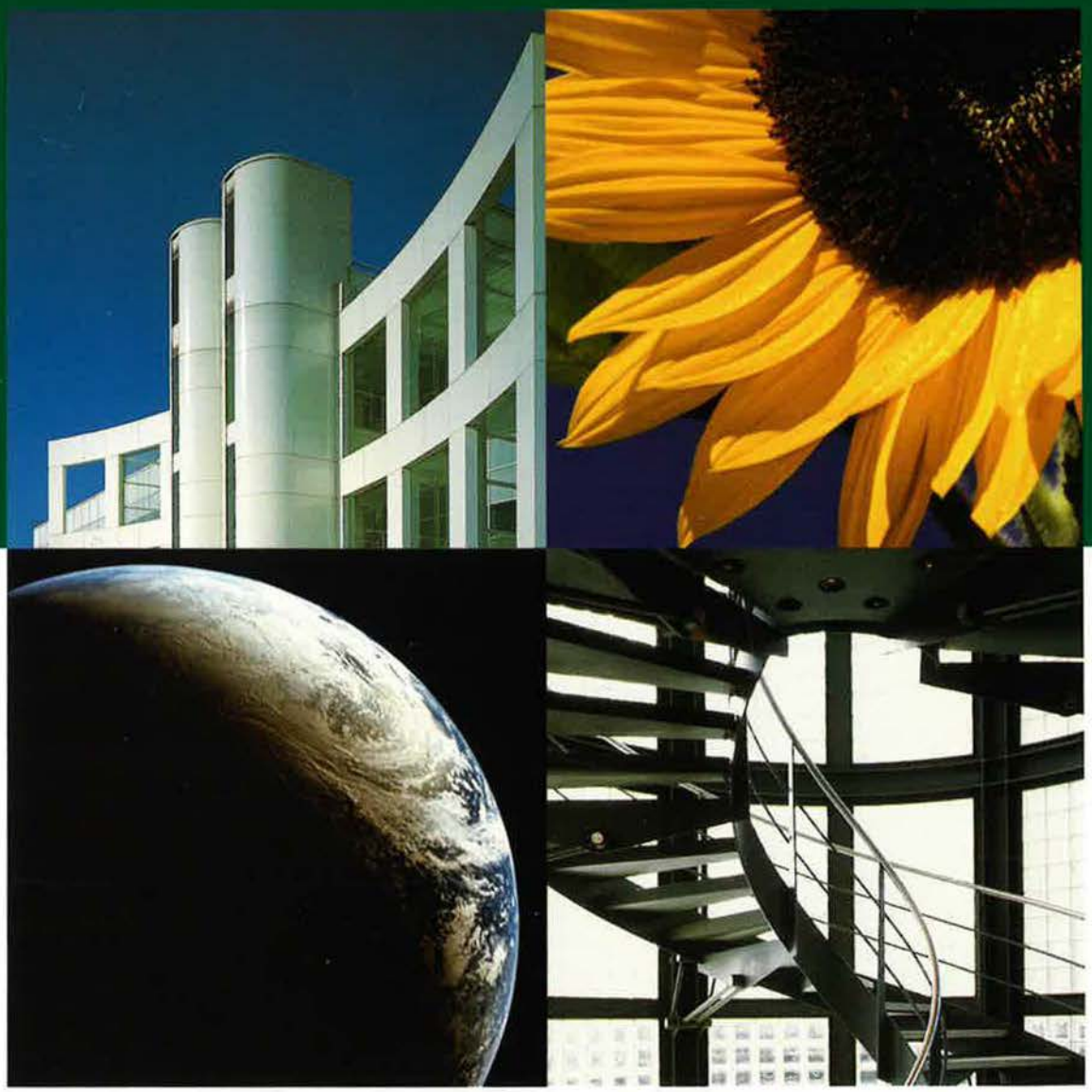
BREEAM 98 for offices

Roger Baldwin Alan Yates Nigel Howard Susheel Rao



BREEAM BRE

BREEAM 98 for offices

an environmental assessment method for office buildings

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Introduction

The Building Research Establishment Environmental Assessment Method (BREEAM) was originally launched in 1990[1]. It sought to provide authoritative guidance on ways of minimising the adverse effects of buildings on the global and local environments while promoting a healthy and comfortable indoor environment. It was a world first, and has since formed the basis for similar schemes in other countries. In the UK it has been widely accepted as representing best practice, with significant market penetration. It is an important component of the environmental policy of many major businesses.

The basis of the scheme is a certificate awarded to individual buildings on the basis of 'credits' for a set of performance criteria. The certificate provides a 'label' for the building that enables the owners or occupants to gain recognition for the building's environmental performance. The certificate can be displayed in the building or used as part of an organisation's overall environmental statement. The building is assessed independently by trained assessors appointed by BRE. BRE is responsible for specifying the criteria and methods of assessment and for quality assurance of the assessment process used.

The main objectives of the scheme are:

- To distinguish buildings of reduced environmental impact in the market place.
- To encourage best environmental practice in building design, operation, management and maintenance.
- To set criteria and standards going beyond those required by law and regulations.
- To raise the awareness of owners, occupants, designers and operators of the benefits of buildings with a reduced impact on the environment.

BREEAM is regularly updated to take advantage of new research, to reflect changing priorities in regulations and in the market place, to build on experience gained, and generally to keep it up to date. The aim is to ensure that BREEAM continues to represent current best practice, going beyond what is required by regulations. BREEAM for offices was first revised in 1993[2][3]. This publication describes the latest version, launched in September 1998, which includes major changes in the way BREEAM operates, incorporates several major environmental issues which can now be assessed, and includes a new way of assigning priorities between the issues covered.

The BREEAM label for buildings

BREEAM was conceived as a tool to stimulate demand for 'green' buildings in the market place, to send signals to clients and occupiers who wish to do something for the environment. Labelling is a well established tool for conveying to consumers important credentials about products, whether it be health, energy or safety. An environmental label for buildings is an obvious choice for demonstrating the environmental credentials of a building to an increasingly environmentally conscious public and business community. BREEAM is therefore focused on providing a credible, transparent label for buildings based on best practice. It may be applied either at the design and refurbishment stages, or for existing buildings in operation.

BRE research has shown that around 20% of office buildings in northern Europe would be prime candidates for using natural ventilation techniques.

For existing buildings, environmental management is particularly important. The assessment of management policies and practice against best practice criteria within BREEAM provides a valuable benchmark for businesses and an action plan for continuous improvement. The BREEAM label will provide assurance to senior managers, staff and shareholders that environmental issues are well under control.

BREEAM awards an environmental label after assessing buildings against a range of environmental issues covering the impacts of buildings on the environment at global, regional, local and indoor levels. For each issue there are a number of 'credits' available. Where buildings have attained or exceeded various benchmarks of performance, an appropriate number of credits is awarded. For energy there are 15 credits available, depending on the level of emissions of carbon dioxide (CO_2) relating to energy consumption in the building. Overall, more than 100 credits are available. The philosophy of BREEAM is always to reward positive steps taken to improve the environmental performance of buildings, a feature much valued by clients.

In the UK there are approximately 520 000 refrigeration systems that use ozone-depleting refrigerants for general air conditioning/comfort cooling in buildings.

The number of credits attained is interpreted in the form of an overall rating of *Excellent*, *Very Good*, *Good* and *Pass*. The method of weighting issues relative to each other is described below.

Business benefits

It is also becoming increasingly important for businesses to take into account future legislation and fiscal measures aimed at improving the environment: eg reducing dependence on the car; creating vital and viable town centres; and reducing the emission of greenhouse gases into the atmosphere. The Government has issued two consultation papers recently, one on sustainable development, the other on sustainable construction, which outline a range of fiscal, legislative and voluntary measures which are under consideration. The Transport White Paper, published on 20 July 1998[4], proposes a range of fiscal measures; for example charges on workplace parking. The Government's commitment to reducing CO_2 levels both at the Kyoto Conference in December 1997 and in the more challenging Manifesto commitments, will require significant improvements in energy efficiency by all. These measures

will have an increasing impact on businesses. BREEAM offers a convenient tool for reducing environmental impacts and hence the impact of future fiscal measures and legislation.

A market survey carried out by Deloitte & Touche Consulting Group asked current and potential users of BREEAM what benefits they expected and achieved from an environmental assessment.

The construction needs in the UK consume approximately 366 million tonnes of materials per year. The extraction and supply of these has significant effects on the environment.

The main business benefits identified were:

- Financial – achieving higher rental incomes, increasing energy efficiency, and higher productivity.
- PR/marketing – as a selling point to potential customers or tenants.
- Benchmarking – ensuring best practice, providing a thorough checklist for comparing buildings and guiding their improvement.
- Staff/user benefits – creating a better place for people to work more productively.
- Environmental improvement – to support a wider corporate strategy or act as a stand-alone review.

The results of the survey are shown in Figure 1. Although many of these benefits are hard to quantify, about 20% of respondents said they had measured at least some of the impacts on their business. The survey also revealed that these business benefits are the key reasons for clients choosing to commission a BREEAM assessment.

BREEAM 98 for offices provides a tool for measuring the environmental impact of a building throughout its life and so benchmarking this against other buildings or the UK office stock generally. There are a number of key uses for the methodology which relate to the benefits above:

About 25 million tonnes of waste are generated by the construction industry each year.

- Maximising opportunities during design of both new build and refurbishment schemes.
- Specifying environmental requirements in the procurement and management of office accommodation of any age or type.
- Providing an independently verifiable measurement tool for use within Environmental Management Systems. These can range from formal certification schemes such as ISO 14000 and EMAS to simple locally developed systems.
- Providing an independently verifiable environmental label for marketing and promotional purposes.

Appendix A highlights some of the benefits that can be achieved by addressing the range of issues covered by BREEAM.

Buildings account for around half of the UK's emissions of carbon dioxide, the main 'greenhouse' gas.

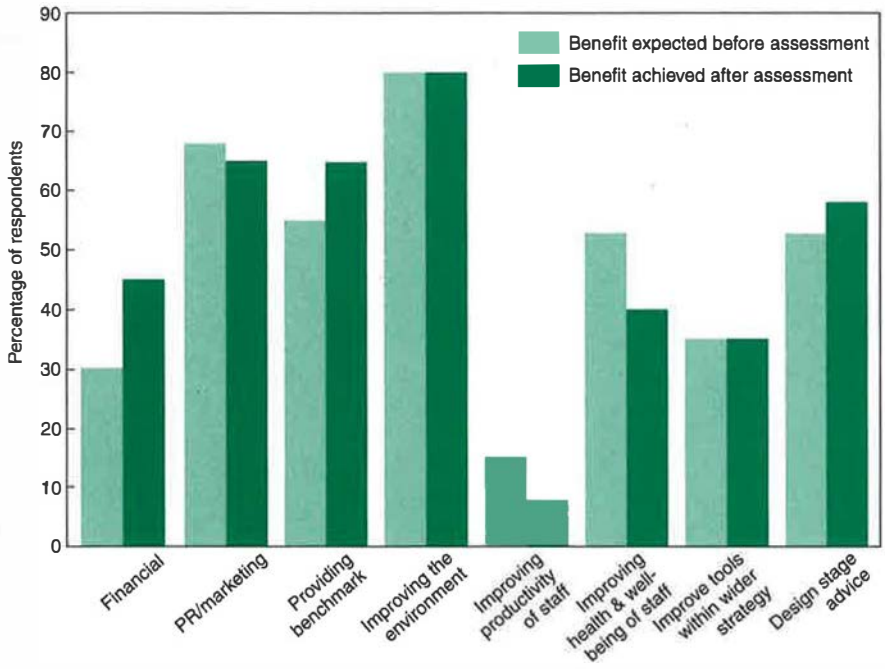

Figure 1 Benefit expectations of users of BREEAM before and after a BREEAM assessment

Sustainable development

Since BREEAM was first launched in 1990 the world-wide policy climate[5] relative to the environment, has shifted. Environmental issues have become increasingly important as one component of sustainable development. This is now a key element in determining environmental policy at an international, national, business and community level. Construction makes a significant contribution to sustainable development: it is a major sector of the economy and an essential contributor to our quality of life. Equally, construction and maintenance form a massive consumer of resources, and produce a large mass of waste and pollution of the environment.

Lighting typically represents between 20% and 40% of all energy costs in offices.

Sustainable development is concerned with achieving development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Four main aims of sustainable development have been identified in the UK[6]:

- Social progress which meets the needs of everyone.
- Effective protection of the environment.
- Prudent use of natural resources.
- Maintenance of high and stable levels of economic growth and employment.

Only 12 million tonnes of demolition materials are recycled or re-used each year, mostly for low-grade uses. A further 6 million tonnes could be recycled.

BREEAM addresses the following which are relevant to these aims:

- Environmental impacts, leading to protection and perhaps enhancement of the environment by reducing pollution of air, land and water.
- Prudent use of natural resources by: providing durable buildings able to survive changes of fashion and use; selection of materials and products with better environmental performance; encouraging appropriate recycling; encouraging the re-use of buildings; encouraging the re-use of land, water economy, etc.
- Quality of life, with competitive business providing high-quality built environments, buildings and indoor environments to satisfy human and business needs.

How to get a BREEAM assessment

For further details on commissioning a BREEAM assessment or obtaining an Assessment Licence contact the BREEAM Office at BRE:

Tel: 01923 664462
Fax: 01923 664103
E-mail: breeam@bre.co.uk

BREEAM 98 for offices

In the UK over 33 billion litres of water are extracted each day. This equates to about 7.5 baths per person per day. Over half of this is supplied to the public water system.

Background to the current scheme

New and existing offices have hitherto been assessed by different versions of BREEAM. The version for new office buildings[2] has achieved significant market penetration, with some 25% of new office designs assessed. Take-up of the scheme for existing offices[3] is similar in numbers but has been disappointing in relation to the size of the market.

BREEAM is a market-focused tool aimed at encouraging significant improvements in the performance of buildings in the UK through providing recognition and demonstrating the benefits of improvements made. It is essential that the BREEAM scheme meets the needs of current and potential customers and that it remains up to date and close to the market. The Deloitte & Touche market survey assessed current perceptions of, and satisfaction with, BREEAM amongst current customers, and evaluated the needs of potential new customers, primarily from the existing offices sector. As a result of this survey and discussions with various stakeholders, it was decided to make significant changes to the scheme to provide greater clarity and greater flexibility in the way the scheme operates.

The main changes are as follows.

1 The existing and new offices versions of BREEAM are consolidated into a single scheme.
2 The scheme consists of a core assessment of the building fabric and services with two optional parts relating to the quality of the design/procurement and management/operating procedures.
3 Issues overtaken by legislation/general practice are removed.
4 New issues are included where knowledge has improved, to ensure a broader coverage of sustainability and environmental issues. These include materials specification and consideration of commuter transport.
5 A weighting scheme has been introduced to determine objectively an overall rating for the building.

Scope of the assessment

BREEAM establishes a set of issue categories under which specific credit requirements are grouped. These are:

● Management	Overall policy and procedural issues
● Health and comfort	Indoor and external issues
● Energy	Operational energy and CO_2 issues
● Transport	Transport-related CO_2 and locational issues
● Water	Consumption- and leakage-related issues
● Materials	Environmental implications of materials selection
● Land use	Greenfield and brownfield site issues
● Site ecology	Ecological value of the site issues
● Pollution	Air and water pollution issues (excluding CO_2)

Within each category there are a number of credit requirements that reflect the options available to designers and managers of buildings. The number of credits in each category does not reflect the relative importance of these issues. This is given by the weighting factors that are described in more detail under *Weighting of assessment criteria issues within BREEAM*.

Appendix A sets out the background to the issues covered by each of these issue categories and the aims of BREEAM in addressing them. It also establishes the key benefits that arise from tackling these. The *Assessment prediction* checklist, provided as a loose insert in this publication, details the specific credit requirements. These are simplified from the full assessment requirements for use by design/management teams. A registered assessor will be able to predict accurately the result of an assessment by running through the full methodology.

Changes in the current version of BREEAM

There was a total of 396 km^2 of derelict land in England in 1993. It is estimated that 316 km^2 of this justified reclamation.

The current version of BREEAM represents a substantial step forward from earlier versions. This is a result of a major review of the BREEAM issues, improved knowledge, improved industry practice and greater availability of technology and design options that can lead to further improvement. The main changes are described in *Background to the current scheme*. In addition, three key features of the scheme have changed.

1 The move towards a full life assessment of the building improves the ability of building users to make use of BREEAM to evaluate and monitor all their accommodation requirements.
2 For most of the issues in BREEAM, changes have been made to the performance levels specified for credit. Where possible these have been set to encourage improvement without being prescriptive in the means of achieving this. The estimating procedure for water consumption, in place of a list of water-saving features, is an example of this.
3 Major changes to the structure of the assessment method arise from the introduction of environmental weightings into the process. This has resulted in a move away from the *Global*, *Local* and *Indoor* categories of earlier versions to a set of assessment categories that relate better both to industry concerns and to environmental impacts.

The aim is to minimise the difficulty of collecting data and maximise the tool's credibility as an environmental auditing method.

Table 1 sets out the major changes in technical content that have been included in this version of BREEAM.

BREEAM has been developed as a reviewing and auditing tool for use within environmental management procedures. For this reason continuity of assessment is an important aspect. This allows updates to be carried out at any time and comparisons to be made between new and old assessments. Finally the new scheme has been designed to be more accessible to those who use it. A wider assessor network and greater flexibility in pre-assessment guidance will improve access to BREEAM to optimise both the design of a building and the effectiveness of its management procedures.

50 – 70% of office waste can be recycled. This could achieve significant savings in the cost of disposal.

Weighting of assessment criteria issues within BREEAM

In previous versions of BREEAM, assessment criteria were grouped into three categories: *Global*, *Local* and *Indoor*. The numbers of credits awarded within each of the categories implied some degree of weighting. Until now, however, no attempt had been made to weight the issues on a common scale and hence to arrive at a single score for a building. BREEAM now includes a consensus-based weighting of all the issues and this is used to calculate a final rating for the building being assessed. This marks a significant improvement in the method.

Table 1 Major changes in technical content in BREEAM 98 for offices

Issue category	Additions and amendments	Omissions
Management	● Better definition on policy and procedural requirements ● Definition of good practice in maintenance requirements ● Recognition of environmental management within occupant organisations ● Commitment to full commissioning of fabric and services	
Health and comfort	● Location of air intakes included ● Glare prevention included ● Distance to windows included ● Local temperature control included ● Occupant satisfaction and feedback included ● Healthy buildings indicators included as separate credit requirements in most cases ● Lighting levels amended ● Assessment of thermal comfort amended ● Indoor air quality credits revised	● External noise prediction ● Radon requirements ● Wind effects around buildings ● Overshadowing of adjacent sites
Energy	● CO_2 scale extended to zero ● Energy monitoring and targeting included ● Actual energy consumption figure included and benchmarked	
Transport	● Improved definition of public transport provision ● Transport-related CO_2 impacts from site selection included ● Corporate policies and initiatives on transport included	
Water	● Water consumption calculation figures included ● Water monitoring and targeting included ● Leak detection provisions included	● Prescriptive requirements for water-saving fittings
Materials	● Life cycle environmental impacts of construction materials included ● Removal of exclusion clauses for paints, timber treatments, etc ● Recognition of independently certified timber sources ● Re-use of buildings included ● Corporate recycling policy included	● Prescriptive requirements on materials utilising industrial wastes/ recycled materials
Land use	● Greenfield/brownfield issues revised	
Site ecology	● Change in ecological diversity included ● Identification and protection of key features on site included ● Simple ecological enhancement review included	
Pollution	● Recycled insulant materials included ● Refrigerant recovery and detection requirement revised ● Credits for reduced NO_x-emitting burners in boiler plant amended	● Credits for 'reduced ODP' refrigerants removed

A city-centre air-conditioned office causes similar levels of CO_2 emissions from operation of the building and the commuting of its staff.

Research carried out by the Centre for Sustainable Construction at BRE in 1997/8 established a preliminary set of consensus weightings for environmental issues based on the priorities and views of a wide range of interest groups. This work was funded under the Department of the Environment, Transport and the Region's 'Partners in Technology' programme. Broader issues of sustainable construction were also considered. The project found a high degree of consensus about the relative importance of different sustainability issues across the following interest groups:

- Government policymakers
- Construction professionals
- Local authorities
- Materials producers
- Developers and investors
- Environmental groups and lobbyists
- Academics

The results of the study will require more refinement in the future and will need to be repeated at intervals to reflect changing views and priorities. In the meantime, they provide a useful guide to understanding current priorities for future action and, in particular, to assess the relative weightings of different environmental issues included in BREEAM .The results of this work have, therefore, been used to inform the calculation of a final rating. The process is set out in Figure 2 and is as follows:

Energy used to manufacture and transport building materials represents about 10% of the UK total energy consumption.

- BREEAM establishes a set of issue categories under which specific credit requirements are grouped. These are described in the earlier section *Scope of the assessment.*
- Within each category there are a variable number of credits that reflect the options available to building designers and managers. The number of credits in each category does not reflect the relative importance of these issues.
- The percentage of credits is calculated for each issue category and an issue-weighting factor is applied to adjust the score under each category.
- An overall building score can then be calculated for the building and a rating applied.

Use of water in WCs accounts for about 40% of all water used in the office.

The *Assessment prediction* checklist provided as a loose insert in this publication gives the current weightings for each of the categories and can be used to calculate a prediction of a BREEAM rating for a building. Since the formal

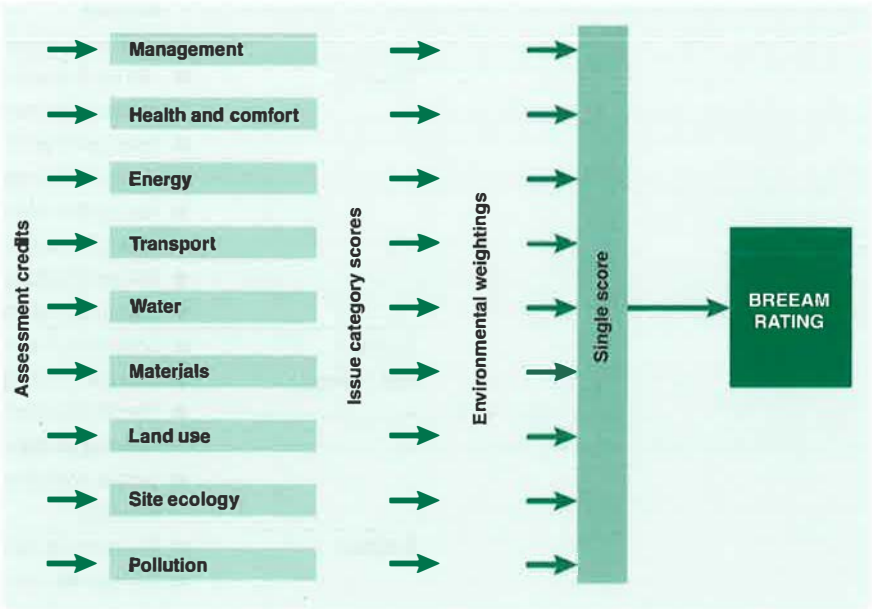

Figure 2 Process of calculation of an overall rating under BREEAM

assessment makes use of assessment tools that are not available to non-assessors, the final rating that a building might achieve when assessed might differ slightly from that predicted by the checklist. The involvement of an assessor at an earlier stage in a design or management process can give a more accurate prediction where this is necessary.

About 400 tonnes of refrigerants are lost to the atmosphere every year through leakage and maintenance. This equates to a global warming potential equivalent to 820 000 tonnes of CO_2. This would fill a balloon approximately 1 km in diameter.

Assessment process

The assessment will comprise three parts as shown in Figure 3. A core assessment of the building fabric and services will be carried out in all cases. The two parts dealing with the quality of the design/procurement and management/operation procedures are included as appropriate. They are, however, important issues to consider and present significant opportunities for auditing and improvement of buildings.

1 Core

The issues assessed here will result in a credible and comparative assessment of the building's potential environmental impacts in operation. This allows buildings of any age to be compared across the range of issues covered to give a consistent tool for the property market.

2 Design and procurement

This part of the assessment aims to optimise the outcome of a design/procurement exercise. It is carried out for all new build and refurbished designs. It will cover those issues that are of relevance during the design process, such as issues of specification and process.

3 Management and operation

This part of the assessment will only be carried out on a building that is occupied. It will provide occupants and managers with an independent audit of the way the building is managed. This presents significant benefits to the client in financial, legal, health/well-being and image terms. It is also intended that this part of the assessment will not only provide a review of performance but also lead naturally to the development of an action plan that can be carried forward by the client.

Only 10% of office buildings have no option but to employ air conditioning, owing to environmental pollution or extremes of climate.

The BREEAM assessment service has been developed to provide flexibility and thus is capable of meeting the requirements of particular clients. The most appropriate form of assessment service varies depending on the the building being assessed but assessors will offer services as shown in Appendix B.

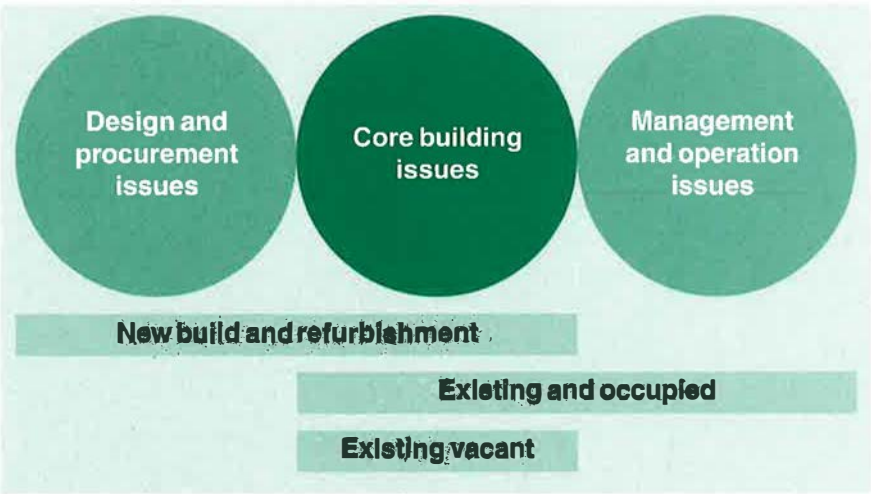

Figure 3 Structure of assessment process of BREEAM for offices

Quality control

BREEAM certification is carried out by BRE. The certificate is issued on the basis of a report prepared by a registered assessor. Assessment organisations are licensed by BRE to carry out formal assessment reviews, prepare assessment reports and offer related consultancy services under the BREEAM label. Stringent quality management procedures have been adopted to ensure a consistent approach and level of service. Assessors are not required to be formally certified under a quality management scheme such as ISO 9000 as this would limit the number and range of organisations that are able to offer the service. Where formal quality certification is required some assessors will be able to offer this.

'BREEAM' and its logo are registered trademarks owned by BRE. Use of the methodology is tightly controlled so as to maintain quality and consistency in assessments carried out using it. The formal assessment process uses a number of tools that are only available to licensed assessors and are maintained and updated by BRE. For this reason assessments and related consultancy services can only be offered by licensed assessment organisations and individuals. BRE can supply a directory of licensed assessors from which assessors and consultants can be selected. No limit is placed on the range and number of assessors but formal training is required before a licence is granted.

Feedback is an important aspect of the scheme and BRE collects and analyses data on assessments carried out. General data and case studies will be published by BRE on a regular basis with the consent of the client.

Lighting and small power use produces significant heat, which needs to be removed by ventilation or an air conditioning system.

Water consumption has risen by 70% over the last 30 years.

Appendix A

Issues assessed under BREEAM

Climate change

There is mounting evidence that the global climate is changing as a result of human activities. There are two major concerns:

1 First, the release of CO_2 and other gases into the atmosphere is increasing the greenhouse effect and leading to global warming.
2 Second, the release of some chemicals into the atmosphere is leading to the destruction of the ozone layer in the stratosphere that protects all living things from harmful UV radiation from the sun. It also serves to regulate the convective currents in the troposphere, and so influences the weather.

Buildings and their use have a significant impact on both issues.

Global warming

The greenhouse effect is caused by gases in the atmosphere that absorb and re-emit a proportion of the infra-red radiation emitted by the earth's surface, leading to a warming of the lower atmosphere. The cause for concern is the increase in the greenhouse effect, due to increasing levels of gases such as CO_2, methane, chlorofluorocarbons (CFCs) and nitrous oxides (NO_x).

At the Kyoto Conference in December 1997, developed countries agreed to cut their emissions of greenhouse gases by an average of 5.2% in the period 2008 to 2012. Domestically, the Government has a Manifesto commitment to reduce CO_2 emissions to 20% below 1990 levels by 2010.

The main source of greenhouse gases is the burning of fossil fuels for energy. The construction and use of buildings is directly and indirectly responsible for a high proportion of the total UK emission of CO_2. About 50% of the total arises from energy used for heating, cooling and lighting in buildings, 10% from energy used during the production and transport of materials and construction of the building (embodied energy), and a further 22% from energy used by the occupants in travelling between buildings.

CO_2 production is related to the amount and type of fuel consumed. The CO_2 emissions are greater from electricity owing to the inherent inefficiency of generation, conversion and transmission. Also energy consumption, particularly in the generation of electricity from fossil fuels, can cause sulfur and nitrogen oxide emissions which combine with water vapour in the atmosphere to form acidic aerosols. These cause damage to forests and rivers, especially in high-rainfall upland areas of Northern Europe.

The aims should therefore be to:

- Maximise the energy efficiency of buildings in use, by design and management action.
- Reduce embodied energy of materials used in construction and maintenance.
- Reduce transport energy for commuting and business travel.

These are covered in greater detail below.

Energy efficiency in offices

Energy efficiency measures are most cost-effective when installed in new or refurbished buildings, or when equipment which is at the end of its useful life is replaced. Further information and guidance can be found in DETR publications, for example Energy Consumption Guide 19 (ECON 19)[7], and two 'guides for the design team' on energy efficiency in new and refurbished offices (GPG 34[8] and GPG 35[9]). Attention must be given to reducing heating, cooling and lighting loads, and ensuring that all equipment is at the highest level of efficiency. Air conditioning should be avoided wherever possible and minimised in other cases. It is recognised that this may be difficult in some town centres and on some sites. However, transport energy may well be less in these uses because of increased use of public transport.

BREEAM aims
To minimise the overall emission of CO_2 to the atmosphere arising from the operation of a building and its services.

Achieving the aims
BREEAM adopts an energy targeting approach, with an increasing number of credits (up to 15) available for better performance, measured against specific CO_2 levels. The performance of the building is assessed by calculation for new-build and refurbishment, and by reference to checklists for existing buildings. Actual energy consumption figures may be used where available.

In existing buildings, credits are also available where there is a good energy policy operated by occupants.

This issue is assessed in the Energy issue category

Other benefits from reducing impacts

☑ Financial	● Direct savings in energy costs and future taxes ● Improved user satisfaction/productivity
☑ Legal	● Guarding against current and future legal requirements
☑ Health and well-being	● Improving internal and external health resulting from pollutants
☑ Management auditing	● Review and target-setting and monitoring of consumption ● An Environmental Management tool
☑ Image	● Presentation of external/internal image of organisation

Embodied energy/CO_2 in materials

Embodied energy/CO_2 in materials and components arises from their manufacture, the construction process and during refurbishment. It is relatively small compared with the lifetime operational energy of the building, although still significant. It is one of a number of environmental impacts due to materials, which are discussed later in the section on resource use.

This issue is assessed in the Materials issue category

Transport use

The transport of people between buildings accounts for 22% of national energy use. This reflects how homes, workplaces and amenities are located and how our transport infrastructure is planned. Transport energy and emissions are growing at 4% per year, mostly owing to the increase in personal transport. Freight transport (about half of which transports construction materials) is responsible for 10% of UK energy use.

The Transport White Paper[4] outlines new Government measures to

reduce dependence on the car, and encourage the use of other means of transport, particularly public transport. The White Paper outlines fiscal measures, including charges for workplace car parking. It will be increasingly important for employers to take into account the transport implications of their businesses, including commuting.

Studies by Howard, Gilham, Rao and Thomas have demonstrated that energy use for transport to and from offices for commuting is comparable in size with energy for operating the building[10]. There is a marked variation in the energy used in commuter transport. Although the staff in the London offices studied typically travelled longer distances, their energy consumption was half that of commuters to offices in other cities. The crucial difference was the proportion of commuters travelling in cars (usually singly occupied), and the availability of public transport to London commuters.

These studies show that transport must be considered alongside operational energy when environmental impacts of office buildings are being considered.

The aim for designers and managers must be to encourage the greater use of public transport and other alternatives to the private car for commuting and business travel. At the planning and design stages, best results will be obtained by: providing mixed-use developments; siting buildings near to public transport; limiting car parking facilities; and providing facilities for the cyclist. For managers of buildings, energy and monetary savings and welfare benefits to staff can be achieved by, for example, introducing flexible working hours, introducing car sharing and a bus service, offering incentives to use public transport, and carefully considering the location of staff. Teleworking is another option. In addition, there can be substantial business benefits from reducing the need for car parking, especially on high-value city-centre land.

BREEAM aims

To encourage greater use of public transport and other alternatives to the private car for commuting and business travel.

Achieving the aims

BREEAM credits the provision of cycling facilities, good access to public transport, and policies and actions taken to encourage the use of public transport or to discourage the use of private cars, or to do both. In addition, the predicted transport CO_2 is based on an assessment of occupants and distance travelled by different modes, using a simple checklist.

This issue is assessed in the Transport issue category

Other benefits from reducing impacts

☑ Financial	● Reduced costs of business travel and commuting to company and staff ● Minimising possible travel-related taxes on car parking, etc ● Improved productivity of staff ● Reduced travel times and frustration from congestion
☑ Legal	● Addressing planning and local controls on traffic
☑ Health and well-being	● Minimising exposure to traffic fumes arising from traffic in congested areas. This affects both occupants and neighbours
☑ Management auditing	● Review, target-setting and monitoring of consumption ● An Environmental Management tool
☑ Image	● Presentation of external/internal image of the organisation

Ozone depletion

Building services can have a profound impact on the amount of damage done to the ozone layer from chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs) and halons. These substances are used as refrigerants, in some insulating materials and for fire-fighting equipment; they cause long-term damage to the Earth's stratospheric ozone layer, exposing living organisms to harmful radiation from the sun. They also have significant global-warming potentials and so contribute to global warming. In 1987 many of the world's governments signed an agreement (The Montreal Protocol) to reduce emissions of CFCs and halons into the atmosphere. This agreement has subsequently been reviewed and the current requirement is that signatories will cease production by the year 2000.

Within Europe, a European Community (EC) regulation brought forward the phase-out date for CFCs to January 1996. The EC has also proposed phasing out HCFCs by 2015.

The aim for design and management is to reduce the release of CFCs, HCFCs and halons into the atmosphere. From the point of view of both energy and ozone depletion, the best thing would be to design buildings so that they did not need air conditioning. However, where air conditioning systems are unavoidable they should be designed to use refrigerants with an ozone depletion potential approaching zero. Measures are also needed to prevent or detect leakage, and to avoid losses during servicing. Guidance is available in a BRE Information Paper[11]. Advice on choosing alternatives to halon for fire-fighting (in hand-held extinguishers) has been produced by the Department of Trade and Industry[12].

BREEAM aims

- To reduce the emissions of refrigerants to the atmosphere arising from accidental release from cooling plant in buildings.
- To discourage the use of thermal insulants which include the use of ozone-depleting substances in their manufacture or composition.
- To discourage the use of halon fire-fighting systems which may result in emissions to the atmosphere.
- To reduce the release of ozone-depleting substances to the atmosphere.

Achieving the aims

The aims can be achieved by avoiding the use of ozone-depleting substances as refrigerants, in insulation materials (either in their manufacture or composition) and in fire-fighting systems. In addition, appropriate equipment can be installed to reduce the risk of accidental releases from cooling plant, and a best-practice maintenance schedule can be instituted.

This issue is assessed in the Pollution issue category

Other benefits from reducing impacts

☑ Financial	● Avoiding increasing costs of obtaining phased-out refrigerants
☑ Legal	● Montreal Protocol covers phasing out of these substances ● Tighter controls are to be expected over time
☑ Health and well-being	● Minimise risk of skin disorders through increased UV radiation. This can have an impact on days lost both in the short term through sunburn, etc, and long term through increased cancer incidence
☑ Management auditing	● Review and target-setting and monitoring of consumption ● An Environmental Management tool
☑ Image	● Presentation of external/internal image of the organisation

Use of resources

Buildings are a major consumer of resources, both during their construction and in their operation. They use land, consume minerals, fossil fuels and other natural materials, and consume energy; and their occupants use water, and generate domestic waste, office waste, etc. When they are demolished, some material is recycled; the rest goes to landfill sites or incineration causing more pressure on land and potential pollution.

Selection of materials and components

The UK construction industry uses 6 tonnes of building material per person, mostly minerals. About 20% of this is for infrastructure (civil engineering). Over 50% is for repair and maintenance of the existing stock of buildings. The quarrying of 250–300 million tonnes of materials in the UK each year for aggregates, cement and bricks imposes significant environmental costs.

Timber, whilst a renewable resource, is largely imported into the UK. Rates of extraction can exceed rates of planting. Monoculture practices, which are commonplace in managed forestry, create forests that have a relatively low ecological value.

A wide range of other materials and components are also used in buildings, each with different environmental consequences during their production, use and final disposal. The contribution of materials to the overall efficiency of a building is also important. As awareness of the environmental impact of the processes has increased, many construction professionals and client organisations have taken greater interest in the selection of construction materials and components.

The internationally accepted method for producing an assessment of the environmental impacts arising from manufacturing processes is life-cycle assessment for which standards are being developed by the International Standards Organisation. This is a complex and time-consuming procedure, whose application to construction is still in its infancy.

BREEAM uses the *Post Office/BRE Green Guide to materials specification*[13] for determining the credits attributed to timber specification. The Green Guide offers the designer a simple elemental guide based on life-cycle assessment data, for use at the early stages of design when key decisions are made. The Green Guide is a system of environmental profiling for building specifications in the UK commissioned by one of the UK Government's largest property portfolios, Post Office Property Holdings. It is designed to be an easy-to-use reference document for busy professionals actively engaged in design and construction and is based upon an extensive collection of existing, public domain, data. It provides A, B or C environmental ratings for over 200 elemental specifications in terms of embodied energy, emissions, consumption of resources, recycling issues and toxicity.

BREEAM aims

To encourage the use in construction and maintenance, of materials that have less impact on the environment, taking account of the full life cycle of the material in question.

Achieving the aims

There are credits available for choosing a specified proportion of major building elements with an overall A rating from the Green Guide. There are further credits available for company policies which require maintenance and refurbishment to be carried out with materials for which a high proportion achieve an overall A rating.

This issue is assessed in the Materials issue category

Other benefits from reducing impacts

☑ Financial	● Environmentally less damaging solutions may be cheaper than alternatives, especially where transport is limited
☐ Legal	
☑ Health and well-being	● Reduced toxicity levels from materials specified
☑ Management auditing	● Aids development of a building procurement policy within overall environmental management procedures
☑ Image	● Presentation of external/internal image of the organisation

Timber

Deforestation of tropical forests is a matter for global concern and there are various international and national commitments to forest conservation, including UNCED and Target 2000.

Most of the timber used in Britain for construction (over 98%) is imported from temperate sources where forest management policies and practices are firmly established and where the use of timber plantations with replanting programmes promotes well managed and regulated timber production. Only a very small proportion of timber from tropical forests is sold into the international market, and of this less than 0.1% is used in the UK.

There is no internationally accepted system to indicate that wood comes from sources where the management of forests or tree plantations ensures sustainable production. In most cases it is still not possible to give specific guidance on whether a forest is well managed in terms of environmental, economic and social issues. The Forests Stewardship Certification scheme (FSC) provides an independent and verifiable audit of environmental management strategies as do some other more local systems, but their coverage of plantations is currently small albeit growing rapidly. The Timber Trade Federation and the Forests Forever Group have drawn up some environmental policies that have been adopted by many of the UK timber and importing companies. These policies require the timber companies to seek information continually about their timber sources and the status and progress of forest management from their overseas suppliers and make this available to specifiers. They are, however, not independently verified.

Designers should aim to use timber from well managed and regulated sources, and re-use suitable timber wherever possible.

BREEAM aim

To encourage the sustainable growing and harvesting of timber in properly managed plantations.

Achieving the aims

Credits are given where timber and timber panel products are specified from sustainably managed sources. Appropriate assurance will be required by assessors.

This issue is assessed in the Materials issue category

Other benefits from reducing impacts

☐	Financial	
☐	Legal	
☑	Health and well-being	● many of today's medicines are derived from tropical forest plants
☑	Management auditing	● Aids development of procurement policies as part of overall environmental management procedures
☑	Image	● Presentation of external/internal image of organisation

Re-use and recycling of construction materials

The construction industry accounts for 29% of all UK controlled waste arising each year, of which 70 million tonnes is construction and demolition (C&D) waste. The bulk of C&D waste that is recycled is used for low-grade purposes such as road sub-base construction or landfill engineering, and only about 4% is recycled for higher-grade applications. However, 30% of this waste is dumped in landfill or otherwise disposed of.

One of the key restraining factors that prevents the more effective use of C&D materials is lack of information. The key issues are: where it is, what it is, how much there is, and when it will become available. The challenge of providing information on availability, type and quantity of materials is now addressed by the *BRE Materials Information Exchange*, which is sponsored by the Department of the Environment, Transport and the Regions (DETR). The Exchange allows construction firms and building material producers to find productive uses for waste through the Internet.

The *Materials Information Exchange* consists of four parts:

- Materials for sale or free collection, for a variety of recycled materials and demolition products.
- Un-utilised materials that include over-ordered and unused stock for sale.
- A 'materials wanted' board.
- A 'future demolitions' board to notify others of potential sources of waste.

In all four parts, users can see what is available, add their information, or search by type of material or geographical region. The exchange is designed to be a self-maintaining system and there is no charge for either accessing or inputting data to the web site. You can access the exchange on your own Internet link at:

http://helios.bre.co.uk/waste

In addition, offices generate waste paper, glass bottles and aluminium cans, materials that are commonly recycled, with many private companies and some local authorities providing collection. To make recycling schemes more economic, it is beneficial for waste to be collected quickly and efficiently. A convenient, purpose-designed storage space ensures that sufficient waste is accumulated before it is collected, and helps occupants to store material.

Demolition of buildings occurs for many reasons, not only because they are unfit or uneconomic to repair. Often it is because they are in the wrong place, cannot be adapted for new uses, or have simply become unfashionable. New buildings consume new resources and impose new impacts on the environment, but they may be more energy efficient. A balance has to be struck, but generally it is preferable to re-use existing buildings rather than demolishing them and build new. BREEAM therefore encourages refurbishment and retention of key elements of the original building. It also encourages the re-use of construction and demolition material.

BREEAM aims
To encourage the re-use of buildings and re-use and recycling of waste and materials.

Achieving the aims
Credits are awarded where a high proportion of the existing structure and facade are retained, where use is made of recycled material, and where there are facilities and active policies for storage and collection of office waste for recycling.
This issue is assessed in the Materials issue category

Other benefits from reducing impacts

☑ Financial	● Re-use of existing structure can lead to cost savings ● Income can be obtained from well managed recycling schemes in some cases
☑ Legal	● Re-use of buildings can aid granting of planning consents
☐ Health and well-being	
☐ Management auditing	
☑ Image	● Presentation of external/internal image of the organisation

Land use

Research carried out for DETR, based on the 1995 household projections, has shown that by the year 2016 about 12% of England could be in urban use, compared with between 10 and 11% in 1991 [14]. The figure includes land for new housing and other developments, such as shopping, employment, leisure, education and transport. It also assumes that the re-use of previously developed sites for new housing can contribute at the current rate. The UK Government has committed to a higher target of 60%. More intensive use of land available can create sustainable communities and reduce the need for car travel, although care must be taken to guard against loss of green space and urban quality. In common with most developed countries, many city centres suffer from some dereliction, and maintenance of vital and viable town centres is an important issue.

The re-use of sites previously built upon or reclaimed from industrial processes or landfill will reduce the pressure on land and, where built within an existing urban area, reduce pressure on the countryside. It is also an issue concerned with the preservation of natural habitats, dealt with in the section on wildlife.

BREEAM aims
To encourage the use of sites previously built upon, reclaimed from industrial processes, etc, particularly within existing urban areas.

Achieving the aims
Credits are awarded for using sites previously built upon, or used for industrial purposes and for reclaimed contaminated land.
This issue is assessed in the Land Use issue category

Other benefits from reducing impacts

☑ Financial	• Cost implications vary considerably between locations
☑ Legal	• Use of brownfield sites can aid granting of planning consents • Identifying previous use of a site can avoid unforeseen liabilities arising in the future
☑ Health and well-being	• Identifying previous use of a site can avoid unforeseen risks to health arising in the future
☐ Management auditing	
☑ Image	• Presentation of external/internal image of the organisation

Water economy

In 1995 approximately 33 200 million litres of water a day were abstracted in England and Wales, much of this for the supply of water to the public. In the UK as a whole, water consumption has risen by 70% over the last 30 years[15]. In order to meet increases in demand, new sources of water supply have to be created, but building reservoirs is expensive and damaging to the environment. An alternative approach is to reduce the demand for water.

In January 1992 the United Nations held a world water conference in Dublin. They called for water to be treated as an 'economic good' everywhere, to encourage conservation of scarce resources. In July 1992 the, then, Department of the Environment published its consultation paper *Using water wisely,* encouraging everyone to conserve water[16].

In offices, on average, 43% of water is used for WC flushing, 20% for urinal flushing, 27% for washing and 9% in canteens. A variety of technical options exists for reducing water use for WCs, urinals and washing, for detecting leaks, and for measuring and controlling consumption. These can be supplemented by management policies dealing with monitoring and targeting.

BREEAM aims

To reduce consumption and leakage of water during internal usage of a building.

Achieving the aims

BREEAM uses an estimate of water consumption to assess water economy. Credits are awarded when the predicted or actual water consumption is less than specific targets. Additional credits are awarded where monitoring and targeting is carried out.

This issue is assessed in the Water issue category

Other benefits from reducing impacts

☑ Financial	• Direct savings on water costs
☑ Legal	• Helps to guard against possible future controls on consumption
☐ Health and well-being	
☑ Management auditing	• Aids review and target setting and monitoring of consumption • An Environmental Management tool
☑ Image	• Presentation of external/internal image of the organisation

Impacts on human beings

In the UK, people spend on average around 90% of their time in buildings, or within the built environment. Buildings make a major contribution to our quality of life because of the environments they provide for work, leisure and home life. They must provide a healthy and comfortable environment, and provide appropriate amenity for the activities carried out. There is some evidence that the quality of environments within offices can impact on productivity, with enormous financial benefits.

Externally, the visual impact of buildings is clearly a key issue affecting the quality of towns and cities, although difficult to measure and assess. More tangible impacts include: high winds induced at ground level by tall buildings, which cause problems of comfort and safety; health problems associated with wet cooling towers (ie Legionnaires' disease); and air quality problems associated with nitrous oxides.

Indoors, the key issues are indoor air quality, noise, lighting, thermal comfort and humidity. A particular problem in offices is the possibility of summer overheating. These issues are familiar to most designers and building services engineers, and guidance on many of them is available through The Chartered Institution of Building Services Engineers (CIBSE) guides.

A full assessment of the indoor environment in existing buildings requires a costly programme of measurement over a period of time. Some issues, however, can be assessed by calculation or appropriate provisions at the design stage, or by simple spot measurements in existing offices. These are the issues assessed in BREEAM, together with appropriate management and operational policies covering systems maintenance.

Internal environment

Legionnaires' disease arising from domestic water systems

Legionnaires' disease is a rare form of pneumonia caused by the bacterium *Legionella pneumophilia*. In recent years around 300 cases of Legionnaires' disease have been reported each year. Of these, about 12% have proved fatal. The first Badenoch Inquiry report[17] points out that the majority of outbreaks of Legionnaires' disease are associated with the domestic hot water systems in non-domestic buildings. CIBSE Technical Memorandum TM13[18] recommends design procedures for minimising risks. In existing buildings it is important to institute appropriate maintenance schedules and to carry out safety surveys of systems.

BREEAM aims
To minimise the risks to health from legionellosis in domestic hot water systems.

Achieving the aims
Systems should be designed to minimise risks using TM13[18], steps should be taken to minimise risks in older buildings, and appropriate maintenance schedules should be in place.
This issue is assessed in the Health & Comfort issue category

Other benefits from reducing impacts

☐ Financial	
☑ Legal	● Helps to guard against health and safety controls ● Decreases the risk of legal remedies being sought by others
☑ Health and well-being	● Minimises health risks to occupants
☑ Management auditing	● Provides simple specification tool for contractors/facilities managers
☑ Image	● Presentation of external/internal image of the organisation

Indoor air quality

Satisfactory indoor air quality can be achieved by removing pollutants at source, diluting them with fresh air, or doing both. There are many pollutants present arising from the materials used in the building fabric and building services, and also from the activities of the occupants. Tobacco smoke is one of the main pollutants and passive smoking, apart from the nuisance, is also a significant health hazard. Remedies include an effective ban on smoking except within designated areas, and where smoking is permitted a significant increase in ventilation rates is required, as recommended by CIBSE[19]. Other pollutants include dust mites in carpets and soft furnishings, which can be removed by regular high-performance cleaning.

Ventilation can be provided by openable windows (an amenity valued by most occupants), by trickle vents in windows, or by mechanical ventilation (including air conditioning).

It must be ensured that the ventilation system does not introduce additional hazards due to dust contamination, water sprays from external sources, or excessive recirculation of air. Design and operational procedures are important.

BREEAM aims

To ensure a high quality of indoor air for occupants.

Achieving the aims

Credits are awarded for:

- A high proportion of openable windows
- Provision of fresh air in mechanical ventilation systems, or trickle vents in naturally ventilated buildings
- Location of air intakes and outlets to avoid pollutants and recirculation
- 'No smoking' policies
- High-performance cleaning
- Appropriate maintenance schedules

This issue is assessed in the Health & Comfort issue category

Other benefits from reducing impacts

☑ Financial	● Increases in productivity arising from good internal environment
☑ Legal	● Aids compliance with spirit of health and safety legislation, etc
☑ Health and well-being	● Reduced illness at work ● Increased feeling of personal control
☑ Management auditing	● Provides a performance specification tool
☑ Image	● Presentation of external/internal image of the organisation

Lighting

Most people prefer daylight to artificial light, with a view out of windows. Provision needs to be made to avoid unwanted increase in temperature caused by solar gain. Where artificial lighting is provided, over-provision must be avoided and steps taken to ensure that the lighting installation maintains its design levels. Personal control by occupants is required. These actions will have energy benefits.

In offices, headaches and eyestrain have been successfully reduced when high-frequency ballasts have been substituted for conventional ballasts used in fluorescent lighting. High-frequency ballasts also reduce energy consumption by a small amount.

BREEAM aims

To ensure that lighting provision is adequate for the purpose and minimises risks to health or comfort levels.

Achieving the aims

Credits are given for:

- Good daylighting
- All workstations with a view out
- Prevention of glare
- Personal control of lighting stations
- Avoidance of excessive lighting levels
- High-frequency ballasts
- Good maintenance schedules

This issue is assessed in the Health & Comfort issue category

Other benefits from reducing impacts

☑ Financial	● Increases in productivity arising from a good internal environment ● Savings from reduced energy consumption
☑ Legal	● Aids compliance with spirit of health and safety legislation, etc
☑ Health and well-being	● Reduced illness at work ● Increased degree of control
☑ Management auditing	● Provides a performance specification tool
☑ Image	● Presentation of external/internal image of the organisation

Thermal comfort

The main issue for office buildings is the avoidance of overheating due to excessive internal solar gains. In town centres, where noise and/or pollution dictates a sealed building, air conditioning may be needed, but otherwise natural ventilation usually provides a good solution if designed correctly. Information concerning design methods for avoiding overheating may be found in *CIBSE Guide: Volume A*[19], and in the BRE *Environmental design guide*[20].

Thermal comfort is defined as 'that condition of mind which expresses satisfaction with the thermal environment'. Research has resulted in the development of methods that enable the comfort of occupants to be assessed. Other research has examined the effects of discomfort on people. The general rule is that conditions of optimal thermal comfort result in the best conditions for performance and well-being. It is important to seek occupant feedback and to set up monitoring and targeting procedures relating to occupant satisfaction.

BREEAM aims
To minimise the risk of discomfort due to overheating of buildings.

Achieving the aims
Credits are given for:
- Providing local control of temperature
- Using accepted techniques to assess thermal comfort at the design stage
- Regular monitoring and targeting of occupant satisfaction

This issue is assessed in the Health & Comfort issue category

Other benefits from reducing impacts

☑ Financial	● Increases in productivity arising from good internal environment ● Increased feeling of personal control
☑ Legal	● Aids compliance with spirit of health and safety legislation, etc
☑ Health and well-being	● Reduced illness at work
☑ Management auditing	● Provides a performance specification tool
☑ Image	● Presentation of external/internal image of organisation

Indoor noise

Noise is a frequent cause of complaint in office buildings and can be distracting. However, in open plan areas low noise levels can result in a lack of acoustic privacy and a balance must be struck. Intrusive noise levels used for building design are given in British Standard BS 8233:1987 (Sound insulation and noise reduction for buildings)[21].

BREEAM aims
To ensure a comfortable and productive internal acoustic environment in office areas.

Achieving the aims
Credits are awarded on the basis of calculated or measured ambient noise levels.

This issue is assessed in the Health & Comfort issue category

Other benefits from reducing impacts

☑ Financial	● Increases in productivity arising from good internal environment
☑ Legal	● Aids compliance with spirit of health and safety legislation, etc
☑ Health and well-being	● Reduced illness at work
☑ Management auditing	● Provides a performance specification tool
☑ Image	● Presentation of external/internal image of the organisation

External environment

Legionnaires' disease arising from wet cooling towers

Legionnaires' disease is a rare form of pneumonia caused by the bacterium *Legionella pneumophilia.* In recent years around 300 cases of Legionnaires' disease have been reported each year. Of these, about 12% have proved fatal. These deaths result from the poor design, operation and maintenance of building services, including cooling towers. Air conditioning systems must be designed to allow regular and complete cleaning and maintenance, and the effective application of water treatment systems. This will greatly reduce the risk of Legionnaires' disease. Where cooling towers are used, it is important that good design procedures are followed. The most important features of a well designed cooling system from the hygiene point of view are:

- The complete collection of all the condensate and sludge formed in the system.
- Provision of an easily accessible drain point at all the very lowest points of the system.
- Easy access to condensate trays for cleaning purposes.

The Health and Safety Commission Approved Code of Practice L8[22] gives practical guidance on the requirements of the Health and Safety at Work etc Act 1974[23] and the Control of Substances Hazardous to Health (COSHH) Regulations 1988[24] with regard to the risk of Legionnaires' disease. The Code does not address the technical aspects of controlling the risk. Practical guidance on how to assess and minimise the risk of exposure to the bacteria which cause Legionnaires' disease is given in the Health and Safety Executive publication *The control of legionellosis including Legionnaires' disease*[25] and in CIBSE Technical Memorandum TM13[18].

Compliance with the Health and Safety Commission's Approved Code of Practice is not a legal requirement. But failure to comply may be interpreted by a court of law as proof that the law has been broken. It would be necessary to satisfy the court that the required levels of safety had been met in some other way.

BREEAM aims

To minimise the risks to health arising from microbial contamination from poorly designed or maintained cooling systems.

Achieving the aims

Credits are awarded for the avoidance of wet cooling towers. Where they are present, there are credits for the design of the system and the procedures that are established for their maintenance with a view to identifying and minimising the risk of contamination occurring.

This issue is assessed in the Health & Comfort issue category

Other benefits from reducing impacts

☐ Financial	
☑ Legal	● Reduces risk of liabilities for third parties ● Aids compliance with spirit of COSHH requirements
☑ Health and well-being	● Reduced illness at work
☑ Management auditing	● Provides a performance specification tool
☑ Image	● Presentation of external/internal image of the organisation

Impacts on wildlife

The re-use of existing sites will help to slow down or stop the destruction of natural habitats and the wildlife they support, and prevent loss of farm land. Wherever buildings are constructed there is always a risk that, however environmentally friendly the building itself may be, it may present a threat to local ecology or areas of natural beauty. The principle here is, first to minimise damage to the existing local ecology, and then to enhance it. Damage can be minimised either by selecting a site of low ecological value or by developing a site in a way that protects the most important ecological attributes. Construction does not have to reduce the ecological value of a site – it can be used to enhance it.

It is difficult to specify simple rules that could apply to the whole of the UK. For example, rules concerning trees vary widely between local authorities. This is why developers are advised to take advice from local experts.

One attractive option is to build on and revitalise a previously derelict site. Care must be exercised because an apparently derelict site may be inhabited by rare, protected or locally important species if it has been derelict for some time, and so be ecologically valuable. Derelict sites may also be contaminated, so care must be taken to protect occupants and construction workers. Landfill sites which are producing gas present significant difficulties.

Landscaping offers a major opportunity for the protection of an existing site ecology, enhancement of a site and even creation of new habitats. The use of mixed-age plants from seedlings to maturity is important in creating a viable natural asset as well as improving its appearance. Horticultural techniques exist for growing plants on almost any type of land, including polluted ground. The choice of highly visible and attractive planting may make it possible to develop a simpler and therefore cheaper building whilst increasing the site's ecological value. Planting can be done at any time of year although plants are at their most vulnerable in the summer when it is hot and precautions need to be taken to protect them. The November to March season is ideal.

The use of local native species or other tolerant species, or the creation of 'wild areas', can have a significant impact on costs by reducing the need for maintenance, chemical usage and watering.

Water run-off from car parks can be collected in a suitable storage tank, or even left free draining. Some form of treatment may be required to avoid pollution from oil contamination. A wetland habitat can be created using reed-bed techniques. Alternatively, streams and ponds can be created next to the car park. Safety is a factor that should be carefully considered, especially in areas where young children, animals and disabled people may be at risk.

BREEAM aims

To minimise the ecological impact of a development project and maximise the enhancement of a site for both new and existing buildings.

Achieving the aims

BREEAM identifies key features on a site and the steps taken to protect and enhance them. It also evaluates the ecological diversity of a site before and after development, using plant species diversity as a proxy for overall ecological diversity.

This issue is assessed in the Site Ecology issue category

Other benefits from reducing impacts

☑ Financial	● Cost savings through reduced maintenance costs
☑ Legal	● Reduces risk of liabilities under protection of wildlife legislation
☑ Health and well-being	● Improved quality of life
☑ Management auditing	● Aids review of procedures for construction and site management
☑ Image	● Presentation of external/internal image of the organisation

Appendix B

Using BREEAM to optimise performance

Assessment process

The following tables set out the range of assessment services that licensed assessors offer.
Note: Shaded services form mandatory stages of the formal certification process; other services are optional.

Design stage assessments: New build, refurbishment

Assessment will cover all Design and Procurement issues and Core issues
Formal assessment can occur only towards the end of the detailed design stage. However it is important that the issues covered by BREEAM are considered well in advance of this. The *Design and procurement* checklist on pages 32 and 33 sets out when issues should be considered. Involving an assessor at an appropriate stage in the development of a design can ensure that the environmental performance and therefore the BREEAM rating is optimised.

Service	Design stage	Form of service
Design consultancy	All stages	● The assessor can be included in the design team in an appropriate way, to guide the design process
Outline design stage guidance meeting	Outline design RIBA stage A–C	● The assessor will hold a meeting with the client/design team to outline issues for consideration at this stage
Detailed design stage guidance meeting	Detailed design (early) RIBA stage D	● The assessor will hold a meeting with the client/design team to outline issues for consideration at this stage ● Additional meetings can be organised at the request of the client/design team as required
Formal assessment review	Detailed design (late) RIBA stage D–E	● The assessor will review information provided by the client/design team and produce a final assessment rating
Final certification	Detailed design (late) RIBA stage D–E	● Formal certification by BRE will follow directly
Review after construction	After construction RIBA stage H	● Specification issues will be revisited to ascertain changes that have occurred during the construction stage. Checks will be based on information supplied by the contractor and design team

Existing buildings (general building rating): Vacant properties, landlord assessment, portfolio review

Only the Core issues will be assessed in these cases

There are few, or no, opportunities for change at this stage and as such a simple assessment of the building fabric and services is all that is likely to be required. Where decisions are being taken on the future direction for a property portfolio these should be taken in the light of a knowledge of the performance of individual buildings. BREEAM assessments can inform this process by highlighting strengths and weaknesses.

Service	Form of service
Formal assessment review	● The assessor will review information provided by design team/developer/manager and produce an assessment rating ● There will be no interim assessment
Final certification	● Formal certification by BRE will follow directly

Existing buildings (management and operation): Occupied properties

Assessment will cover all Management and Operation issues and Core issues
Many of the issues are assessed for occupant organisations, and where a previous assessment has been carried out on a different building for the same organisation these issues will be checked rather than reassessed. Issues relating to the building itself will be assessed fully in each case. Where a previous assessment has been carried out on a building this will reviewed by the assessor during the process.

The *Management and operation* checklist on pages 34 and 35 sets out when issues should be considered. Involving an assessor to carry out a review at an early stage can ensure that environmental performance, and therefore the BREEAM rating, is optimised. A review can be carried out at any stage to guide the development of a Management Action Plan.

In rented accommodation, responsibilities will be split between the landlord and the tenant. This split will vary and can pose a difficulty in addressing the issues. In these cases the assessment report will clearly distinguish between these responsibilities, and the certificate will reflect this.

Service	Form of service
Outline Board level guidance meeting	● The assessor will hold a meeting with the senior management to outline strategic issues for consideration at this stage
Detailed guidance meeting	● The assessor will hold a meeting with the building management team to outline issues for consideration at this stage
Formal assessment review	● The assessor will review information provided by senior management/property management team and produce an interim assessment report including preliminary rating and outline action plan ● Assessor may offer a more detailed action plan outside the BREEAM process if required
Detailed guidance meeting	● The assessor will hold a meeting with the building management team to outline progress and issues for consideration at this stage ● Additional meetings can be organised at the request of the management team as required
Progress review	● The assessor will review additional/progress information provided by senior management/management team and produce a revised preliminary assessment report including preliminary rating and outline action plan ● *Note: Assessor may offer a more detailed action plan outside the BREEAM process if required*
Final certification	● Assessment review will be revisited to ascertain changes that have occurred since last interim report and produce final rating ● BRE will issue certificate on instructions from assessor ● *Note: Certification can be given at any time during the process, although it is envisaged that many clients will seek to improve performance before certification is sought*
Follow-up after assessment	● Schedule for review will be recommended on a 3-year cycle. This will normally repeat the final certification review only

When and what to consider

BREEAM provides a formal assessment process in the form of an external audit. It has great value in this respect. There is a need to make sure that decisions taken both in the design of new buildings and refurbishment schemes and in the management of existing ones are considered at an appropriate level, detail and stage.

BRE, BREEAM assessors and other consultancies offer consultancy services aimed at providing specific guidance to a design team or management organisations. Whilst valuable, such consultancy is only a part of the answer. In order to optimise the performance, those directly involved in taking decisions need to be aware of the potential that they have for influencing environmental impacts and so improving performance. The *Design and procurement* checklist and the *Management and operation* checklist provide simple guidance on the decisions that should be taken and procedures established at each stage during the design or management of a building and the activities that go on within it.

In reality each case is different but the actions and recommendations in these checklists represent those that decision makers should be aware of at all times.

Both checklists cover the full range of issue categories that are included within BREEAM. They should be used to highlight when and what decisions should be taken in all design and management situations.

The *Design and procurement* checklist covers each of the RIBA stages from A to M. This categorisation is familiar to most in the design and construction industry and presents the best means of defining design and construction stages. The stages are listed in strictly traditional order for clarity. In many cases, stages will be reordered or overlapped in specific cases and much will depend on the procurement route that is followed. The checklist indicates those that are commonly involved at each stage. For both new-build or refurbishment projects, the checklist should be considered from the earliest stages, ie early inception before the design team is in place.

The *Management and operation* checklist covers a range of aspects of the management and operation of buildings. These are selected to represent the key aspects of management that can have a major influence on the environmental performance of a building and the occupants within it. The checklist indicates those that are commonly involved in each aspect. In existing buildings it can be used at any stage as a guide to improving the way the building is managed.

The BSRIA Environmental Code of Practice[26] gives further information on optimising environmental performance through the design and management process.

Checklists

Design and procurement

Major task and people involved	Project management actions	Energy	Water	Materials
RIBA Design stage A ***Inception:*** Set up client organisation; consider requirements; appoint design team; outline briefing. *Client; Asset/premises manager; Project manager.*	Develop strategic environment objectives. Establish preferred procurement and communication routes. Appoint appropriate consultants and establish fee structures.	Establish client priorities and build into objectives.	Establish client priorities and build into objectives.	Establish client priorities and build into objectives.
RIBA Design stage B ***Feasibility:*** Study: client requirements, site conditions, design and outline cost. *Client; Project manager; Design team; Quantity surveyor.*	Finalise strategic environmental objectives: set targets. Establish briefing and reporting procedures. Establish client requirements. Consider benefits of new build/refurbishment. Determine local constraints/planning priorities. Set a BREEAM performance standard.	Establish site microclimatic features and determine how they can be used to minimise energy consumption and maximise passive aspect.	Identify local water courses. Discuss site storage requirements with Environment Agency. Consider rainwater collection for landscaping and internal use.	Consider relative benefits of new build and refurbishment. Analyse potential for on-site re-use, recycling, disposal of demolition and other waste. Consider off-site recycling of demolition waste.
RIBA Design stage C ***Outline proposals:*** Develop brief; planning; outline design options; cost options. *Client; Project manager; Design team; Quantity surveyor; CDM planning supervisor.*	Develop design brief. Maintain client involvement in outline design and decision making process. Establish principle: *simple is best*. Negotiate with statutory authorities. Consider involving a registered BREEAM assessor to give guidance now.	Consider daylighting, passive design, orientation, shelter, form, thermal response, space and efficiency, control strategies.	Consider protection of existing water features and provision of additional features or enhancements. Consider potential for rainwater collection and use of grey water.	Consider materials specifications for major elements, maintainability. Consider strategies for operational recycling.
RIBA Design stage D ***Scheme design:*** Finalise brief; full general building design; outline engineering designs; cost plan; submission for planning consents. *Client; Project manager; Design team; Quantity surveyor.*	Finalise design brief. Maintain client involvement in design and decision making. Consider involving a registered BREEAM assessor to give guidance now if not involved earlier.	Consider daylighting, passive design, orientation, shelter, form, thermal response, space and efficiency, control strategies.	Develop strategies to protect existing water features and provide additional features or enhancements. Develop schemes to collect rainwater and use grey water. Design landscaping areas and on-site storage facilities to minimise need for mains watering.	Develop materials specifications for major elements, maintainability. Consider strategies for operational recycling policies. Consider efficient construction techniques: site waste strategies.
RIBA Design stage E ***Detailed design:*** Component design; full engineering designs, ongoing cost review. *Client; Project manager; Design team; Quantity surveyor.*	Don't over-specify fabric or services. Consider flexibility for future uses/adaptation. Consider environment aspects of specification using appropriate best practice guidance. Consider full life cycle analysis and whole life costing techniques as much as possible. Consider pre-qualification for suppliers to meet performance requirements. Commission a formal BREEAM assessment.	Specify for efficiency. Consider sizing carefully to avoid over-specification. Develop control strategies, remembering *simple is often best*. Consider maintenance at all stages of design.	Design to maximise water efficiency in appliances. Specify water efficient taps, showers, WCs, urinals etc. Integrate grey water systems to ensure safe operation. Select hard surfacing materials for permeability where water is used for landscaping.	Use reputable materials specification guide: *Post Office/BRE Green Guide*[13] or *Environmental Preference Method*[27]. Explore potential for recycling materials from local suppliers (but avoid excessive transportation which negates benefits). Obtain data from manufacturers and suppliers on environmental impacts during extraction, manufacturing, processing, transport. Plan design to fit standard module for materials and components to minimise construction waste.
RIBA Design stage F/G ***Production information:*** Finalise specifications; tender documentation, including production drawings, schedules, specifications, bills of quantities. *Production manager; Design team; Quantity surveyor.*	Ensure key environmental objectives are stated clearly in tender documents. Establish clear line of communication in documentation. Specify environmental requirements for materials not specifically specified. Include clear clauses on materials specification, energy/water efficiency/commissioning/handover etc. Prepare list of acceptable changes and cost savings, taking account of environmental impacts, so that quick and informed decisions can be made later if necessary.	Specify energy performance requirements in all performance specifications.	Specify water efficiency requirements in all performance specifications.	Specify environmental requirements in all performance specifications for construction materials. Appropriate clauses should be set out relating to the supply of documentation to ascertain the environmental sourcing of materials such as timber and timber products, blocks and bricks, plasterboards, paints etc used on the project. Documentation should set out limitations on the contractor to alter these requirements.
RIBA Design stage H ***Tender action:*** Invite to tender; tender preparations; tender review; appoint contractors. *Project manager; Design team; Quantity surveyor; Contractors.*	Check environmental credentials of proposed tenderers. Integrate environmental issues into pre-tender interviews. Ensure adequate time for pricing the job. Provide technical advice and support to the tenderers to ensure they fully understand environmental objectives, requirements and limitations. Issue documentation on commissioning to ensure adequate accommodation into work plans. Ensure all tenderers are given the same environmental information.			
RIBA Design stage J ***Project planning:*** Project planning; site inspections; prepare to start work on site. *Project manager; Design team; Quantity surveyor; Contractors; Sub-contractors.*	Integrate fully clients'/design teams' environmental objectives into work programmes. Establish clear lines of communication and responsibilities, including environmental issues. Ensure key individuals understand environmental requirements. Ensure enabling works support environmental objectives. Monitor works drawings for compliance with environmental objectives.			
RIBA Design stage K ***Operations on site:*** Management and operation of construction process. *Contractors; Sub-contractors; Project manager; Design team; Quantity surveyor.*	Actively monitor and develop on-site communications. Establish environmental monitoring procedures to ensure compliance with design objectives. Ensure early warning is given of supply problems for materials, components etc. Carry out pre-commissioning review.	Plan operations to minimise site energy consumption. Install energy efficient lighting. Ensure all site personnel are briefed on efficiency measures.	Plan site operations to minimise water consumption. Install water efficient sanitary facilities. Ensure site personnel understand efficiency measures.	Ensure suppliers understand environmental requirements and make documentation available at an early stage to avoid problems later. Plan work to minimise materials wastage. Establish procedures to sort construction waste on site for recycling.
RIBA Design stage L ***Completion:*** Commissioning; remedy defects; handover. *Contractors; Sub-contractors; Project manager; Design team; Quantity surveyor.*	Ensure adequate time for commissioning. Check complete system under operating conditions. For handover, provide full records and clear and complete systems documentation.			
RIBA Design stage M ***Feedback:*** Review all aspects of project performance. *Client; Project manager; Design team; Quantity surveyor; Contractors; Sub-contractors.*	Ensure feedback is collected from all involved and hold a follow-up meeting.			

Health and comfort	Ecological value	Transport	Pollution
Establish client priorities and build into objectives.	Establish client priorities and build into objectives.	Establish client priorities and build into objectives.	Establish client priorities and build into objectives.
Determine internal environment required, including light levels, thermal comfort levels and permitted flexibility. Establish local noise/pollution levels and sources.	Establish ecological features of site (existing trees, grassland, scrubland, water features, flora and fauna). Carry out environmental impact studies.	Consider site options. Consider: availability of public transport, local car parking, ease of access etc. Consider options for company initiatives such as company sponsored bus services where owner occupied.	
Consider: CDM environmental issues, issues related to 'sick buildings', and alternative working strategies. Consider major servicing routes and lengths to aid cleaning, minimise noise, external pollution.	Consider recommendations on site enhancement/protection from earlier analysis.	Develop transport policy. Ensure provision of cycling facilities, public transport division, efficient use of cars/deliveries etc.	Consider surface run-off from hard surfaces, storage facilities, landscaping.
Consider issues related to 'sick buildings'. Consider major servicing routes and lengths to aid cleaning, minimise noise, external pollution.	Build in recommendations on site enhancement/protection from earlier analysis.	Develop transport aspects of design. Provide cycling facilities. Negotiate improved public transport. Design access so users of alternative transport are treated equally. Design adequate facilities for cyclists, walkers etc.	Use appropriate materials to minimise surface run-off from hard surfaces.
Consider fully issues related to 'sick buildings'. Consider detailed design of servicing routes/enclosures and accessibility to aid cleaning, minimise noise. Consider use of low-VOC materials: paints, varnishes, floor finishes.	Specify plant species that will encourage the development of wildlife on the site. Consider carefully management implications of landscaping.	Design parking/delivery areas to avoid excessive manoeuvring of vehicles.	Select plant to minimise NO_x emissions. Select refrigerant to be non-ozone-depleting. Design for full leak detection and refrigerant recovery: these substances have significant global warming potential if released accidentally.
	Set out clear requirements for protection of existing ecologically valuable features on the site, such as trees, hedges, water courses, ponds. Make available any environmental impact assessment done for the site.		Ensure contractor establishes sound procedures to avoid unnecessary pollution and nuisance during construction. Consider specifying use of the *Considerate Contractors Scheme*.
Link environmental issues into all CDM planning to make full use of combined benefits arising from whole life cycle approach.			
	Ensure all site personnel understand protection measures. Inspect measures frequently.	Try to use local suppliers whenever possible for all materials, equipment etc. Avoid excessive manoeuvring and idling of heavy vehicles and plant on the site. Try to use efficient and environmentally sensitive fuels.	Monitor policies and procedures to minimise pollution (air, water, ground), on and off site. Use best practice guidance for site management. Provide guidance on site pollution management (eg from Environment Agency) to site operatives.

Management and operation

Major task and people involved	Overall management considerations	Energy	Water	Materials
Corporate policies *Chief Executive; Finance Director; Environment Director; Management Board; Directors; Shareholders.*	Carry out strategic environmental review, prepare and publish corporate environment policy for external and internal use and ensure its dissemination throughout the organisation. Establish an action plan with achievable targets and timescales to cover: building operation and maintenance; procurement; management; corporate environmental impacts; office procurement, including furniture; equipment; consumables; transport; flexible working patterns; homeworking. Commission an initial BREEAM review to guide the development of all these.	Establish clear energy policy and targets for organisation based on GPG 186[28]. Benchmark building performance against DETR ECON 19[7]. Establish corporate energy management responsibilities at Board level (may be incorporated in a broader environmental role). Establish regular dissemination of information on energy use and savings.	Establish clear targets for water consumption and regular dissemination of information on water use and savings.	
Corporate procedures *Environment Director; Management Board; Directors; Shareholders.*	Establish operational procedures in management structure and mechanisms. Establish lines of communication at all levels to provide bottom-up involvement.	Monitor regularly energy consumption and benchmarking, internally and externally. Disseminate key findings and actions to all staff.	Establish procedures to monitor regularly water consumption and benchmarking, internally and externally. Disseminate key findings and actions to all staff.	Establish procedures to guide clearly the procurement of materials, furniture, construction, accommodation etc, to take account of environmental impacts. Disseminate clearly to all relevant staff.
Communications *All.*	Establish lines of communication so people can raise concerns and suggestions on improving environmental performance and allow progress to be efficiently disseminated. Consider including any issues in staff briefings.	Provide regular information on energy performance compared with previous years and internal or external benchmarks. Encourage energy efficiency through staff awareness campaigns.	Provide regular information on water consumption compared with previous years and internal or external benchmarks. Encourage water efficiency through staff awareness campaigns.	Tell staff what is being done to reduce the environmental impact of materials procured; encourage them to select materials on an environmental and a cost basis, and to recycle materials at work and at home.
Purchasing and procurement *Finance Director; Environment Director; Purchasing team.*	Incorporate environmental priorities from policy into purchasing or procurement policies relating to all aspects of the organisation's procurement.	Ensure energy efficiency is a key issue when selecting new equipment.	Ensure water efficiency is a key issue when selecting new equipment.	Ensure that environmental impacts are considered when procuring all items; obtain information from suppliers of furnishings, consumables (including office and 'domestic' supplies and cleaning materials) and equipment. Aim to use: timber from sustainably managed sources; recycled and low-chlorine papers; recycled printer cartridges.
Contracting out *Finance Director; Management Board; Premises management team; Facilities management team.*	Prepare standard contracts for new contractors; if possible, renegotiate existing contracts to include all elements of corporate policy and procedures. Ensure clear communication with contractors and establish clear internal responsibilities for monitoring their performance. Establish clear procedures to monitor all relevant environmental issues. Use BREEAM to monitor the overall impact of contractors on the building's environmental performance.	Establish clear, simple guidance on corporate energy policies and procedures and ensure all contractors work to them.	Establish clear, simple guidance on corporate water policies and procedures and ensure all contractors work to them.	Establish clear, simple guidance for contractors on corporate policies and materials specification procedures and ensure all contractors work to them.
Facilities/Premises management *Premises management team.*	Identify full property portfolio and manuals for all buildings. Establish environmental constraints of the building, tenure and legislation. Identify lines of responsibility for each building.	Regularly monitor energy consumption to identify trends in consumption. Maintain full records of plant capacities and loadings etc. Ensure light and H & V services are cleaned regularly.	Regularly monitor water consumption to identify trends in consumption. Maintain full records of all installations and alterations made to them.	
Space planning	Ensure space planning takes account of services within the space. If conflicts are unavoidable, allow for those to be altered to ensure optimum performance in future. Recommission services after replanning office areas.			
Maintenance *Premises/Facilities management team; In-house maintenance team; Contractors.*	Prepare maintenance schedules for all plant in line with HVCA *Standard maintenance specification for mechanical services in buildings*[29]. Prepare standard environmental clauses for inclusion in contract documents to conform with policy and strategic targets. Keep full maintenance manuals on all services and fabric in the building. For major construction or refurbishment works, carry out a design-stage BREEAM assessment to ensure that all issues are taken into account.	Ensure recommissioning takes place after all maintenance work or changes to office layouts and services etc to ensure optimum energy efficiency of the systems. Ensure all lighting systems are cleaned and luminaires replaced regularly, not just when failure occurs. Ensure energy-efficient replacement plant is specified.	Ensure all sanitary fittings are cleaned regularly in accordance with manufacturer's recommendations to prevent build up of scale which causes increased consumption and health risks. Monitor water consumption to identify changes in consumption. Consider water efficiency at maintenance and replacement works.	Consider the environmental impact of all construction, cleaning and preparation materials used in maintenance and servicing. Aim to minimise the amount and waste of materials that are used. Use the *Materials Information Exchange* to establish the availability of reused or recycled materials in your area.
Refurbishment and recommissioning *Premises/Facilities management team; In-house maintenance team; Contractors.*	Incorporate environmental priorities in all briefing documentation: use BREEAM where appropriate. Prepare standard environmental clauses for inclusion in contract documents to conform with BREEAM issues, policy and strategic targets. For major construction or refurbishment works, carry out a design-stage BREEAM assessment to ensure that all issues are taken into account.	Ensure energy efficiency is a key aspect of all works and that full recommissioning takes place after all works to ensure optimum energy efficiency. Ensure adequate controls are provided in new heating, comfort cooling, lighting installations. Ensure energy-efficient replacement plant is specified.	Consider water efficiency at replacement or refurbishment. Fit consumption control devices to urinals, leak detection and shut-off technologies, low-water-use WCs, taps, showers etc.	Consider the environmental impact of all construction materials used in refurbishment works. Use an alternative materials selection guide (eg *The Green Guide*) to select environmentally sensitive options for finishes, floor coverings, ceilings, partitioning etc. Consult the *Materials Information Exchange* for the availability of appropriate re-used or recycled materials in your area.
Decommissioning *Premises/Facilities management team*	Find all documentation on the building. Consider commissioning a recycling audit to identify opportunities; prepare a full decommissioning plan covering the points opposite. Incorporate environmental criteria into tender documentation.			Consider opportunities to re-use buildings and components or recycle materials from demolition; require the contractor to sort demolition waste on site; establish a target for % materials recycled. Advertise recyclable materials on the *Materials Information Exchange* before demolition.

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Vol 1 Heating and pipework systems
Vol 2 Ventilating and air conditioning
Vol 3 Control, energy and building management systems
Vol 4 Ancillaries, plumbing and and sewerage
Vol 5 Electrics in buildings

BRE Materials Information Exchange
Sponsored by DETR. Web site accessible at the Internet address:
http://helios.bre.co.uk/waste

BRECSU
BRE's Energy Conservation Support Unit provides a wide range of published information on energy efficiency in offices and other buildings.
It is funded under the DETR's Energy Efficiency Best Practice Programme.
Tel: 01923 664258

Recycled paper

Health and comfort	Ecological value	Transport	Pollution
Ensure that health and safety procedures are fully integrated with environmental targets to prevent conflicts and ensure that issues are addressed at every level without additional burdens being imposed.		Carry out a transport survey to establish commuting and business travel patterns within the organisation, covering methods of travel and benchmarking, externally and internally. Identify opportunities for minimising travel cost through corporate initiatives. Develop a commuter/business transport policy. Encourage all staff to consider their own use of transport.	
Ensure that health and safety procedures are fully integrated with environmental targets to prevent conflicts and ensure that issues are addressed at every level without additional burdens being imposed.		Monitor regularly transport patterns, benchmarking, internally and externally. Disseminate key findings and actions to all staff.	Monitor regularly emissions of pollutants and check them against past trends.
Provide regular information on health and comfort issues. Encourage staff to be more aware of their own impacts on the working environment; provide feedback from all staff satisfaction surveys.	Provide regular information on ecological issues.	Communicate results of staff and business travel surveys. Provide simple guidance on options available and initiatives taken by the company. Seek suggestions from staff on ways to reduce transport initiatives.	
	Ensure that all herbicides and insecticides are biodegradable and ecological impacts are considered in landscaping.	When possible, use local suppliers and locally manufactured materials to minimise transport. Explore alternatives to company cars which allow greater flexibility to staff to select more environmentally friendly transport. Where possible, use low-sulfur fuels for company vehicles.	
Establish clear, simple guidance on corporate health and safety policies and procedures and ensure all contractors work to them.	Establish clear, simple guidance on corporate policies and procedures relating to ecological impacts and ensure all contractors work to them.	Try to use local contractors whenever possible. Encourage contractors to source materials locally.	Establish clear, simple guidance on corporate policies and procedures relating to pollution issues and ensure all contractors work to them.
Regularly seek and record staff feedback on general satisfaction levels; from feedback, develop maintenance and refurbishment schedules. Establish schedules to ensure that all parts of the buildings are cleaned regularly.		Monitor staff travel and identify options for minimising it. Prepare proposals for Board consideration.	Identify air conditioning plant and refrigerants. Study options for direct replacement or minor alterations to avoid the use of ozone-depleting substances. Identify NO_x emissions of boiler plant and explore options for replacement.
Develop maintenance schedules from findings of occupant satisfaction surveys and ensure decisions taken on maintenance and replacement take account of these findings.	Ensure that all maintenance of landscaping takes account of ecological factors: avoid the use of herbicides and insecticides where possible and use biodegradable chemicals. If possible, leave some areas relatively undisturbed to promote wildlife and use native species of plants appropriate to local soil conditions to promote wildlife and avoid the need for excessive watering. Protect existing ecological features on the site, such as trees, hedges, water courses.	When possible, use local suppliers and locally manufactured materials to minimise transport. Explore alternatives to company cars which allow greater flexibility to staff to select more environmentally friendly transport. Where possible, use low-sulfur fuels for company vehicles.	Ensure all plant is maintained regularly to minimise pollution. Replace burners in boiler plant with low NO_x-emitting equivalents. Plan to phase out ozone-depleting refrigerants over reasonable timescale.
Develop refurbishment proposals from findings of occupant satisfaction surveys and ensure decisions taken on maintenance and replacement take account of these findings.	Ensure that landscaping takes account of ecological factors: avoid the use of herbicides and insecticides where possible and use biodegradable chemicals. If possible, leave some areas relatively undisturbed to promote wildlife and use native species of plants appropriate to local soil conditions to promote wildlife and avoid the need for excessive watering. Protect existing ecological features on the site, such as trees, hedges, water courses. Specify peat substitutes.	When possible, use local suppliers and locally manufactured materials to minimise transport. Explore alternatives to company cars which allow greater flexibility to staff to select more environmentally friendly transport. Where possible, use low-sulfur fuels for company vehicles.	Replace burners in boiler plant with low NO_x-emitting equivalents. Plan to phase out ozone-depleting refrigerants over a reasonable timescale.
		Consider using local contractors and materials-recycling companies to minimise transport.	

BREEAM 98 *for offices*
Assessment prediction checklist

BREEAM

This pre-assessment checklist allows a quick evaluation of the likely rating to be achieved under a formal BREEAM assessment. The checklist is a simplified version of the full method and for this reason the final rating may vary.

Issue 1 September 1998

Using this checklist

All credits included in *BREEAM 98 for offices* are listed. Credits are arranged in three columns but those to be assessed vary depending on the timing of the assessment.

- **Design stage, new build and refurbishment schemes**
  Building Performance + *Design & Procurement* columns should both be completed.
  A BREEAM rating and an Environmental Performance Index are calculated.
- **Existing buildings that are occupied and are being assessed as part of an environmental management review**
  Building Performance + *Management & Operation* columns should both be completed.
  A BREEAM rating and an Environmental Performance Index are calculated.
- **Existing buildings which are vacant or where a review of the fabric and services only is required**
  Building Performance column only should be completed in these instances.
  An Environmental Performance Index is calculated but no BREEAM Rating is given.

STEP **1** Complete the checklist of credits by adding the number of points (shown in the *points* column) in the checkbox under the appropriate columns being assessed. Shaded areas indicate that the issue is not assessed in that column.

STEP **2** Sum the total number of points in the *Building Performance Score* (BPS) and transfer to Box A in the *Design & Procurement* column OR the *Management & Operation* column as appropriate on page 6. Transfer. Also transfer this score to Box C below.

STEP **3** Sum the total number of points achieved in the column being assessed (including the BPS transferred above) and enter in Box B on page 6 and transfer to Box D below.

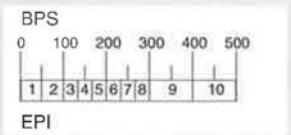
STEP **4** Calculate the Building Performance Score in Box C below by using the scale given. The Environmental Performance Index is given on a scale of 1 to 10.

STEP **5** Use Box D to predict the final BREEAM Rating by comparing the final number of points achieved with the minimum required number of points in the rating matrix.

C

Building Performance Score
BPS
from Box A on page 6 ☐

Probable Environmental Performance Index (EPI)



☐

D

Final Score
from Box B on page 6 ☐

Probable BREEAM Rating

	Minimum No of Points Required	
	Design & Procurement Assessments	Management & Operation Assessments
❑ PASS	200	160
❑ GOOD	300	280
❑ VERY GOOD	380	400
❑ EXCELLENT	490	520

BREEAM 98 *for offices*

Assessment prediction checklist

Management

	Points	Building Performance	Design & Procurement Assessments	Management & Operation Assessments
Where evidence can be provided showing a client commitment to a firm commissioning period prior and immediately post occupation to ensure efficient operation of all services within the building	**30**			
Where there is an established and openly available company policy on the environment. This should include the following as a minimum requirement: - Define the scope of the policy covering all issues within BREEAM - Action Plan - Responsibilities and nominated people - Strategic and short-term targets - A commitment to be reviewed annually - A commitment to report internally, and preferably externally, the results of review and performance	**30**			
Where there is a verifiable environmental purchasing policy at a corporate level and is demonstrably in use at a local level	**30**			
Where a verifiable environmental management system (formal or informal) is in operation	**30**			
Where building operating manuals are available on site	**30**			

Health & well-being

Where cooling towers locations are designed to allow ease of access to filters/drip trays etc for cleaning/replacement or no cooling towers	**6**			
Where domestic hot water systems have been designed or actions taken to minimise risk of Legionellosis	**6**			
Where at least 30% of windows to office areas are openable. This should have an even distribution around the office area	**6**			
Where there is no/steam humidification	**6**			
Where air intakes/outlets are over 10 m apart to minimise recirculation *and* avoid sources of major external pollution	**6**			
Where either: - at least 30% fresh air is provided in a/c mech vent systems - or trickle vents are provided in naturally ventilated buildings	**6**			
Where at least 80% of net lettable office area is adequately daylit	**6**			
Where controllable internal or external blinds are fitted to prevent glare	**6**			
Where high frequency ballasts are installed in all general office luminaries	**6**			
Where lighting meets BCO Specification for Offices recommendations in terms of lighting levels	**6**			
Where control of lighting in office areas relates to circulation space, daylighting *and* is broken down to provide separate control for groups of no more than four work areas	**6**			
Where all workstations have view out with max 7 m to windows	**6**			
Where local control is available for temperature in office areas	**6**			
Where cooling towers/systems are designed in accordance with HSG70 & TM13 or no cooling towers	**6**			
Where assessments have been made of thermal comfort levels at design stages and used to evaluate appropriate servicing options	**6**			
Where design achieving ambient noise levels below: - 40 dB LAeqT in small offices - 45 dB LAeqT in large offices	**6**			

Total points achieved to carry forward to page 3			

	Points	Building Performance	Design & Procurement Assessments	Management & Operation Assessments
Points brought forward from page 2				
Where there is an established and operational policy to operate maintenance schedules covering all systems including regular checking of controls, filters and cleaning in compliance with the HVCA Standard Maintenance Specification for Mechanical Services in Buildings				
• Heating/cooling systems	**6**			
• Ventilation/humidification systems	**6**			
• Lighting systems	**6**			
• Domestic hot water systems (dhws)	**6**			
Where safety survey of dhws has been carried out and appropriate steps taken to minimise risks within last three years or building is less than three years old. Where building < 3 years old design to TM13	**6**			
Where smoking ban is in effect	**6**			
Where maintenance schedules include high performance cleaning of carpets and soft furnishings with steam or liquid nitrogen cleaning at least once a year	**6**			
Where procedures operate for the collection and recording of occupant feedback and comparisons are made to historical data	**6**			
Where improvement targets relating to occupant satisfaction are in place	**6**			

Energy

Total net CO_2 emissions will be predicted. Credits given based on scale below: Total net emissions as follows:				
• CO_2 emissions 160 – 140 kg/m^2/yr	**8**			
• CO_2 emissions 139 – 120 kg/m^2/yr	**16**			
• CO_2 emissions 119 – 100 kg/m^2/yr	**24**			
• CO_2 emissions 99 – 90 kg/m^2/yr	**32**			
• CO_2 emissions 89 – 80 kg/m^2/yr	**40**			
• CO_2 emissions 79 – 70 kg/m^2/yr	**48**			
• CO_2 emissions 69 – 60 kg/m^2/yr	**56**			
• CO_2 emissions 59 – 50 kg/m^2/yr	**64**			
• CO_2 emissions 49 – 40 kg/m^2/yr	**72**			
• CO_2 emissions 39 – 30 kg/m^2/yr	**80**			
• CO_2 emissions 29 – 20 kg/m^2/yr	**88**			
• CO_2 emissions 19 – 10 kg/m^2/yr	**96**			
• CO_2 emissions 9 – 5 kg/m^2/yr	**104**			
• CO_2 emissions 4 – 0 kg/m^2/yr	**112**			
• CO_2 emissions <0 kg/m^2/yr	**120**			

Total points achieved to carry forward to page 4 (including brought forward from page 2)			

	Points	Building Performance	Design & Procurement Assessments	Management & Operation Assessments
Points brought forward from page 5				

Ecology

Where land is defined as of low ecological value	**16**			
• Where change in ecological value of site is minor and negative	**16**			
• Where change in ecological value of site is neutral	**32**			
• Where change in ecological value of site is minor and positive	**48**			
• Where change in ecological value of site is significant and positive	**64**			
Where seeking and acting on advice from Wildlife Trusts (AWTC) or a member of IEA on enhancement	**8**			
Where contract specification ensures that all trees over 100 mm trunk dia, hedges, ponds, streams etc are maintained and adequately protected from damage during construction works	**8**			

Pollution

Where refrigerant type has ODP of zero or no refrigerants	**14**			
Where presence of refrigerant leak detection system covering high risk parts of plant (coil can be omitted from this) or no refrigerants	**14**			
Where provision of automatic refrigerant pump down to coil or storage tanks with isolation valves or no refrigerants	**14**			
Where absence of Halon based fire fighting systems	**14**			
Where burners in boiler plant (except standby) have maximum NO_x emission levels as follows:				
• Where emissions are 200 – 100 mg/kWhr delivered heating energy	**14**			
• Where emissions are 99 – 70 mg/kWhr delivered heating energy	**28**			
• Where emissions are 69 – 40 mg/kWhr delivered heating energy	**42**			
• Where emissions are <40 mg/kWhr delivered heating energy	**56**			
Where site facilities reduce potential for run off to natural watercourses and/or municipal watercourses by 50% and where on site treatment such as oil interceptors / filtration is present	**14**			
Where specification of insulants avoids the use of ozone depleting substances in either manufacture or composition	**14**			
Where there is an established and operational policy to operate maintenance schedules covering BOILER/BURNER systems including regular checking of controls, filters and cleaning in compliance with the HVCA *Standard Maintenance Specification for Mechanical Services in Buildings*. Use of an HVCA registered contractor would comply. Full maintenance records should be available	**14**			

Sum points achieved in each column assessed

A **Building Performance Score (BPS)**
Transfer Building Performance column total to this box.
Also transfer to Box C on page 1 and calculate Building Performance Index.

B **Total number of points achieved (including BPS in box A)**
Transfer to Box D on page 1 and predict the final rating using the matrix given (Design & Procurement OR Management & Operation assessment only).

	Points	Building Performance	Design & Procurement Assessments	Management & Operation Assessments
Points brought forward from page 3				
Where sub-metering is available for substantive energy uses within the building covering lighting and each of the following where present: – Computer Room – Catering Facilities – Humidification Plant – Cooling Plant – Fans	**8**			
Where check-metering of tenancy areas (in multi-occupant buildings only) or where single tenancy	**8**			
Where energy policy is endorsed by Board and available to staff in accordance with GPG 186	**8**			
Where an energy audit of building is carried out at least every three years	**8**			
Where there is quarterly dissemination of information on energy use and savings	**8**			
Where energy/CO_2 monitoring is carried out using historical data	**8**			
Where energy/CO_2 targeting is carried out using historical data	**8**			
Where evidence is available showing movement towards energy/CO_2 targets over time	**8**			
Where actual energy consumption figures are less than established good practice benchmark levels	**8**			
Where there are established and operational maintenance schedules covering calibration and operation of all heating and cooling system controls. Full maintenance records should be available	**8**			
Where there are established and operational maintenance schedules that cover regular cleaning of lighting installations (at least every two years) and phased replacement of luminaires in line with best practice. Full maintenance records should be available	**8**			

Transport

Total net CO_2 emissions arising from transport too and from the building will be predicted based on location. Credits given based on scale below: Total net emissions as follows: • RURAL location with TYPICAL public transport connections	**0**			
• EDGE OF TOWN location with TYPICAL public transport connections	**16**			
• SMALL TOWN location with TYPICAL public transport connections	**24**			
• TOWN / SMALL CITY location with TYPICAL public transport connections	**32**			
• URBAN CONURBATION location with TYPICAL public transport connections	**48**			
• NATIONAL TRANSPORT NODE location with TYPICAL public transport connections	**64**			
• Where public transport connections are GOOD and car parking in the area is restricted by at least 20% from the LA standard	**16**			
Where provision of cycling facilities: Sheds, Showers and changing facilities	**8**			
Where policies and actions taken to encourage the use of public transport for commuting to and from the site (passes/loans etc) and to discourage the use of the private car	**8**			
Where policies and actions have been taken to encourage the use of public transport and to discourage the use of the private car for business travel	**8**			
Where good access to public transport networks within 500 m and with a 15 min service frequency to local urban centre	**8**			
Where good access to public transport networks within 500 m and with a 30 min service frequency to major transport node	**8**			
Total points achieved to carry forward to page 5 (including brought forward from page 3)				

BREEAM 98 *for offices*
Assessment prediction checklist

	Points	Building Performance	Design & Procurement Assessments	Management & Operation Assessments
Points brought forward from page 4				

Water Consumption

• Where predicted water consumption is 20 – 10 m^3 per person per year	6			
• Where predicted water consumption is 9 – 5 m^3 per person per year	12			
• Where predicted water consumption is <5 m^3 per person per year	18			
Where a water meter is installed to all supplies to building	6			
Where a leak detection system is installed covering all mains supplies	6			
Where a proximity detection shut off is provided to water supply in toilet areas	6			
Where there are established and operational maintenance procedures covering all water systems, taps, sanitary fittings and major water consuming plant. Full maintenance records should be available	6			
Where water consumption monitoring is carried out at least once every quarter using historical data	6			

Materials

Where there is no asbestos in structure, services, lifts, etc. or where asbestos survey has been carried out and all asbestos either removed or contained and identified within H&S plan	8			
Where presence of dedicated storage space for materials either within building or on site skips with good access for collections (2 m^2 per 1000 m^2 up to 10 m^2 max)	8			
Major Building elements will be evaluated against the specifications set out in the *Green Guide to Specification* as follows:				
• Where at least 80% by area of upper floor slab specifications achieve an 'A' overall rating	8			
• Where at least 80% by area of external wall specifications achieve an 'A' overall rating	8			
• Where at least 80% by area of roof specifications achieve an 'A' overall rating	8			
• Where at least 80% by area of windows specifications achieve an 'A' overall rating	8			
Where timber for key elements including structural timber, cladding, carcassing, internal joinery is specified to come from sustainably managed sources	8			
Where specifications of timber panel products use only timber that complies with above requirements. This relates specifically to plywood and other composite panel products and to composite timber doors	8			
Where there is reuse of > 50% of existing façades	8			
Where there is reuse of > 80% of major structure by building volume	8			
Where there is use of crushed aggregate or masonry for use in structure, slabs, roads etc	8			
Where there is corporate policy endorsed at Board level and operational procedures for the collection and recycling of office consumables. Should cover paper, printer cartridges, toner cartridges, plastics	8			
Where there is information on presence of hazardous materials is available for staff and contractors	8			

Land Use

Where the site has been previously built on or used for industrial purposes within the last 50 years	16			
Where land is 'contaminated' and where adequate steps have been taken to contain or clean the site prior to construction. Evidence of survey and consultants report demonstrate targets to be achieved	16			

Total points achieved to carry forward to page 6 (including brought forward from page 4)			