IMAGE: Sedum planting on a typical 'green roof' (Photo: Peter White)

Sustainable Roofing

The 4th edition of the BRE's on-line 'Green Guide' - Environmental Profiling System for Building Materials and Components, will soon be launched. Here, we look at the key benefits of the Guide and what it particularly has to say within the context of sustainable roofing solutions.

The scope of the new *Green Guide* examines the relative environmental impacts of the construction materials commonly used in six different generic types of building including:

- Commercial buildings: offices;
- Educational;
- Healthcare;
- Retail;
- Residential;
- Industrial.

The environmental rankings in the Green Guide are based on Life Cycle Assessment (LCA) studies. The LCAs which underpin the information in this Guide take into account the environmental impacts of the winning of the raw materials, manufacture, assembly, maintenance and repair, demolition and waste management at the end of life.

Designers should be aware of the view amongst many environmental researchers that operational impacts of buildings normally outweigh the embodied impacts arising from materials production and construction. There may therefore be circumstances under which a less-than-environmentally-ideal specification choice can be justified in the interests of better long-term operational environmental performance. This is not to say, however, that embodied impacts are inconsequential. For example, the materials sector still consumes around 30 per cent of total UK industrial energy and approximately 10 per cent of all UK energy. It is widely accepted that there is mounting evidence to suggest that the concentrations of Carbon Dioxide and other 'greenhouse' gases (such as methane) in the atmosphere are increasing. As the main source of these greenhouse gases is the burning of fossil fuels for energy, a reduction in the energy levels required in the manufacture of building materials represents an opportunity for materials producers to minimise the environmental impact of their products.

Designers and specifiers can assist in this process through more environmentally responsible choices.

ELEMENTAL BASIS

Materials and components in the Green Guide are arranged on an elemental basis – for example, External Wall Construction, Internal Walls, Floor Finishes – so that designers and specifiers can compare and select from comparable systems or materials as they compile their specification. Furthermore, it is meaningless to compare the environmental profiles of say, concrete floors and a particular type of paint; ratings are therefore based only on product performance within each respective element group. The principal building elements covered in this edition of the Guide include:

- External walls;
- Internal walls;
- Roofs;
- Ground floors;
- Upper floor construction;
- Floor finishes;
- Windows;
- Insulation;
- Landscaping.

WALLS AND ROOFS - PRIMARY BUILDING ELEMENTS

A roof has greater impact for say, three-storey buildings in comparison to either eight- or 20-storey

IMAGE: Installing zinc roofing on the Hanson Ecohouse at BRE (Photo: Peter White)

buildings. This is as would be expected as the roof area would be equivalent to 33 per cent of the floor area for a three-storey building and only five per cent of the floor area for a 20-storey building.

The roof also has slightly more impact for a deeper-plan building, reflecting the reduction in external wall and window area relative to floor area.

Walls and roofs, as the primary building elements, are inextricably linked structurally and aesthetically and are the principal components of the weather-proofing building envelope. Hence, wall and roof systems must be compatible in both functional and visual terms and designers should take care not to compromise these essential requirements by mixing incompatible wall and roofing solutions purely on the grounds of perceived environmental preference.

ROOFING SPECIFICATIONS

Roofing specifications in the *Green Guide* have been arranged into subsections for ease of use by designers. However, ratings have been arrived at through comparison of all roofing types shown across all subsections. The subsections are:

- Flat roofs – 'cold deck', 'inverted deck' and 'warm deck', the position of the insulation being the primary difference between the systems;
- Pitched roofs – roofs with a pitch of 16° to 45°, including tiled roofs on a timber roof structure and profiled sheet roofing;
- Low pitched roofs – pitched profiled roof decking, composite cladding panels, etc up to 15°.

Although the environmental ratings in this Guide are underpinned by extensive quantitative data, it was felt that these numerical values and comparisons would be of interest only to specialists rather than those involved in the day-to-day procurement of building projects. This data has therefore been translated into a simple environmental rating system to enable specifiers to make meaningful comparisons between materials and components.

THE PERFORMANCE OF A MATERIAL

By evaluating the performance of materials and building systems against specific environmental parameters, it is possible for the roofing specifier to select specifications on the basis of personal or organisational preferences or priorities, or take decisions based on the performance of a material against a particular environmental parameter.

ENVIRONMENTAL PARAMETERS

- Climate Change;
- Water extraction;
- Mineral resource depletion;
- Stratospheric Ozone depletion;
- Human toxicity;
- Ecotoxicity to water;
- Nuclear waste;
- Ecotoxicity to land;
- Waste disposal;
- Fossil Fuel Depletion;
- Eutrophication;
- Photochemical Ozone Creation;
- Acidification.

THE MERITS OF RECYCLING

Perceptions regarding best environmental practice are subject to change as our understanding increases and a clear consensus regarding what is most important and practically achievable emerges. Designers should be aware, for example, of the ongoing debate concerning the merits of recycling and how recycling may not always represent best environmental practice, especially where high value and polluting energy resources are consumed to recycle low value material.

BRE suggests that the merits of recycling should be judged on a case-by-case basis, looking particularly at key issues for each individual material and location. For example, the relatively low impacts of some reclaimed materials can be adversely affected if they have to be transported over very long distances when compared with new materials, which may be produced more locally.

CAREFULLY THINK THROUGH THE ROOFING SPECIFICATION

The Environmental Profile (LCA) of a building material is only one of many factors which need to be taken into consideration when compiling a roofing specification; cost, durability, appearance, development control issues, buildability, function and operational issues (including the benefits of using high thermal mass materials), maintenance and availability are all important and potentially decisive issues. The most successful approach to specification is one where underlying objectives and priorities are clearly established in the early stages of a project as this can then help determine the appropriate balance between these sometimes conflicting requirements.

Even in the best buildings, compromise is an inevitable part of design and specification; 'green' considerations will no doubt be subject to this same process of trade-off in achieving the right balance of priorities for a particular project. It is hoped that by thoughtful consideration, designers and client organisations will at the very least begin to 'move in the right direction' towards reducing the environmental impacts of construction projects.

REDUCING ENVIRONMENTAL RISK

Many in the property sector are becoming more aware of the need to further reduce exposure to 'environmental risk' and the future scope of environmental liability may have far-reaching implications for the construction industry. The impact of the construction process in terms of energy use or levels of emissions on global conditions could be identified as a major 'indirect' environmental hazard. As such, it is possible that these issues will become potential legal-liability flashpoints and that designers, specifiers and materials manufacturers will be obliged to take this into account in the design and construction process.

Property investors and funding institutions, under pressure from shareholders and insurers, are also seeking a 'greener' and more 'socially responsible' approach to the design and procurement of buildings and many property-owning organisations are signing up to CSR initiatives. A more carefully considered, environmentally aware approach to the specification of materials is important in being able to demonstrate that projects are well managed and are protecting shareholders' interests through minimising the risks associated with environmental impact □

The new BRE online '*Green Guide*' – written by Jane Anderson, BREEAM Materials, BRE, David Shiers, Oxford Brookes University and Kristian Steele, BREEAM Materials, BRE – will be available to the public from early June.

For further information on BRE Environmental Profiles, visit **www.bre.co.uk/envprofiles**
Tel: 01923 664462 • www.bre.co.uk