to both discharge points.

Sites should not be subdivided to enable higher overall limiting discharge rates to be claimed. It is, however, recognised that some sites may require more than one discharge point as a result of the local topography or existing surrounding drainage infrastructure, and in such cases the limiting discharge flow rate may be increased to a level no more than 5 l/s at each discharge point. The assessor should seek evidence that the number of discharge points is necessary due to topography and/or infrastructure limitations. Evidence may be in the form of a topographical map and an explanation from the Appropriately Consultant as to why multiple discharge points are required, stating that it is not feasible to have fewer discharge points.

100-year peak rate event: Excess volume of run-off

The storage of excess flows from the 100-year event does not necessarily have to be contained within the drainage system or SuDS features (the features designed solely for the purpose of drainage). Where appropriate, storage of some or all of this volume can be achieved using temporary surface flooding of areas such as a playing field. Specific consideration should be given to overland flow routeing. Overland flood flows and temporary storage of flood water on the surface must not be so frequent as to unreasonably inconvenience residents and other users.

Other information

Sources of flooding and flood risk

1. Streams and Rivers: Flooding that can take place from flows that are not contained within the channel due to high levels of rainfall in the catchment.
2. Coastal or Estuarine: Flooding that can occur from the sea due to a particularly high tide or surge, or combination of both.

3. Groundwater: Where the water table rises to such a height where flooding occurs. Most common in low-lying areas underlain by permeable rock (aquifers), usually due to extended periods of wet weather.
4. Sewers and highway drains: Combined, foul or surface water sewers and highway drains that are temporarily over-loaded due to excessive rainfall or due to blockage.
5. Surface water: The net rainfall falling on a surface (on or off the site) which acts as runoff which has not infiltrated into the ground or entered into a drainage system.
6. Infrastructure failure: Canals, reservoirs, industrial processes, burst water mains, blocked sewers or failed pumping stations.
7. SuDS - sustainable drainage systems: a sequence of management practices and control structures designed to drain surface water in a more sustainable fashion than some conventional techniques. Examples of SuDS devices include:
    a. Holding ponds
    b. Swales
    c. Reed beds
    d. 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.
    e. 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.
    f. Run-off from roofs collected as a part of a rainwater harvesting system.
    g. Run-off from roofs directed to a local soakaway or other holding facility such as tanks, ponds, swales etc.
    h. Green roofs.

    For more information refer to the SuDS manual (CIRIA C697, 2007)

---

[1]Pollution Prevention Guideline (PPG) 3 Use and design of oil separators in surface water drainage systems, Environment Agency/SEPA/Environment & Heritage Service, 2006.
[2]C697 The SUDS Manual, CIRIA 2007.
[3]Pollution Prevention Pays, Environment Agency/SEPA/Environment & Heritage Service, 2004. www.environment-agency.gov.uk/business/topics/pollution/36641.aspx
[4]Pollution Prevention Guidelines (PPG) 25: Hospitals and Healthcare establishments, Environment Agency, 2008. www.environment-agency.gov.uk/business/topics/pollution/39083.aspxCompliance note
[5]Planning Policy Statement 25: Development and Flood Risk, CLG, 2010.
[6]Preliminary rainfall run-off management for developments, W5-074/A/TR/1 Revision D, EA/DEFRA (September 2005)
Useful Link: http://www.defra.gov.uk/environment/flooding/documents/research/sc030219.pdf
[7]•IH Report 124, Flood estimation for small catchments (Marshall and Bayliss, 1994)
[8]Flood Estimation Handbook (Centre for Ecology & Hydrology, 1999)
[9]CIRIA publication C635 (2006) Designing for exceedence in urban drainage – good practice
[10]BS 8515 Rainwater harvesting systems: Code of Practice, Annex A

Pol 04 Reduction of night time light pollution

Number of credits available	Minimum standards
1	No

Aim

To ensure that external lighting is concentrated in the appropriate areas and that upward lighting is minimised, reducing unnecessary light pollution, energy consumption and nuisance to neighbouring properties.

Assessment Criteria

The following is required to demonstrate compliance for:

One credit

1. The external lighting strategy has been designed in compliance with Table 2 (and its accompanying notes) of the ILP Guidance notes for the reduction of obtrusive light, 2011[1], (see Additional Information - Buildings located in Scotland must also refer to the Compliance notes below for additional criteria).
2. All external lighting (except for safety and security lighting) can be automatically switched off between 23:00 hr and 07:00 hr. This can be achieved by providing a timer for all external lighting set to the appropriate hours.
3. If safety or security lighting is provided and will be used between 23:00 hr and 07:00 hr, this part of the lighting system complies with the lower levels of lighting recommended during these hours in Table 2of the ILP's Guidance notes, for example by using an automatic switch to reduce the lighting levels at 23:00 hr or earlier.
4. Illuminated advertisements, where specified, must be designed in compliance with ILE Technical Report 5 – The Brightness of Illuminated Advertisements[2]

Compliance Notes

Ref	Terms	Description
CN1	Shell only/speculative developments	Typically external lighting will be specified and installed by the developer and not the future tenant. If external lighting will be specified and installed by the tenant, then compliance can be demonstrated via one of the following available means: 1. Option 1 – Use of a tenancy lease agreement between the developer and tenant/s (full value of available credits) 2. Option 2 – A Green Building Guide for tenant fit outs (half the

Ref	Terms	Description
		value of the available credits) 3. Option 3 – Developer/Tenant collaboration (full value of available credits) Refer to Appendix D – BREEAM New Construction and shell and core/speculative assessments of this Scheme Document for further description of the above options. If responsibility for the external lighting specification and installation is shared by each party (developer and tenant), then compliance can be demonstrated via a combination of the base build design drawings/site inspection and one of the above options. Note; where option two is used as a means of demonstrating compliance in this manner, only half the value of the credits available can be awarded.
CN2	Extensions to existing buildings	If the scope of the assessment covers a 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.
CN3	Scope of requirements	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. Where the assessment is of a building that forms part of an entire new development, the criteria apply site-wide.
CN4	No external lighting	If there is no external lighting on or around the assessed development the credit can be awarded by default.
CN5	Buildings located in Scotland	In addition to the criteria above, buildings located in Scotland must comply with the light pollution criteria in the guidance note 'Controlling Light Pollution and Reducing Lighting Energy Consumption[3]'. This can be demonstrated via completion of the checklists in Annexes B and C of the guidance note by a relevant member of the design team.
CN6	Safety lights See criterion 3	Flush stud lights used for safety purposes in vehicle manoeuvring areas may be excluded from the assessment.
CN7	Floodlighting, signage lighting See criterion 2	The guidance notes recommend the setting of a curfew, during which all non-essential external lighting is switched off. This will normally include floodlighting, signage and all lighting that is not required for safety or security.
CN8	Essential lighting between 23:00 hr and 07:00 hr See criterion 3	Where essential lighting is provided between 23:00 hr and 07:00 hr, i.e. for 24-hour operating buildings, the system is able to automatically switch to the lower levels of lighting recommended in the ILE Guidance notes for lighting during these hours (or provide these lower levels at all times).

Ref	Terms	Description
CN9	Specific security criteria	Where light fittings are specified to comply with specific security standards and these conflict with these BREEAM criteria they can be excluded from the assessment of this issue. In these circumstances the assessor must obtain evidence confirming that the specific security standards are applicable to the assessed development.

Schedule of Evidence

Ref	Design stage	Post-construction stage
All	Design drawings Relevant section/clauses of the building specification or contract or external lighting design data/calculations In the case of the external lighting design, the M&E engineer or lighting designer must provide indicative examples of where and how the strategy complies with the assessment criteria.	BREEAM Assessor's site inspection report and photographic evidence AND EITHER Written confirmation from the project team that the solutions assessed at the design stage have been implemented OR Where the design has changed evidence is provided for post construction/'As built' details

Additional Information

Relevant definitions

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.

Checklists and Tables

None

Calculation procedures

None

Other information

The ILP Guidance notes for the Reduction of Obtrusive Light, 2011 are available free of charge from the ILE website www.ilp.org.uk.

Table 2 of the ILP guidance and its accompanying notes outlines 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.

---

[1]GN01 Guidance notes for the reduction of obtrusive light, Institution of Lighting Professionals(ILP), 2011. www.ilp.org.uk
[2]Technical Report No. 5: The Brightness of Illuminated Advertisements, Institution of Lighting Engineers (ILE), Third Ed, 2001.
[3]Guidance Note Controlling Light Pollution and Reducing Lighting Energy Consumption, Scottish Executive, 2007.

Pol 05 Noise attenuation

Number of credits available	Minimum standards
1	No

Aim

To reduce the likelihood of noise arising from fixed installations on the new development affecting nearby noise-sensitive buildings.

Assessment Criteria

The following is required to demonstrate compliance for:

One credit

1. The credit can be awarded by default where there are or will be no noise-sensitive areas or buildings within 800m radius of the assessed development.
2. Where there are or will be noise-sensitive areas or buildings within 800m radius of the assessed development a noise impact assessment in compliance with BS 7445[1] has been carried out and the following noise levels measured/determined:
    a. 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.
    b. The rating noise level resulting from the new noise-source (see also Compliance note: Compliance at the design stage).
3. The noise impact assessment must be carried out by a suitably qualified acoustic consultant holding a recognised acoustic qualification and membership of an appropriate professional body (see Relevant definitions in the Additional Information section).
4. The noise level from the proposed site/building, as measured in the locality of the nearest or most exposed noise-sensitive development, is a difference no greater than +5dB during the day (07:00 hr to 23:00 hr) and +3dB at night (23:00 hr to 07:00 hr) compared to the background noise level.
5. Where the noise source(s) from the proposed site/building is greater than the levels described in criterion 4, measures have been installed to attenuate the noise at its source to a level where it will comply with criterion 4.

Compliance Notes

Ref	Terms	Description
CN1	Shell only	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

Ref	Terms	Description
		strategy/installations and sites similar to that of the assessed building or on a maximum design fit out specification. Alternatively, compliance with this BREEAM issue can be demonstrated via one of the following means: 1. Option 1 – Use of a tenancy lease agreement between the developer and tenant/s (full value of available credits) 2. Option 2 – A Green Building Guide for tenant fit outs (half the value of the available credits) 3. Option 3 – Developer/Tenant collaboration (full value of available credits) . Refer to Appendix D of this Scheme Document for further description of the above options.
CN2	Attenuating noise at its source See criteria 4 & 5	BS 8233:1999[2] gives recommendations for the control of noise in and around buildings. Confirming the specification of attenuation measures in accordance with this Code of Practice can be used as a method of demonstrating compliance with criterion no.4.
CN3	Compliance at the design stage See criterion 2	At the design stage of assessment, where noise sensitive areas or buildings are present, actual measurement is unlikely to be possible due to the planned but non existent installation. In such situations compliance can be demonstrated through the use of acousticians' calculations or by scale model investigations. For such cases BS7445-2 states that "as universally agreed prediction models do not exist, the method adopted should be carefully described in the acoustician's report". And that "when available, prediction models accepted by relevant authorities should be used." Where prediction through these methods is not possible, measurement will be necessary using either a noise source similar to that proposed or, alternatively, measurement of the actual noise from the installation (once installed); compliance with the latter approach requires a written commitment to appoint a suitable qualified acoustician to carry out the required measurements post installation, and a further commitment to attenuate the noise source in compliance with criteria 4 and 5 of BREEAM (if proved necessary by the measurements)
CN4	Untreated buildings	This assessment issue does not apply to buildings designed to be untreated i.e. where internal spaces will not be serviced by heating, ventilation or air conditioning systems and therefore no noise generating plant. Examples of such building types could include industrial warehouse storage.

Schedule of Evidence

Ref	Design stage	Post-construction stage
1	Design drawings highlighting: 1. All existing and proposed noise-sensitive buildings local to, and within, the site boundary 2. Proposed sources of noise from the new development 3. Distance (m) from these buildings to the assessed development.	BREEAM Assessor's site inspection report and photographic evidence confirming: 1. All noise-sensitive buildings local to, and within, the site boundary 2. Proposed noise sources within the development 3. Distances (m) from these buildings to the assessed development.
2-3	The acoustician's report, acoustician's qualifications and professional status. OR Relevant section/clauses of the building specification or contract requiring a noise assessment by a suitably qualified acoustician in compliance with BS 7445:1991. OR A letter from the client or design team confirming that they will appoint an acoustician to carry out a noise assessment in compliance with BS 7445:1991	The acoustician's report with measurements based on installed and operating plant.
4	Acoustician's report with recommendations for noise attenuation measures. AND EITHER A marked-up design plan highlighting the specification of the acoustician's attenuation measures OR A formal letter from the client or design team confirming where relevant, that attenuation measures recommended by an appointed suitably qualified acoustician will be installed.	BREEAM Assessor's site inspection report and photographic evidence confirming the existence of the specified noise attenuation measures. OR A letter from the acoustician confirming that all specified attenuation measures have been installed to the required standard.

Additional Information

Relevant definitions

Suitably qualified acoustician

An individual who holds a recognised acoustic qualification and membership of an appropriate professional body. The primary professional body for acoustics in the UK is the Institute of Acoustics.

Noise sensitive area

Landscapes or buildings where the occupiers are likely to be sensitive to noise created by the new plant installed in the assessed building, including:

1. Residential areas
2. Hospitals, health centres, care homes, doctor's surgeries etc.
3. Schools, colleges and other teaching establishments.
4. Libraries
5. Places of worship
6. Wildlife areas, historic landscapes, parks and gardens.
7. Located in an area of Outstanding natural beauty or near a Site of Special Scientific Interest (SSSI).
8. Any other development that can be considered noise sensitive.

Checklists and Tables

None

Calculation procedures

None

Other information

None

---

[1] BS 7445:1 Description and measurement of environmental noise, Part 1: Guide to quantities and procedures, British Standards Institute, 2003.
BS 7445:2 Description and measurement of environmental noise, Part 2: Guide to the acquisition of data pertinent to land use, British Standards Institute, 1991.
BS 7445:3 Description and measurement of environmental noise, Part 3: Guide to application to noise limits, British Standards Institute, 1991.
[2] BS 8233 Sound insulation and noise reduction for buildings, Code of practice, British Standards Institute, 1999.

Innovation

Inn 01 Innovation

Number of credits available	Minimum standards
10	No

Aim

To support innovation within the construction industry through the recognition of sustainability related benefits which are not rewarded by standard BREEAM issues.

Assessment Criteria

The following is required to demonstrate compliance;

Up to a maximum of 10 credits are available in aggregate from a combination of the following:

Exemplary level of performance in existing BREEAM issues

1. Where the building demonstrates exemplary performance by meeting defined exemplary level performance criteria in one or more of following BREEAM assessment issues:
    a. Man 01 Sustainable procurement
    b. Man 02 Responsible construction practices
    c. Hea 01 Visual comfort
    d. Ene 01 Reduction of CO_2 emissions
    e. Ene 04 Low or zero carbon technologies
    f. Ene 05 Cold storage
    g. Wat 01 Water consumption
    h. Mat 01 Life cycle impacts
    i. Mat 03 Responsible sourcing of materials
    j. Wst 01 Construction site waste management
    k. Wst02 Recycled Aggregates

    One innovation credit can be awarded for each individual BREEAM issue exemplary performance level complied with. Please refer to the relevant BREEAM issue within this Scheme Document for the exemplary level performance assessment criteria.

Approved Innovations

2. One innovation credit can be awarded for each innovation application approved by BRE Global, where the building complies with the criteria defined within an Approved Innovation application form.

Compliance Notes

Ref	Terms	Description
CN1	Exemplary	Refer to the Compliance notes within the individual assessment issues

Ref	Terms	Description
	level of performance	that contain exemplary performance levels.
CN2	Applying for Innovation credits	Any new technology, design or construction method or process can potentially be recognised as 'innovative', provided it demonstrates it meets the BREEAM eligibility criteria for Innovation credits. Applications for innovations can be submitted to BRE Global by Licensed BREEAM Assessors using the formal Innovation Application Form. BREEAM Assessors can obtain the application form from BRE Global or via the BREEAM Assessor Extranet. Relevant details of the BREEAM Innovation application and approval process, application fees, innovation credit eligibility criteria and details of previously approved innovations are available separately from the BREEAM Assessor Extranet and BRE Global.

Schedule of Evidence

Ref	Design stage	Post-construction stage
1	As defined within existing BREEAM issues.	As defined within existing BREEAM issues.
2	A copy of the Approved Innovation application or confirmation of the Approved Innovation reference number. AND Relevant documentary evidence demonstrating specification of the approved innovation.	As Design stage AND Relevant documentary evidence confirming that the project has achieved/installed the approved innovation as described and quantified within the approved innovation application form.

Additional Information

Relevant definitions

Approved Innovation

Any technology, method or process that can be shown to improve the sustainability performance of a building's design, construction, operation, maintenance or demolition, and which is approved as innovative by BRE Global.

Checklists and Tables

None

Calculation procedures

None

Other information

None

Appendices

Appendix A – BREEAM New Construction scope and healthcare building types

BREEAM New Construction has been tailored specifically for the assessment of the following healthcare establishments:

1. Teaching/specialist hospitals
2. General acute hospitals
3. Community and mental health hospitals
4. GP surgeries
5. Health centres and clinics

The table below provides a description of the typical facilities and services offered by and forming a part of one of the above healthcare buildings. Where a healthcare development does not fit one of the building type descriptions below, BREEAM New Construction can still be used to assess that building type provided it falls within one of the standard or non standard category descriptions (as detailed in the scope section of this document). Where it does not fall in to one of these categories, the project will require the development of bespoke assessment criteria.

Typical descriptions	Facility	Service
Teaching Hospital Specialist Acute Hospital	In-patient High concentration of energy-intensive engineering services & specialist equipment	Diagnostic & Treatment services for physical healthcare together with specialist services Consultant-led
General Acute Hospital	In-patient Medium concentration of energy-intensive engineering services & specialist equipment	Diagnostic & Treatment services for physical healthcare Consultant-led
Community Hospital Cottage Hospital Mental Health Hospital/Unit Learning Disability Unit	In-patient Basic engineering services & equipment	Limited Diagnostic & Treatment services for physical healthcare Nurse- or GP-led Care services for physical healthcare Nurse- or GP-led Mental health & learning disability services Consultant- or nurse-led
GP surgery	Non in-patient Use typically 50-65 hours/week Basic engineering services &equipment	Primary care consultation GP-led
Health Centre/Clinic	Non in-patient Use typically 35-45 hours/week Basic engineering services & equipment	Primary care & mental health Nurse/dental/visiting consultant or specialist

Other 'healthcare' associated building types

BREEAM New Construction can also be used to assess the following:

1. Ambulance Trust buildings ('Other buildings' type)
2. Residential care homes and staff residential accommodation (Multi-residential accommodation standard building type)
3. Non-patient building types e.g. offices, laboratories, storage buildings (as listed in the table of building types in section 2).

Appendix B – BREEAM New Construction scope and education buildings

BREEAM New Construction has been tailored specifically for the assessment of the following educational establishments:

1. Pre-School, including;
    a. Nursery schools[1]
    b. Children's centres[2]
2. Schools, including;
    a. Primary schools
    b. Secondary schools (including those containing sixth form colleges)
    c. All age-range schools (including education/teaching buildings at boarding schools)
    d. Academies
    e. Non-acute Special Educational Needs (SEN) schools
3. Sixth Form Colleges
4. Further and Higher Education/Vocational Colleges and Institutions, including;
    a. Teaching facility
    b. Learning Resource Centre
    c. Laboratory/Workshop/studio
    d. Student Union
    e. Student residential accommodation (Multi-Residential)
    f. Or a mixture of the above types.

All age range schools and academies

All age range schools and academies should typically be assessed using the guidance/criteria applicable to secondary schools. In some cases, for these types of education establishments, it may be more appropriate to use the assessment criteria for further education colleges or primary schools. For example, where an all age range school or academy will contain functional/operational areas more akin to further or higher education buildings or where the needs of the accommodation and occupiers are similar to those of primary or early years pupils. Based on the information received about the proposed building, the BREEAM Assessor should determine the most appropriate BREEAM criteria to apply in the assessment of the building.

Acute SEN schools

Acute Special Educational Needs (SEN) refers to children with severe disabilities/learning difficulties that prevent them from interpreting their surroundings without feeling anxious or distressed. These children can become easily distracted and/or over-stimulated. This group of pupils mainly include children with a behavioural, emotional or social development disability (Behaviour, Emotional and Social Difficulty (BEDS)) and children with communication and interaction disability (Autistic Spectrum Disorder (ASD)).

This BREEAM scheme has not been specifically tailored to assess acute SEN schools, however assessment using the methodology is still possible except where highly specialised accommodation is provided. Acute SEN schools are therefore defined as a non standard building types and BREEAM Assessors carrying out assessments on schools for pupils with such needs will need to carefully consider all the BREEAM issues that might be affected by the need to provide special facilities for such building users, e.g. View Out, Cyclist Facilities, etc. Where it is not explicit within this scheme document for this building type, the Assessor will need to decide which, if any, building type assessment criteria is appropriate and apply accordingly, seeking confirmation from BRE Global on the application of alternative building criteria where appropriate to do so.

For more information on SEN please refer to Building Bulletin 102 Designing for Pupils with Special Educational Needs and Disabilities, published by the Department for Children Schools and Families (available from www.teachernet.gov.uk)

Boarding schools residential accommodation and student halls of residence

BREEAM New Construction can be used to assess boarding school residential and halls of residence accommodation buildings. These types of building fall under the multi-residential accommodation building type.

---

[1]Nursery school/education means full-time or part-time education suitable for children who have not attained compulsory school age (whether provided at schools or elsewhere), i.e. facilities/buildings for the teaching of children who are between the ages of two or three to five years old.
[2]Children's centres are multi-agency service hubs where young children and their families can receive early education, full day childcare, parental support and child and family health services, such as access to health visitors and health screening. Children's centres will often be allied to a local primary school, on or adjacent to the school site.

Appendix C – BREEAM New Construction scope and multi-residential buildings

BREEAM New Construction for non domestic buildings can be used to assess multi-occupancy residential buildings which are not suitable for assessment under the Code for Sustainable Homes (CSH) in England, Wales and Northern Ireland, or EcoHomes in Scotland. The New Construction scheme provides a whole building assessment methodology which can also be applied to buildings which contain dwellings assessed under the CSH, but also communal facilities within the same building, to allow assessment of the whole building.

BREEAM New Construction can be used to assess the following types of buildings:

1. Student halls of residence
2. Key worker accommodation
3. Care homes that do not contain extensive or specialist medical facilities (limited consulting rooms and medical rooms are acceptable)
4. Sheltered housing
5. Other multi-residential buildings which contain a mix of residential accommodation with communal areas such as some military accommodation.

BREEAM Multi-residential and the Code for Sustainable Homes

BREEAM New Construction for non domestic buildings provides a whole building assessment methodology which can also be applied to a building containing self-contained dwellings and communal facilities.

Where both a Code for Sustainable Homes and a BREEAM assessment are required, to avoid duplication of effort evidence collected for the CSH assessment can be used towards demonstrating compliance with the equivalent BREEAM assessment criteria and vice versa.

A number of issues within BREEAM are assessed on the same basis as the CSH and where such similarities exist, this has been noted in the compliance notes for each BREEAM issue to simplify the assessment process.

Appendix D – BREEAM New Construction and shell and core/speculative assessments

Non-fitted, speculative new buildings (often referred to as shell and core buildings) can be assessed using the BREEAM New Construction scheme.

The application of the BREEAM New Construction assessment criteria for a shell and core building, for the majority of BREEAM assessment issues, will be straightforward. However, several of the BREEAM issues and their criteria are tailored to assess a building that is being fitted out. These BREEAM issues will not be scoped out of the assessment of a shell and core new building. Ultimately the building will be used in a fitted-out state, the BREEAM assessment and rating must therefore reflect the environmental performance of the building based on its intended use.

It is recognised however, that it may not be possible for a shell and core design/specification to demonstrate compliance with some of the BREEAM criteria, as fit-out decisions relating to certain aspects of a new building will be made by the future tenant, who at the time of the interim or final assessment stage may not be known. Subsequently BRE Global recognise that there is a need for a degree of flexibility in applying BREEAM to new shell and core building design and specification, 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 are using BREEAM to assess a new shell and core building. Each option provides a different level of robustness to assessing and demonstrating compliance with BREEAM issues from a shell and core perspective and therefore each has a different value in terms of its contribution towards the BREEAM percentage score and rating.

Option 1 – Use of a 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. As such, Green Lease Agreements (or 'green' clauses/sections in a standard lease agreement) can be used as evidence demonstrating compliance with the relevant BREEAM issue criteria at the interim and post construction stages of assessment.

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

In developments with multiple tenants, provided at least 75% of the net lettable floor area within the tenanted building/development is covered by a compliant lease agreement, this will be acceptable for the purposes of awarding BREEAM credits.

Option 2 – A Green Building Guide for tenant fit-outs

As an alternative to a Green Lease, developers may demonstrate part compliance with BREEAM issues 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 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 issue or requirement, half of the value of the available credits can be achieved and contribute towards the overall BREEAM score and rating. It should also be noted that not all fit-out related BREEAM assessment issues permit the use of the Green Building Guide as a means of demonstrating compliance (refer to the table of issues below). For example, it is not permitted as an option for modelling energy consumption for the reduction of CO_2 emissions issue (Ene 01). The performance/modelling must be based on either the actual fit-out specification or the most energy intensive fit-out specification permissible under Approved Document Part L of the Building Regulations i.e. the maximum design fit-out specification.

The BREEAM assessor should note that Green Building Guides which simply copy BREEAM scheme criteria verbatim do not necessarily demonstrate compliance with this option. The Guide produced must be specific to the building, its layout and function. The BREEAM related requirements and advice included in the Guide must reflect what a tenant's fit-out specification can realistically achieve given the opportunities and limitations of the core building and its services.

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 verified using both evidence provided by the shell and core project team/client 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 the developer of the shell and core building cannot confirm compliance with a particular issue or chooses not to produce a compliant 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 compliance with a particular BREEAM issue cannot be verified), the BREEAM credits available for the particular issue must be withheld.

The table below lists the BREEAM New Construction assessment issues and highlights the following:

1. The assessment issues that are either specific to, or contain criteria that potentially rely on or influenced by building fit out design/specification issues.
2. The availability of options 1 - 4, in terms of demonstrating compliance with the criteria for each issue.
3. Whether or not specific compliance notes are provided concerning the application of the assessment criteria to shell and core building design and construction. Where this is the case the compliance note can be found within the assessment criteria for that specific issue (in the main body of this scheme document).

BREEAM New Construction assessment issues with shell and core evidence options

Ref	Issue	Compliance influenced by fit-out spec	Option availability 1	2	3	4	Specific compliance notes
MANAGEMENT							
Man	Sustainable procurement	Yes	Y	Y	Y	Y	Yes

Ref	Issue	Compliance influenced by fit-out spec	Option availability 1	2	3	4	Specific compliance notes
01							
Man 02	Responsible construction practices	No	-	-	-	-	-
Man 03	Construction site impacts	No	-	-	-	-	-
Man 04	Stakeholder participation	Yes	Y	-	Y	Y	Yes
Man 05	Service life planning and costing	Yes	N	N	N	N	Yes
HEALTH & WELLBEING							
Hea 01	Visual comfort	Yes	Y	Y	Y	Y	Yes
Hea 02	Indoor air quality	Yes	Y	Y	Y	Y	Yes
Hea 03	Thermal comfort	Yes	Y	Y	Y	Y	Yes
Hea 04	Water quality	Yes	Y	Y	Y	Y	Yes
Hea 05	Acoustic performance	Yes	N	N	N	N	Yes
Hea 06	Safety and security	No	-	-	-	-	-
ENERGY							
Ene 01	Reduction of CO_2 emissions	Yes	Y	N	Y	Y	Yes
Ene 02	Energy monitoring	Yes	Y	Y	Y	Y	Yes

Ref	Issue	Compliance influenced by fit-out spec	Option availability 1	2	3	4	Specific compliance notes
Ene 03	Energy efficient external lighting	Yes	Y	Y	Y	Y	Yes
Ene 04	Low or zero carbon technologies	Yes	Y	N	Y	Y	Yes
Ene 05	Energy efficient cold storage systems	Yes	Y	Y	Y	Y	Yes
Ene 06	Energy efficient transportation systems	Yes	Y	Y	Y	Y	Yes
Ene 07	Energy efficient laboratory systems	No	-	-	-	-	-
Ene 08	Energy efficient equipment (process)	Yes	Y	Y	Y	Y	Yes
Ene 09	Drying space	Yes	Y	Y	Y	Y	Yes
TRANSPORT							
Tra 01	Public transport accessibility	No	-	-	-	-	-
Tra 02	Proximity to amenities	No	-	-	-	-	-
Tra 03	Cyclist facilities	Yes	N	N	Y	Y	Yes
Tra 04	Maximum car parking capacity	Yes	N	N	Y	Y	Yes
Tra 05	Travel plan	No	N	N	N	N	Yes
WATER							
Wat 01	Water consumption	Yes	Y	N	Y	Y	Yes

Ref	Issue	Compliance influenced by fit-out spec	Option availability 1	2	3	4	Specific compliance notes
Wat 02	Water monitoring	Yes	Y	Y	Y	Y	Yes
Wat 03	Water leak detection and prevention	Yes	Y	Y	Y	Y	Yes
Wat 04	Water efficient equipment (process)	No	-	-	-	-	-
MATERIALS							
Mat 01	Life Cycle Impacts	Yes (for floor finishes only)	Y	Y	Y	Y	Yes
Mat 02	Hard landscaping and boundary protection	No	-	-	-	-	-
Mat 03	Responsible sourcing of materials	No	-	-	-	-	-
Mat 04	Insulation	Yes	Y	Y	Y	Y	Yes
Mat 05	Designing for robustness	Yes	Y	Y	Y	Y	Yes
WASTE							
Wst 01	Construction waste man-agement	No	-	-	-	-	-
Wst 02	Recycled aggregates	No	-	-	-	-	-
Wst 03	Operational waste	Yes	N	N	N	N	Yes
Wst 04	Speculative Floor Finishes	Yes	N	N	Y	Y	No

Ref	Issue	Compliance influenced by fit-out spec	Option availability 1	2	3	4	Specific compliance notes
LAND USE & ECOLOGY							
LE 01	Site selection	No	-	-	-	-	-
LE 02	Ecological value of site and protection of ecological features	No	-	-	-	-	-
LE 03	Mitigating ecological impact	No	-	-	-	-	-
LE 04	Enhancing site ecology	No	-	-	-	-	-
LE 05	Long term impact on biodiversity	No	-	-	-	-	-
POLLUTION							
Pol 01	Impact of refrigerants	Yes	Y	Y	Y	Y	Yes
Pol 02	NO_x emissions from heating source	Yes	Y	Y	Y	Y	Yes
Pol 03	Surface water run-off	No	-	-	-	-	-
Pol 04	Reduction of night time light pollution	Yes	Y	Y	Y	Y	Yes
Pol 05	Noise attenuation	Yes	Y	Y	Y	Y	Yes

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 developer. For issues reliant upon compliance of tenant areas/fit-out items, the minimum standards are still applied to those areas and compliance can be demonstrated via one of three permissible options i.e. the lease agreement, green building guide or tenant fit-out specification.

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.

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.betterbuildingspartnership.co.uk/working-groups/green-leases/green-lease-toolkit/

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.

Appendix E – Organisational, Local or National Considerate Constructor Scheme requirements: guidance for scheme administrators

The purpose of this appendix is to provide guidance for considerate construction scheme administrators/operators, against which they can determine whether their scheme is potentially eligible for recognition in BREEAM as a 'compliant scheme'; and therefore whether performance, as assessed/rated by that scheme, is appropriate for the purpose of awarding BREEAM credits.

Where the administrator has reviewed their scheme against the requirements below and wishes to have the schemed listed in BREEAM as a 'compliant scheme', they should contact the BREEAM office at BRE Global, providing the following information:

1. A description of the scheme's operation, including how it monitors and verifies compliance and to what standards it or its assessors are accredited.
2. The Scheme's Code of Practice.
3. How the scheme scores/rates contractor and site performance against that code of practice.
4. If relevant, the number of projects that have used the scheme and the average score/level of performance achieved.

BRE Global will then inform the scheme operator of the next steps in the review and listing process.

Operational scheme requirements

1. The scheme has a code of practice (see below for scope).
2. The assessment and scoring for the scheme is structured such that it is possible to determine and rate the performance of the contractor/site against the scheme as a whole, and for individual code of practice items, on the basis of:
    a. Non compliance
    b. Compliance (level required to achieve one BREEAM credit)
    c. 'Beyond' compliance e.g. top quartile performance (level required for seeking two BREEAM credits)
    d. Exemplary practice e.g. top 10% performance (level required for seeking exemplary level credits)
3. The scheme has defined a baseline of performance against which performance of individual items and overall project performance is determined. This baseline should broadly align with common practice on UK/European construction sites.
4. The performance of contractors and sites are independently monitored and verified by individuals or service providers appointed by the scheme administrator.
5. The scheme administrator demonstrates what measures they have in place to ensure that those who undertake assessment and verification have the necessary skills, knowledge and experience to do so competently.
6. Construction sites are visited at least once by the monitor during the construction phase to verify compliance with and rate performance against the schemes code of practice (or more frequently for sites where the construction phase is longer than 12 months).
7. Construction site performance is reported by the monitor and an overall score/compliance determined for each site visit.

8. A certificate of performance/compliance is awarded to the contractor by the scheme administrator.
9. The scheme administrator operates a public complaints procedure and investigates complaints accordingly.

Scope of scheme's code of practice

The scheme's code of practice must include/account for the following categories and items:

Environmental awareness and impact mitigation

Demonstrate constructor awareness, consideration and mitigation of the impact of the site on the environment.

1. Environmental Management Systems and/or environmental policy
2. Management and prevention of light, noise and air pollution
3. Energy and water saving measures/processes
4. Waste reduction and diversion from landfill measures/processes
5. Responsibly sourced and low impact construction materials
6. Locally source labour and suppliers
7. Monitoring and targeting of environmental impacts
8. Protection of ecological features
9. Low or zero carbon sources of energy
10. Construction site operative awareness and training

Safe and adequate access

Demonstrate that the constructor operates the site in a manner that ensures safe access to and around the site.

1. Site Traffic Management Plan
2. Unobstructed, clearly signed and safe roads, footpaths and diversions
3. Accessible, safe and signed site and site accommodation for all genders/abilities
4. Secure site and boundary
5. Provision of safety information and emergency procedures
6. Protection of the public from site activities e.g. plant movement, debris etc.
7. Management of site visitors

Safe and considerate working environment

Demonstrate that the constructor is operating the site in a clean, safe and accountable manner in order to ensure the wellbeing of site operatives and to minimise the risk to their health and safety.

1. Provision of clean, well maintained and appropriately sized/located/screened site facilities (showers, changing/drying facilities/smoking areas/canteens)
2. Occupational health guidance and provision of emergency information/procedures, first aiders and first aid equipment
3. Clean and well maintained work areas and plant
4. Monitoring/preventing anti-social/criminal behaviour on site and around perimeter e.g. littering, abusive/offensive language, vandalism/graffiti.
5. Provision of clean and appropriate Personal Protective Equipment (PPE)
6. Implementation, monitoring and compliance with Health and Safety plan
7. Professional appearance and behaviour of site operatives
8. Consideration of the expectations/requirements of the Construction Skills Certification Scheme (CSCS) card
9. Training needs of site operatives

Good neighbour

Demonstrate that the constructor operates the site in a manner that is considerate to the surrounding neighbours and those who visit the locality within the sites vicinity.

1. Communication, notification and accessible information concerning site activities/programme/information, including emergency procedures/contacts
2. Accessible site management and comments procedure
3. Maintenance and cleanliness of site, perimeter and adjacent roads and site access
4. Dust and noise prevention measures
5. Site image, including visually appropriate and well maintained site hoardings and boundary and advertised scheme involvement
6. Wider community engagement

Appendix F – Guidance for relating ecologist's report to BREEAM

Before using this guidance and completing the form please read the following:

1. This document is to be used for BREEAM 2011 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 BREEAM 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 issue of the BREEAM 2011 New Construction Scheme Document 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.

1. Section A requires contact details for the ecologist and developer/client.
2. 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'.
3. 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.
4. 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.
5. Section D provides the BREEAM assessor with the necessary information to complete the assessment of the ecology related BREEAM issues.
6. Section E provides details of the documentation/information required by BREEAM as evidence of compliance.
7. 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 a BREEAM assessment.

Section A: Contact Details

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:
Development details
BRE reference number (if known):
Development name:
Development address:

Section B1: Ecologist's Qualifications

1. Do you hold a degree (or equivalent qualification, e.g. N/SVQ level 5) in an ecology related subject?

Yes		No	

If yes, please provide details

Note: Depending on the ecological content (minimum 60%), the following degrees might be considered relevant: Ecology, Biological Sciences, Zoology, Botany, Countryside Management, Environmental Sciences, Marine and Freshwater Management, Earth Sciences, Agriculture, Forestry, Geography, Landscape Management.

2. Are you a practising ecologist with a minimum of 3 years relevant experience within the last 5 years?

Yes		No	

If yes, please provide details

Note: Relevant experience must clearly demonstrate a practical understanding of factors affecting ecology in relation to construction and the built environment; including, acting in an advisory capacity to provide recommendations for ecological protection, enhancement and mitigation measures. Examples of relevant experience are: ecological impact assessments; Phase 1 and 2 habitat surveys and habitat restoration.

3. Are you bound by a professional code of conduct and subject to peer review*?

Yes		No	

If yes, please provide details

Note: a full member of one of the following organisations will be deemed suitable: Chartered Institution of Water and Environmental Management (CIWEM); Institute of Ecology and Environmental Management (IEEM); Institute of Environmental Management and Assessment (IEMA); Landscape Institute (LI).

Note: Peer review is defined as the process employed by a professional body to demonstrate that potential or current full members maintain a standard of knowledge and experience required to ensure compliance with a code of conduct and professional ethics.

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).

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).
2. The verifier of the report must confirm in writing they have read and reviewed the report and 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.

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)?

Yes		No	

If yes, please provide details to justify this (e.g. date(s) and scope of site survey(s))

Note: 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.

Note: the contents of the ecology report must be representative of the site's existing ecology prior to the commencement of initial site preparation works, i.e. before RIBA stage K, Construction to Practical Completion, and after RIBA stage B, Design Brief.

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.

Section D: Site Survey Details

LE 02 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?

Yes		No	

If yes, please provide a brief statement explaining how it has been deemed to be of low ecological value:

Note: 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.

2. Are there any features/areas of ecological value that fall within the site, but outside the construction zone?

Yes		No	

Note: 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 LE 04 Enhancing site ecology.

If yes, please provide a brief statement outlining the advice / recommendations given for protecting all existing features and areas of ecological value:

LE 03 Mitigating ecological impact

3. Are you able to provide the following information for before and after construction:

- Broad habitat types
- An estimate of the number of floral species present per broad habitat type (based on appropriate census techniques and confirmed planting regimes)?

Yes		No	

a. If yes, please give a brief description of the landscapes and broad habitats surrounding the development site.

b. The total site area (in m^2). This will be the same before and after development.

c. Please fill in Table - 37 below with site details before and after development:

Table - 37: Site details before and after development[1]

Broad habitat type[2]	Area of broad habitat type (m^2)	Average total taxon richness per broad habitat type

Broad habitat type[2]	Area of broad habitat type (m^2)	Average total taxon richness per broad habitat type
Broad habitat type[2]	Area of broad habitat type (m^2)	Average total taxon richness per broad habitat type

1. Note to assessor (and ecologist where requested to carry out calculations); the information contained in these tables can be used to calculate both LE 03 Mitigating ecological impact and LE 04 Enhancing site ecology issues.
2. Broad 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.

4. Has the client / developer requested you to carry out the calculation for LE 03 Mitigating ecological impact and /or LE 04 Enhancing site ecology (where relevant)?

Yes		No	

Note: The calculations must be carried out in line with the methodology provided in the current version of the BREEAM 2011 Scheme Document.

If yes, please complete Table - 38 and Table - 39 below:

Table - 38: Calculation of the Ecological Value of the Site Before Development

Broad habitat type	Area of broad habitat type [m^2]		Average total taxon richness (see BREEAM issue LE 03 or a SQE*)		Average total taxon richness x Area of broad habitat type
		x		=	
		x		=	
		x		=	
		x		=	
		x		=	
		x		=	
		x		=	
		x		=	
		x		=	
		x		=	
		x		=	
		x		=	
(1) Total site area =			**(2) Total =**		
Average total taxon richness before development =					
Average total taxon richness x area of habitat type / Total site area = (2)/(1) =					

* SQE = Suitably Qualified Ecologist

Table - 39: Calculation of the Ecological Value of the Site After Development

Broad habitat type	Area of broad habitat type [m^2]		Average total taxon richness (see BREEAM issue LE 03 or a SQE)		Average total taxon richness x Area of broad habitat type
		x		=	
		x		=	
		x			
		x		=	
		x		=	
		x		=	
		x		=	
		x		=	
(1) Total site area =			(2) Total =		
Average total taxon richness after development =					
Average total taxon richness x Area of broad habitat type / Total site area = (2)/(1) =					

LE 04 Enhancing site ecology

5. Has the client / developer required you to provide advice and make recommendations for enhancing site ecology?

Yes		No	

If yes, please provide a brief statement outlining the advice / recommendations given on enhancing and protecting the ecological value of the site:

Note: Such advice is to include, and go beyond, compliance with all current EU and UK legislation relating to protected species and habitats.

LE 05 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:

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:
   i. management of any protected features on site
   ii. management of any new, existing, or enhanced habitats
   iii. 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:
   i. scope of management plan
   ii. key responsibilities, and with whom these responsibilities lie, e.g. owner, landlord, occupier?

If you have answered 'yes' to either question 8a or 8b please provide a brief explanation outlining the details

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:

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:

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:

12. 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

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 Land Use and Ecology criteria:

1. The suitably qualified ecologists site/project specific report
2. Written confirmation from the verifier of the ecology report (where necessary)
3. 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: Signature of Validation

I confirm the information provided in this document is truthful and accurate at the time of completion.

Name of ecologist:

Signature of ecologist:

Date:

Appendix G - The BREEAM evidential requirements

It is the BREEAM assessor's role to gather building information and use it to evaluate and verify the building's performance against the BREEAM standards. A range of building design and procurement information types, as well as the end product itself i.e. the building can be used by the client/project team to demonstrate compliance with the BREEAM assessment criteria.

To aid the assessor, client and project team members in the information gathering exercise, each assessment issue within the scheme document contains a 'schedule of evidence' table. The table and its content serve to outline the typical types of information that the assessor is obliged to ask for at each stage of assessment. Without this information the assessor has no means of verifying compliance with the relevant BREEAM criteria (where BREEAM credits are sought by the project team/client). In addition to the information listed in each issue's schedule, the assessor may ask for other additional information types where they feel that this is required in order to adequately demonstrate compliance, given the specific nature of the building or the contents of the document listed.

Documentation will vary from one new building project to another and as such BREEAM is not overly prescriptive about the form in which evidence should be provided. In general the following types of project information can serve as suitable evidence of compliance for most, if not all BREEAM assessment issues and criteria:

1. Relevant section/clauses of the building specification or contract
2. Design drawings (e.g. new and existing site plans, elevations, internal layouts)
3. Certificates of compliance (e.g. ISO14001, BES6001, Environmental Profiles, FSC, EPC)
4. Calculation/software modelling results/outputs (e.g. Energy, thermal modelling)
5. Professional reports/studies (e.g. contaminated land, ecologist report, flood risk/security consultant report)
6. Project/construction phase programme
7. Construction phase data/information (e.g. purchase orders, metering data)
8. Letters of appointment (e.g. Professional appointment)
9. Letters of commitment (e.g. Client/contractor commitment which, unless otherwise stated in the schedule of evidence, are only acceptable at the interim Design Stage Assessment)
10. Letters of action (e.g. Client/contractor confirming specific compliance with criteria)
11. BREEAM Assessor's site inspection report and photographic evidence
12. Meeting minutes
13. Third party information (e.g. maps, public transport timetable, product manufacturers details)
14. Tenant lease agreements or 'green' clauses from lease agreements (for shell and core buildings, refer to Appendix D for more guidance on types of evidence).

BRE Global endeavours to ensure that BREEAM requests only types or categories of information which already exist as a result of the design and procurement process for a new building. This information should therefore be readily available and easily referenced if the building is justifiably claiming compliance with BREEAM criteria. Other types of formal information/evidence could be used to demonstrate compliance, provided it demonstrates robust assurance to the same level, or better than those types outlined above or in the schedule of evidence table.

It is the assessor's role to inform the project team as to what types of information are required and who should provide this material. If the information is not provided, the assessor will be unable to verify compliance and award the credit(s). As a result the building may not achieve the required BREEAM rating. All information referenced in an assessment which is submitted to BRE Global Ltd for certification must be verifiable and must be produced by licensed BREEAM assessor organisations upon request by BRE Global Ltd.

Final post construction stage assessment and certification

In some instances the client or project team may not need to, or may choose not to certify the building at the 'interim' design stage of assessment, instead choosing to certify at the final, post construction stage only. In such instances, verification of compliance with the BREEAM criteria will be based on actual 'as-built' information, relying less on design stage information and letters of commitment (unless relevant to the assessment issue).

The 'Post Construction Stage' column in the schedule of evidence table describes the typical information the assessor requires to validate 'as-built' performance and, for a number of issues and criteria, an assessor's site visit and subsequent report and photographs will be adequate.

Note: interim assessment and certification is strongly advised as it provides assurance of BREEAM performance prior to the start of construction works. This will give the project the best possible chance of achieving the desired rating, and maintaining performance at that rating level through to final certification, handover and building occupation.

Final post construction stage review and certification

A Post Construction Stage review (PCR) can be carried out where the building has been assessed and certified at the interim design stage of assessment. The post construction stage review differs from the post construction stage assessment in that a PCR serves to confirm the BREEAM rating achieved at the interim stage as the final 'as-built' rating. For a post construction review, the BREEAM assessor is required to:

1. Review each assessment issue and confirm the criteria and the number of credits committed to at the interim stage of assessment are still valid.
2. Re-assess any issues where changes have occurred on the project since the interim assessment. This will be the case where such changes will or may have had an effect on compliance with a particular requirement and therefore the number of credits awarded/withheld and potentially the BREEAM rating achieved.

In the case of point 1 the assessor will require evidence confirming the validity of the review. For some assessment issues and criteria this will take the form of new information, for example where compliance at the interim stage was based on a formal letter from the client or design team confirming an intention to comply, at the post construction stage evidence confirming that this commitment was undertaken is required. This evidence is likely to be in one of the forms listed above e.g. assessor's site photographs, metered data, purchase orders etc. For other assessment issues and criteria it may be the case that information referenced as evidence at the interim design stage is a true reflection of 'as-built' performance, for example a map or site location plan highlighting proximity to public transport nodes or a bus timetable. In such instances the assessor may simply confirm the validity of the evidence referenced at the interim design stage assessment.

In the case of point 2, where changes have occurred that potentially affect the award of a BREEAM credit, the assessor has two options. Either, it is clear that compliance with a particular issue is no longer possible, in which case the credits awarded at the interim stage are withheld and the final score and BREEAM rating re-calculated. Or, additional, new information or altered versions of existing information are provided and the assessor re-evaluates and verifies compliance.

Multi-residential accommodation that also has self contained dwellings assessed using the Code for Sustainable Homes

The BREEAM New Construction Scheme is designed to assess multi-residential accommodation e.g. halls of residence, sheltered accommodation etc. These types of buildings could be constructed alongside or with self-contained dwellings. Where self contained dwellings are present, it is possible that these buildings have been or are being assessed using the Code for Sustainable Homes (CSH).

There are a number of common assessment issues and criteria between BREEAM and the Code for Sustainable Homes. As such, where both a BREEAM and CSH assessments are required, to avoid

duplication of effort, evidence collected for the CSH assessment can be used towards demonstrating compliance with the equivalent BREEAM assessment criteria and vice versa, provided that same information demonstrates compliance with the criteria of the scheme.

Where such commonalities exist, there is a compliance note within each BREEAM issue in this scheme document confirming this. The note also contains guidance on how the BREEAM issue, its criteria and evidence requirements align with the same issue in the CSH. Where no such compliance note exists within a BREEAM issue, then either the issue or its criteria are not shared with the CSH.

Appendix H – BREEAM assessment issues by building type and their percentage contribution to BREEAM performance

In the tables below all forty nine BREEAM New Construction assessment issues are highlighted by building type and the maximum percentage that each issue contributes to the overall BREEAM score. In referencing the table the reader should bear in mind the following:

1. The percentage for each issue is the maximum available; it therefore represents the score achieved if all the available BREEAM credits for an issue are awarded.
2. The sum of the percentages within any single section equates to the environmental weighting for that section.
3. The percentages have been calculated on the basis that all issues relevant to a given building type are applicable. In some instances this will not be the case, for example BREEAM issue Ene 07 is specific to laboratories, so if the assessed building does not contain a laboratory then this issue will not be applicable. In these circumstances, the percentage score available will be re-distributed amongst the remaining applicable issues in that section.
4. Where a building type has a zero against an assessment issue this means that the issue does not apply to that building type, either because the issue is specific to a certain building or, in some cases, the criteria are covered within another issue.

Table - 40: Management issues by building type and their percentage contribution to BREEAM performance

Building type	Man 01	Man 02	Man 03	Man 04	Man 05
Office	4.40%	1.10%	2.70%	2.20%	1.60%
Retail	4.40%	1.10%	2.70%	2.20%	1.60%
Industrial	4.40%	1.10%	2.70%	2.20%	1.60%
Healthcare	4.40%	1.10%	2.70%	2.20%	1.60%
Primary School	4.40%	1.10%	2.70%	2.20%	1.60%
Secondary school	4.40%	1.10%	2.70%	2.20%	1.60%
Further Education	4.40%	1.10%	2.70%	2.20%	1.60%
Higher Education	4.40%	1.10%	2.70%	2.20%	1.60%
Prisons	4.40%	1.10%	2.70%	2.20%	1.60%
Courts	4.40%	1.10%	2.70%	2.20%	1.60%
Multi-residential	4.40%	1.10%	2.70%	2.20%	1.60%
Other buildings	4.40%	1.10%	2.70%	2.20%	1.60%

Table - 41 : Health and wellbeing issues by building type and their percentage contribution to BREEAM performance

Building type	Hea 01	Hea 02	Hea 03	Hea 04	Hea 05	Hea 06
Office	2.80%	5.60%	1.90%	0.90%	1.90%	1.90%
Retail	3.50%	5.30%	1.80%	0.90%	1.80%	1.80%
Industrial	2.80%	5.60%	1.90%	0.90%	1.90%	1.90%
Healthcare	4.20%	5.00%	1.70%	0.80%	1.70%	1.70%
Primary School	2.60%	5.30%	1.80%	0.90%	2.60%	1.80%
Secondary school	2.60%	5.30%	1.80%	0.90%	2.60%	1.80%
Further Education	2.80%	5.60%	1.90%	0.90%	1.90%	1.90%
Higher Education	2.80%	5.60%	1.90%	0.90%	1.90%	1.90%
Prisons	2.80%	5.60%	1.90%	0.90%	1.90%	1.90%
Courts	2.80%	5.60%	1.90%	0.90%	1.90%	1.90%
Multi-residential	2.50%	5.00%	1.70%	0.80%	3.30%	1.70%
Other buildings	2.80%	5.60%	1.90%	0.90%	1.90%	1.90%

Table - 42: Energy issues by building type and their percentage contribution to BREEAM performance

Building type	Ene 01	Ene 02	Ene 03	Ene 04	Ene 05	Ene 06	Ene 07	Ene 08	Ene 09
Office	8.10%	1.10%	0.50%	2.70%	1.60%	1.10%	2.70%	1.10%	0.00%
Retail	9.50%	1.30%	0.60%	3.20%	1.90%	1.30%	0.00%	1.30%	0.00%
Industrial	8.10%	1.10%	0.50%	2.70%	1.60%	1.10%	2.70%	1.10%	0.00%
Healthcare	8.10%	1.10%	0.50%	2.70%	1.60%	1.10%	2.70%	1.10%	0.00%
Primary School	8.40%	0.60%	0.60%	2.80%	1.70%	1.10%	2.80%	1.10%	0.00%
Secondary school	8.40%	0.60%	0.60%	2.80%	1.70%	1.10%	2.80%	1.10%	0.00%
Further Education	8.10%	1.10%	0.50%	2.70%	1.60%	1.10%	2.70%	1.10%	0.00%
Higher Education	8.10%	1.10%	0.50%	2.70%	1.60%	1.10%	2.70%	1.10%	0.00%
Prisons	8.10%	1.10%	0.50%	2.70%	1.60%	1.10%	2.70%	1.10%	0.00%
Courts	9.80%	0.70%	0.70%	3.30%	2.00%	1.30%	0.00%	1.30%	0.00%
Multi-residential	9.83%	0.66%	0.66%	3.28%	1.31%	1.31%	0.00%	1.31%	0.66%
Other buildings	8.38%	1.12%	0.56%	2.79%	1.12%	1.12%	2.79%	1.12%	0.00%

Table - 43: Transport issues by building type and their percentage contribution to BREEAM performance

Building type	Tra 01	Tra 02	Tra 03	Tra 04	Tra 05
Office	2.70%	0.90%	1.80%	1.80%	0.90%
Retail	4.40%	0.90%	1.80%	0.00%	0.90%
Industrial	2.70%	0.90%	1.80%	1.80%	0.90%
Healthcare	4.00%	0.80%	1.60%	0.80%	0.80%
Primary School	3.40%	1.10%	2.30%	0.00%	1.10%
Secondary school	3.40%	1.10%	2.30%	0.00%	1.10%
Further Education	3.60%	0.70%	1.50%	1.50%	0.70%
Higher Education	3.60%	0.70%	1.50%	1.50%	0.70%
Prisons	4.00%	0.00%	2.00%	0.00%	2.00%
Courts	4.40%	0.90%	1.80%	0.00%	0.90%
Multi-residential	2.70%	1.80%	0.90%	1.80%	0.90%
Other buildings	3.60%	0.70%	1.50%	1.50%	0.70%

Table - 44: Water issues by building type and their percentage contribution to BREEAM performance

Building type	Wat 01	Wat 02	Wat 03	Wat 04
Office	3.30%	0.70%	1.30%	0.70%
Retail	3.30%	0.70%	1.30%	0.70%
Industrial	3.30%	0.70%	1.30%	0.70%
Healthcare	3.30%	0.70%	1.30%	0.70%
Primary School	3.30%	0.70%	1.30%	0.70%
Secondary school	3.30%	0.70%	1.30%	0.70%
Further Education	3.30%	0.70%	1.30%	0.70%
Higher Education	3.30%	0.70%	1.30%	0.70%
Prisons	3.30%	0.70%	1.30%	0.70%
Courts	3.30%	0.70%	1.30%	0.70%
Multi-residential	3.30%	0.70%	1.30%	0.70%
Other buildings	3.30%	0.70%	1.30%	0.70%

Table - 45: Material issues by building type and their percentage contribution to BREEAM performance

Building types	Mat 01	Mat 02	Mat 03	Mat 04	Mat 05
Office	4.80%	1.90%	2.90%	1.90%	1.00%
Retail	5.20%	1.00%	3.10%	2.10%	1.00%
Industrial	2.80%	1.40%	4.20%	2.80%	1.40%
Healthcare	5.80%	1.00%	2.90%	1.90%	1.00%
Primary School	5.80%	1.00%	2.90%	1.90%	1.00%
Secondary school	5.80%	1.00%	2.90%	1.90%	1.00%
Further Education	5.80%	1.00%	2.90%	1.90%	1.00%
Higher Education	5.80%	1.00%	2.90%	1.90%	1.00%
Prisons	4.50%	1.10%	3.40%	2.30%	1.10%
Courts	5.80%	1.00%	2.90%	1.90%	1.00%
Multi-residential	5.80%	1.00%	2.90%	1.90%	1.00%
Other buildings	5.80%	1.00%	2.90%	1.90%	1.00%

Table - 46: Waste issues by building type and their percentage contribution to BREEAM performance

Building types	Wst 01	Wst 02	Wst 03	Wst 04
Office	4.30%	1.10%	1.10%	1.10%
Retail	5.00%	1.30%	1.30%	0.00%
Industrial	5.00%	1.30%	1.30%	0.00%
Healthcare	5.00%	1.30%	1.30%	0.00%
Primary School	5.00%	1.30%	1.30%	0.00%
Secondary school	5.00%	1.30%	1.30%	0.00%
Further Education	5.00%	1.30%	1.30%	0.00%
Higher Education	5.00%	1.30%	1.30%	0.00%
Prisons	5.00%	1.30%	1.30%	0.00%
Courts	5.00%	1.30%	1.30%	0.00%
Multi-residential	5.00%	1.30%	1.30%	0.00%
Other buildings	5.00%	1.30%	1.30%	0.00%

Table - 47: Land Use and Ecology issues by building type and their percentage contribution to BREEAM performance

Building types	LE 01	LE 02	LE 03	LE 04	LE 05
Office	2.00%	1.00%	2.00%	3.00%	2.00%
Retail	2.00%	1.00%	2.00%	3.00%	2.00%
Industrial	2.00%	1.00%	2.00%	3.00%	2.00%
Healthcare	2.00%	1.00%	2.00%	3.00%	2.00%
Primary School	2.00%	1.00%	2.00%	3.00%	2.00%
Secondary school	2.00%	1.00%	2.00%	3.00%	2.00%
Further Education	2.00%	1.00%	2.00%	3.00%	2.00%
Higher Education	2.00%	1.00%	2.00%	3.00%	2.00%
Prisons	2.00%	1.00%	2.00%	2.00%	3.00%
Courts	2.00%	1.00%	2.00%	3.00%	2.00%
Multi-residential	2.00%	1.00%	2.00%	3.00%	2.00%
Other buildings	2.00%	1.00%	2.00%	3.00%	2.00%

Table - 48: Pollution issues by building type and their percentage contribution to BREEAM performance

Building types	Pol01	Pol02	Pol03	Pol04	Pol05
Office	2.30%	2.30%	3.80%	0.80%	0.80%
Retail	2.30%	2.30%	3.80%	0.80%	0.80%
Industrial	2.50%	1.70%	4.20%	0.80%	0.80%
Healthcare	2.30%	2.30%	3.80%	0.80%	0.80%
Primary School	2.30%	2.30%	3.80%	0.80%	0.80%
Secondary school	2.30%	2.30%	3.80%	0.80%	0.80%
Further Education	2.30%	2.30%	3.80%	0.80%	0.80%
Higher Education	2.30%	2.30%	3.80%	0.80%	0.80%
Prisons	2.30%	2.30%	3.80%	0.80%	0.80%
Courts	2.30%	2.30%	3.80%	0.80%	0.80%
Multi-residential	2.30%	2.30%	3.80%	0.80%	0.80%
Other buildings	2.30%	2.30%	3.80%	0.80%	0.80%

Table - 49: Innovaion issues by building type and their percentage contribution to BREEAM performance

Building types	Inn 01
Office	10.00%
Retail	10.00%
Industrial	10.00%
Healthcare	10.00%
Primary School	10.00%
Secondary school	10.00%
Further Education	10.00%
Higher Education	10.00%
Prisons	10.00%
Courts	10.00%
Multi-residential	10.00%
Other buildings	10.00%

Index

A

Accessibility Index 201

Accessible 57

Accredited energy assessor 136

Aggregates 311

- Hospital Sterilisation and Disinfection Unit. 311
- Secondary aggregates 312

anchor tenant 318

Appropriate consultant 384

Appropriate statutory body 384

Appropriate targets 305

Approved building energy calculation software 136

Approved Innovation 401

Architectural Liaison Officer 126

Art 79

Average daylight factor 79

B

Baler 318

BAPS 353

BEMS 152

Biodiversity 353

Biodiversity Action Plan 353

biofuels 165

BRE Environmental Profile Methodology 261

BREEAM Mat 01 calculator 261

BREEAM Mat 03 Calculator 279

BREEAM Mat 04 calculator 296

BREEAM Tra 01 Calculator 201

BREEAM Wat 01 calculator 237

BS8233 108

Building Bulletin 93 revision (schools) 116

Building Emission Rate 136

Building Regulations 116

Buying Solutions 190

C

Carbon negative building 136

Carbon neutral 137

Care Homes 222

Catchment 385

Chain of custody 279

CITES 280

ClassCool 100

ClassVent 93

Clinical Waste 318

Colour rendering index 155

Common areas 152

Complex systems 38

Compliant Test Body 116

Composite material 280

Computer simulation 79

Considerate Constructors Scheme 42

Construction processes 47

Construction zone 79, 156, 251, 326, 331, 393

Contaminant 326

Control devices 385

Controlled service 137

Convention on International Trade in Endangered Species 280

Conversion factors 370

cost 62

- discounted 62
- real 62

Counterbalancing ratio 174

Crime Prevention Design Advisor 126

Critical value 60

CSSD 245

D

Data centre 190

Daylight sensor 156

Dedicated non-obstructive position 318

DELC 359

Design flood event 385

Design flood level 385

Design storm event 385

Development Managers 126

Direct Effect Life Cycle - Carbon Dioxide Equivalent 359

discounted cost 62

Domestic scale components 237

Dwelling Emission Rate 137

Dynamic Simulation Model 137

E

ECA Energy Technology Product List 171

Ecology related subject 332

Ecopoint 261

Effective flush volume 237

Energy performance of lifts, escalators and moving walks 174

Energy Performance Ratio 137

Energy Specialist 164

Energy supply 152

Environmental Product Declaration 261

est Practice SWMP 306

Excess Oxygen Correction 371

External site areas 126

F

Factory gate 47

Fit for purpose 190

Fixed building service 137

Flagship tenant 318

Flood defences 385

Flood event 385

Flood risk 385

Flood risk assessment 385

Flood storage 386

Flood zones 386

Frame 280

Free cooling 165

Fume cupboard 93

G

Global Warming Potential 360

Government's Buying Standards 191

Green Dragon Environmental Standard 280

Green Guide 262

Green Guide element number 262

Green Guide to Specification 262

Greenfield 386

Greenfield run-off rate 386

Greywater recycling 237

Groups 116

GWP 360

H

Habitable rooms 117

Hard Landscaping 280

Hard surfaces 386

High frequency ballast 79

HSDU 245

I

I.T-intensive areas 191

Illuminance 80

Indirect operational greenhouse gas emissions 171

Infiltration 386

Insulation Index 296

ISO Draft standard CD25745-1 174

K

Key process 280

L

Laboratory Areas 179

Legally Sourced Timber 281

Legionnaires disease 105

Levels 370

Life Cycle Assessment 165

Life cycle cost 62

Life Cycle Cost analysis 191

Life cycle costing 62

Lift car lighting 175

Limiting discharge 386

linical area 79

Living-out personnel 222

Low grade aggregate uses 311

Low risk areas 386

Luminous efficacy 156

M

Machine Room Less lift 175

Main building entrance 201

Material change of use 117

Materials optimisation 296

Microgeneration Certification Scheme 165

Moderately airtight enclosure 359

MRL 175

Multiple occupancy offices 117

N

National Calculation Method 137

NCM 137

Near-site LZC 137

Net lettable area 218

NLA 218

Noise sensitive area 398

Non-habitable rooms 117

Non potable water 238

Notional building 137

NR curves 121

O

Occupied space 80

Occupied spaces 117

Office equipment 191

On-site LZC 138

Online Green Guide calculator 262

Online Responsible Sourcing Calculator 281

Ozone Depleting Potential 359

P

Patient areas 80

Payback period 165

Peak run-off rate 386

Peer review 126, 332

Point daylight factor 80

Point of use water cooler 105

Pollution linkages 326

Post-consumer waste stream 281, 311

Potable water 238

Pre-consumer waste stream 281, 311

Pre-development 386

Previously developed land 326

Primary energy consumption 138

Prison Service biodiversity action plan 353

Prisons 201

Private wire arrangement 138

Proposed development 326

Public areas 80

Q

Qbar 386

R

Rainwater discharge 387

Rainwater recycling 238

real cost 62

Recyclable storage 318

Recycled aggregates 311

Recycled material 281

REEAM Accredited Professional 38

Refrigerant 360

Refrigerant leak detection 360

Refrigerant pump down 360

Refrigerant recovery 360

Regulated energy 138

Remediation 327

Renewables Obligation Certificate 138

Responsible sourcing 281

Responsible Sourcing Calculator 290

Reused materials 262, 281

Robust Details 117

ROC 138

Room for residential purposes 117

Run-off 387

S

Safer Parking Scheme 126

SAP 138, 146

sb 126

SBEM 138, 146

Secondary aggregates 312

Secure space 194

Secured by Design 126

Separate occupant control 80

Separate Occupant Control 101

Sewerage undertaker 387

Sheltered Housing 222

Significant contamination 327

Significant Quantity 305

Simplified Building Energy Model 138

Single occupancy offices 118

Site Waste Management Plan 306

Small company 282

Soakaways 387

Specified performance level 117

Staff areas 80

Standard Assessment Procedure for Energy Rating of Dwellings 138

Standby condition 175

Suitably qualified acoustician 118, 398

Suitably qualified ecologist 331

Suitably Qualified Security Consultant 126

Supply chain EMS 281

Surface Water Run-off 387

SWMP 306

T

Target Emission Rate 138

The ILE Guidance notes 393

Thermal Dynamic Analysis 101

Thermographic survey 38

Tier levels 282

Time Out of Range 101

Time switch 156

Travel Plan 228

Treated 38

Treatment 387

trees 331

Types of Oil Separator 387

U

Uniformity 80

Unregulated energy 139

Unregulated water 251

V

Vehicle Wash 251

View of sky 80

Volatile Organic Compound 93

Volatile Organic Compounds 94

Volume of run-off 387

W

Waste compactor 318

Waste stream 281

Waste treatment 318

Water systems 104

Weighted standardised impact sound pressure level 118

Weighted standardized level differences 118

White goods 191

Working plane 80

Z

Zero net carbon (CO2) emissions 139

BRE Global
Bucknalls Lane
Watford
United Kingdom
WD25 9XX

T +44 (0) 1923 664462
E breeam@bre.co.uk
www.breeam.org