Sustainable Construction: Designers

Who should read this factsheet?

This factsheet should be read alongside the general sheet 'Sustainable Construction: An Introduction'.

Written for designers this factsheet outlines aspects of sustainability to consider for more sustainable building design. The mini case studies towards the end of the document provide examples of sustainable designs.

Designers may also be interested in reading the factsheets for suppliers and contractors.

What does sustainable construction mean for designers?

For designers, sustainable construction means designing buildings that work at all levels, economic, environmental and social; buildings that are high quality, attractive, and use fewer resources; buildings that bring economic benefits to their owners and a better environment for their occupants. It will help designers:

- attract and retain clients who are increasingly asking for better - more sustainable - buildings
- result in an increased level of satisfaction, enhancing market appeal
- maximise innovation and reduce the risk of conflicts, time delays, defects and projects going over budget by working more closely with other organisations in the construction process; partnering is an important part of more-sustainable construction
- attract and retain the best employees, especially those who would prefer to work for an environmentally and socially aware company.

Sustainable design concepts and specification need to be considered and included at the earliest stage of a project if they are to be integrated fully into the finished product.

Designers play a key part in producing more sustainable construction. They can influence clients, advising them on the best sustainable solutions. Designers also tend to have greater contact with new methods, tools and research that can be applied in projects. However, it is important, particularly when aiming for a more sustainable solution, that the project team (including designers and suppliers, contractors and client) work together towards a shared goal. All can benefit from the resulting improved efficiency, fewer conflicts or misunderstandings and shared learning opportunities.

What do I need to consider?

Make sure that your employees are up to date with the most recent sustainability guidance, methods and tools. Key economic, environmental and social areas to consider are outlined below.

Economic sustainability

- Think about the quality and whole life cost of the project. For example, designing for greater energy efficiency (reducing energy bills over the lifetime of the building) or creating a healthier and more pleasant indoor environment for occupants (increasing staff productivity) can be very appealing to clients.

'Direct benefits of good design are reduced maintenance, management and running costs, while indirect benefits are gained through improved satisfaction and productivity of building users.' (Constructing Excellence)

Clients will often appoint consultants on the basis of their past experience in sustainable construction, so **highlighting past projects to clients can help win business.** A high level of client satisfaction will also enhance the design team's image and encourage **repeat business.**

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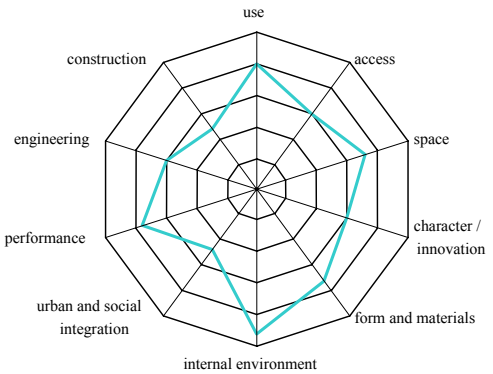
- Design also impacts on the **economic performance of the construction process.** Aim to work in partnership with the supply chain to specify standard materials to save unnecessary waste, cost and labour during construction. Good communication with other members of the team, and involvement of the design team early in the process is also likely to reduce delays and cost over-runs. Considering techniques such as off-site construction and designing simpler building services systems can also reduce the likelihood of delays, defects or variations.

The Design Quality Indicator (DQI) is one way of involving clients and end-users in the design of a building (see box below).

Design Quality Indicator (DQI)

The DQI is a way of developing a high quality design that meets the needs of building users. It can be used at inception for the client to clearly express their requirements, set benchmarks and help to understand the trade-offs between different options.

It is based around a non-technical questionnaire that addresses build quality, functionality and impact of the building. The questionnaire is completed by stakeholders who are assisted by a trained facilitator. The results of the aggregated responses are shown in a diagram such as the one below



Environmental sustainability

There are seven key environmental areas to think about. Most of these can be considered effectively through the use of BREEAM (BRE Environmental Assessment Method) - see further information section.

- ***Energy.*** Design to minimise the energy consumption of buildings in operation. This can be achieved through an air tight building envelope that has controllable ventilation, good insulation, efficient and responsive heating and lighting controls, appropriate glazing and shading to avoid overheating in summer, and natural ventilation instead of air-conditioning. For more information see www.actionenergy.org.uk

- ***Transport***. Make the most of the location. Plan the site with public transport use, efficient vehicle movements, cycling and walking in mind. If building occupants have a choice of alternative transport modes to the single-occupant car they will have the opportunity to significantly reduce the greenhouse gas emissions and other pollution associated with their journeys to and from the building/ development. Design-in features such as sheltered cycle storage and provide safe pedestrian routes to local amenities and transport nodes.

- ***Materials.*** Aim to minimise the amount of raw material and energy used in construction, and the pollution and waste produced. This can be achieved by reusing existing building components such as façades and structures. Consider the embodied impact of different building options when deciding whether new build or refurbishment would be most appropriate (see box below). Careful choice of materials and components can greatly reduce the embodied impact of construction. Reused or recycled materials are generally preferable to new, in terms of sustainability (provided they haven't been transported over considerable distances or undergone a significant cleaning/repairing processes, which would increase their environmental impact). Where you specify new materials, aim to use renewable ones as much as possible (for example wood from sustainably managed sources, natural fibres such as wool or hemp, etc, instead of petroleum-based products).

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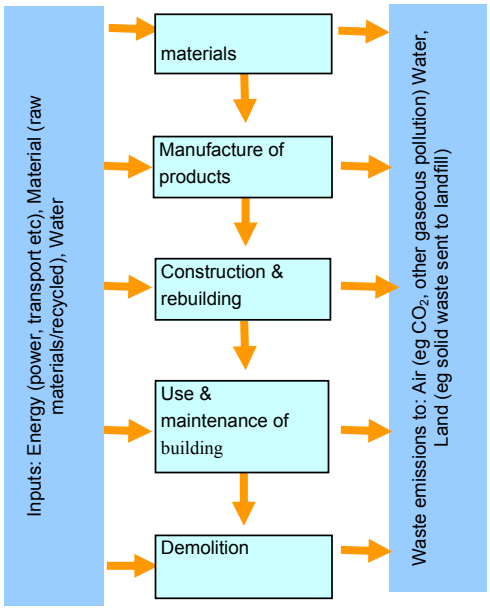
Embodied impact of a building



- ***Waste.*** Construction site waste can be reduced by using standardised components in the design. Building operational waste can be reduced by designing space for recycling bins in the finished building. It is also important to consider deconstruction recycling, so that components can easily be recycled or re-used at the end of the building's life. For more information see www.wrap.org.uk.

- ***Water.*** Aim to reduce the amount of treated water that will be used in the building. This can be achieved through designing-in water-efficient fittings (such as taps, showers and toilets), control devices (for example auto shut-off taps and proximity detection shut off in toilet areas) and also by including systems such as grey-water recycling or rain water collection for toilet flushing and irrigation, or even black water recycling (for example, using reed bed systems) in the design. For more information, see www.environment-agency.gov.uk.

- ***Biodiversity.*** Select the site and plan the development so as to minimise disruption to sensitive areas. Consider obtaining the advice of an ecological consultant on how to minimise impact on the site's existing wildlife and on features of ecological value to include to enhance site biodiversity. For more information, see www.ukbap.org.uk.

- ***Internal environment.*** Aim to create a pleasant and healthy internal environment, by providing appropriate ventilation and fresh air, natural daylight, occupant temperature control, and considering internal noise levels.

It is important that **documentation and commissioning** is effective to ensure that the systems and features operate as designed. A poorly commissioned building can consume far more resources and have a poor indoor environment when compared to a properly commissioned building. The design team is in an ideal position to ensure that documentation and commissioning is effective and robust. Designers can also play a key role by designing buildings that are easy to use (so that complicated documentation is not needed) and in training occupants on efficient building operation.

Social sustainability

- It is important to design the building so it is fit for purpose. **Involving end users** in design can bring great social benefits, ensuring that the finished building meets their needs and performs well for the people who will use it.

- One of the requirements for a sustainable community laid out in the recently published Sustainable Communities Plan (Office of the Deputy Prime Minister) is that local people, groups and businesses should be involved in the planning, design and long-term stewardship of their community. **Community participation** is an important aspect of sustainable design. Design teams should ensure new buildings are in keeping with the local area and, where possible, designed to enhance local areas. For more information see the Factsheet entitled 'Working with the Community' at www.constructingexcellence.org.uk.

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- Aim to design for adaptability. A building that can accommodate changing uses is likely to have a longer life span. This not only enables it to be changed as social requirements of the building users change, but it also has significant environmental and economic benefits. However, avoid over-specification, which can result in the unnecessary incorporation of components into a building which may never be used. Design for easy upgrading of systems.

Examples of more sustainable building designs

Richard Doll Building, University of Oxford

This building is a new cancer research centre. The architect (Nicholas Hare Architects) worked with the main contractor (HBG Construction Southern Ltd) as part of an integrated team, to understand, better manage and so minimise building waste.

At the pre-construction stage, the architect set out goals in the following areas:

- construction materials were chosen with regard for their sustainable origins and proximity to the site in order to reduce transportation
- waste was designed-out through methods such as modular design and specifying standard-sized components to reduce unusable off-cuts
- suppliers with a progressive approach to waste management and recycling were identified.

The design also incorporated more visible design features, including:

- atrium spaces that provide natural ventilation for the adjacent office areas by means of opening windows
- solar shading to reduce heat gain
- highly insulated construction fabric.

The ***benefits*** include a more pleasant indoor environment for the building occupants, in a building with a lower environmental impact. The construction phase was more efficient and had a lower impact on the environment, and provided lessons for the project team to follow in future projects.

For more information, contact Nicholas Hare Architects:
www.nicholashare.co.uk
T: 020 7607 4433, F: 020 7607 7220.

Bennetts Associates Office, Clerkenwell, London

Bennetts Associates Architects have pioneered higher levels of sustainability in their projects for more than a decade; they applied principles of sustainability to the design of their own new office building. The project involved reconstruction and extension of a derelict barn and print works.

Benefits

- *Energy efficiency*. The design encompasses simple proven methods, which are appropriate to the scale and function of the buildings. These include a good level of insulation, double-glazed windows and high thermal mass provided in the floors and roofs.
- *Materials*. Selection of materials took into account both embodied energy and sustainability. Windows are mild steel, which has less embodied energy than aluminium, carpets are made from recycled materials and, wherever possible, timber and brick used were salvaged from buildings on the site that had fallen into disrepair.
- *Location.* The new office makes good use of existing buildings that had fallen into disrepair, a more sustainable solution than demolishing existing buildings and starting from scratch. The development will also go some way to help regenerate the social and economic fabric of the area, which has deteriorated over a number of years.
- *Occupant satisfaction*. Staff consultation was (and continues to be) an important aspect of the project. Staff were consulted throughout the design process, and during post-occupancy, to ensure that the new office meets their needs.

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A more detailed case study is available from www.m4i.org.uk, or contact: Ann Bodkin,

T: 020 7520 3300

E: ann.bodkin@bennettsassociates.com

Sources of further information

BREEAM (BRE Environmental Assessment Method). A voluntary scheme for assessing and certifying the environmental performance of buildings: www.breeam.org.

Green Guide to Specification Anderson J, Shiers D, Sinclair M (2002), Blackwell. Provides environmental ratings for over 250 materials, helping designers to choose materials with lower environmental impact: www.brebookshop.com.

AECB (Association for Environment-Conscious Building), The Real Green Building Book. Produced annually, this booklet provides a listing of 'greener' practitioners from materials producers to contractors and architects: www.aecb.net.

Construction Resources. An ecological building centre, distributing materials & systems for sustainable building: www.constructionresources.com

Design Quality Indicators. Allows designers to draw on user input in design: www.dqi.org.uk

Demonstrations of Sustainability, Constructing Excellence, 2003. A report summarising the Rethinking Construction demonstrations and how they have addressed sustainable construction issues: www.cbpp.org.uk.

Sustainable Buildings: benefits for designers, BRE Information Paper IP13/03 Part 2. Based on case studies, this paper outlines the benefits to designers of producing more sustainable buildings. It is one of a set of four: www.brebookshop.com.

The Value of Good Design, CABE, 2002. A booklet that draws together research to demonstrate the social and economic value generated by good design:.www.cabe.org.uk

Celebrating Innovation, CABE. Case Studies on innovation and integration in design and construction: www.cabe.org.uk

Action Energy. A government-funded programme to help organisations save money through energy saving: www.actionenergy,org.uk.

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