BRE

Environmental issues can't be ignored

Building for people – the real value of construction
Putting creativity into housing
Designing inspirational schools

SUMMER 2004 ISSUE 21

Healthy hospital design
The industry's response to meeting user needs
FRP durability
Intelligent buildings

constructing the future

overview

BRE

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Comment

There are few aspects of life that cannot be improved by the way we design and construct buildings… or made worse.

This year's BRE Annual Conference was on *Building for people – the real value of construction*. Some of the points raised by the distinguished group of speakers on the way we design and build homes and public buildings – and on the way we should be doing it – are featured in this issue of *Constructing the future*.

Current plans for massive housing developments, and investments in school and hospital buildings are a fantastic opportunity to design and build the sort of new homes that people actually want, school buildings that encourage learning and hospitals that aid recovery. And it's a chance for the construction industry to demonstrate a real commitment to sustainable development.

To help the industry grasp the opportunities presented by the drive for sustainable development, BRE has merged its energy and environmental engineering divisions into a new group called BRE Environment. Now able to provide specialist advice, design consultancy and technical services at every stage of the building life cycle, the aims and plans of the new group are discussed on page 5.

In future issues we are going to focus on design, construction and sustainability in particular building sectors, including education, health, housing, offices, leisure and infrastructure.

Andrew Williams
Marketing Director, BRE

Stephen Timms at resource04, visiting the Colt Group exhibit (left in upper photograph) and the PV Systems exhibit (lower photograph)

Timms applauds energy technology showcase

In a little over five years' time the Government aims to be generating 10% of the UK's energy needs from renewable sources. This very challenging target was recently re-affirmed by Energy Minister Stephen Timms (shown left in the top photograph) at resource04, a 4-day energy technology showcase held at BRE on 7–10 June.

Many forms of the renewable energy technologies needed to achieve this goal were on display at resource04, along with the energy efficiency technologies that are also vital to the Government's energy and carbon emission targets.

During the event Mr Timms launched the UK's first domestic fuel cell trial, in which an alkaline fuel cell CHP system (see page 4) will supply electricity to one of BRE's full-scale test houses. 'I am pleased that the Carbon Trust will be supporting this potentially revolutionary development,' said Mr Timms. 'My department will keep a close eye on progress as we have a big stake in its success'.

Organised by BRE and the Energy Saving Trust (EST), resource04 was sponsored by CIBSE, the Colt Group, The Energy Institute, the INTEGER Partnership, Renewable Energy Systems and RIBA. There were nearly 60 exhibitors at the event, including several with large-scale exhibitions.

Among the new products launched at resource04 was SolarSynergy™, developed by Imagination Solar in partnership with PV Systems – one of the large-scale exhibitors. SolarSynergy™ combines solar water heating and solar PV in one roof integrated frame. Having visited the exhibit Stephen Timms commented, 'The new PV Systems hybrid solar equipment holds out a lot of promise for the future'.

Running alongside the exhibition was a conference featuring presentations from some of the UK's most distinguished professionals in the low-carbon and renewables sphere.

As well as Stephen Timms, these included broadcaster and architect, Maxwell Hutchinson, Philip Sellwood, EST Chief Executive, and Jeremy Leggett the CEO of solarcentury – another of the large-scale exhibitors at resource04

'We need to move away from reliance on fossil fuels to more sustainable forms of energy generation, and to reduce our energy use across the board,' said Stephen Timms, opening the conference. 'I therefore applaud your efforts to improve energy efficiency in buildings, and to develop on-site renewable generation.'

Full details of resource04, including copies of the conference speakers' presentations, are available at www.resource04.com.

resource05

The success of resource04 has prompted plans for a similar event next year. More information on the proposed resource05 event will be available soon.

Intelligent buildings – new opportunities

A two-day conference and exhibition will investigate the very important opportunities for designing, constructing and managing intelligent buildings, on 23 & 24 September at BRE, Watford.

21st Century buildings have got to perform significantly better in economic, environmental and social terms. Better performance depends on the improved use of information and systems, which is why more intelligent buildings are needed.

As well as providing greatly enhanced communications, intelligent technologies allow the remote monitoring and control of building systems such as lighting, heating, security and safety, and the potential for much more. The convergence of building management and control systems with communications and IT infrastructures, means that intelligent buildings can now be more effective than ever in increasing building performance.

Intelligent Buildings 2004 will explore the ways in which intelligent systems can increase building performance over two days:

Day One – focussing on building management and control systems including HVAC, fire detection and alarms, security and lighting. There will be a programme of industry and professional workshops.

Day Two – featuring information technology and communications infrastructures. There will be an in-depth analysis of the application of intelligent systems in offices, hotels and the retail sector.

For more information about attending, speaking, exhibiting at or sponsoring the conference:

Intelligent Buildings 2004 – Capturing the Opportunities, which is being jointly organised by BRE and i&i limited in association with the IEE, contact:
BRE Events – 01923 664800
Email events@bre.co.uk
or see the website www.ib2004.net

Ready for Eurocodes?

Many design engineers seem poorly prepared for the replacement – by 2010 at the latest – of current British standards with Eurocodes as the primary basis for designing buildings and civil engineering structures in the UK.

This will mark a huge change for them, but there is little evidence to date that they are taking steps to address it. Trial Eurocodes (ENVs) have been available here for some time but little used.

Developed over twenty five years, the Eurocodes are finally being published between now and 2005. They will coexist alongside national codes and standards for three years and then the British standards will be withdrawn. While the construction industry has adapted to new design codes from time to time, it has never faced the challenge of implementing a complete new suite of codes (twenty in total) that encompass all the major materials and loading requirements.

Even though 2010 seems a long way off, design engineering companies should be planning now for the changes. The format and the terminology of the Eurocodes are significantly different from those of the British standards, so a considerable financial investment in new software tools and staff training will be needed.

ODPM recently commissioned a National Strategy for Implementation of the Eurocodes, which details the guidance and training requirements of design engineers and academics and the industry in general. ODPM is anxious that the construction industry in the UK is prepared for, and can benefit from, implementation of the Eurocodes as they offer significant opportunities for exporting UK design expertise and products.

ODPM has also commissioned BRE to prepare a series of high level companion documents that are aimed at senior engineers and architects. These will cover:

- major technical differences between the Eurocodes and current UK standards
- a road map for the design of buildings
- best value issues
- environmental issues.

Drafts of these documents were presented at a workshop at the Institution of Structural Engineers on 7 July 2004.
For more information –
Email moored@bre.co.uk

For further information on implementing Eurocodes go to:

www.odpm.gov.uk

www.eurocodes.co.uk

News from BRE Certification and LPCB

July CD ROM
The July 2004 issue of the CD ROM of approved products and services has now been published. There are some new product areas including:

- Windows assessed against LPS 1175 and/or BS 7950: 1997for security performance)
- Windows assessed against BS 6375-1 (Weathertightness) and BS 6375-2 (operational and strength characteristics)
- Structural Timber (Water permeability).

For free copies of the CD ROM contact the helpdesk at the address given below. A live list of all approved products and services is kept fully up to date on the website at www.redbooklive.com.

Competent Person Self-Certification Scheme for Part P of the Building Regulations
BRE Certification is delighted to have received authorisation from the Office of the Deputy Prime Minister to operate the Competent Person Self-Certification Scheme for Part P.

Phil Hope, the Minister for Construction, has just announced the new legislation and the Competent Person Scheme in the House of Commons – the scheme will come into effect from 1 January 2005.

Part P imposes the requirement that, 'fixed electrical installations in dwellings shall be suitably designed, installed, inspected and tested so as to provide reasonable protection against their being the source of fire or the cause of injury to persons.'

Once Part P comes into effect electrical work in dwellings (with certain exceptions) will have to be notified to – and inspected by – Building Control, or completed by a company that has been certificated as a 'Competent Person' under an authorised Part P scheme.

BRE Certification welcomes the introduction of electrical safety into the Building Regulations, which will reduce the number of injuries and fires in domestic dwellings. The BRE Certification scheme has been developed with the Electrical Contractors' Association (ECA) and the Institution of Electrical Engineers (IEE), to provide a technically robust assessment and certification scheme for electrical contractors.

For further information see www.partp.com for an on-line facility to apply to join the scheme.

Environmental Profiles
Tarkett Sommer adverts have recently been promoting the BRE Certification of their Environmental Profiles for their Commercial Tufted Carpet Tiles and Homogeneous iQ Vinyl Flooring (see picture).

Aggregate Industries UK Ltd are the most recent company to have joined the scheme and now have certified Environmental Profiles for their Lightweight and Dense Enviroblock products.

For further information on any of the above, contact the Helpdesk 01923 664100
Email enquiries@brecertification.co.uk
or view www.redbooklive.com.

New System Build Standard
A unique new certification standard has been developed specifically for modern methods of construction.

Called the System Build Standard, LPS 1272, it provides manufacturers of prefabricated building systems and sub-systems for housing with a recognised benchmark against which they can test and certify their products. A particular feature of the standard is that, in addition to normal building performance criteria, it covers insurance and mortgage lender requirements such as durability, repairability and identification.

The new System Build Standard applies to:

- light steel frame systems
- timber frame systems
- structural insulated panel (SIP) systems
- pre-cast concrete frame systems.

To date there have been no comprehensive standards directly applicable to prefabricated system build. This has meant that clients have not always been given the level of assurance they needed to adopt modern methods that can have many benefits, such as:

- speed of construction
- value for money
- quality controlled production
- positive environmental credentials.

Carol Atkinson the MD of BRE Certification says, 'We hope that this BRE certification scheme will raise the quality and acceptance of prefabricated systems, helping them to fulfil the demand for new homes in the UK'.

For more information –
Paul Sims 01923 664626
Email simsp@bre.co.uk

Recycled construction products

Launch of Recycled Building Products Network
A new Network has been set up to promote greater use of recycled material in the manufacture of construction products, and to stimulate demand for recycled building products.

The launch in May of the Recycled Building Products Network is particularly timely in view of the growing pressure for the greater use of recycled material in construction – a report from the Sustainable Building Task Group, for example, recommends that Building Regulations should stipulate a 10% use of recycled products for building projects.

The Network will:

- map the information and services currently available to develop a one-stop information service on the Network's website (www.recycledbuildingproducts.co.uk) which is currently under development
- act as focal point for consultation, queries and partnership building
- organise a series of targeted events on regional and national levels
- email newsletter updates on new R&D, grants and other developments.

The exact nature of the activities run by the Network will be decided by the Members, and an Advisory Group to promote this process is now being established. Membership is open to any organisation (and is currently free), but is likely to be of most benefit to:

- construction product manufacturers
- innovators and entrepreneurs creating new recycled products
- reprocessors and those needing markets for recyclate
- specifiers of construction products and materials
- support organisations promoting recycling, business enterprise and market development of recycled products
- providers of technical advice, testing and certification.

For further information, and for those wishing to join the Network (and Advisory Group) –
Amanda Conroy 01923 664471
Email conroya@bre.co.uk

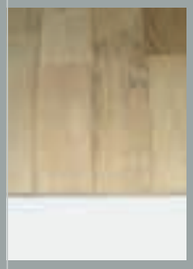
National Green Specification
More than 300 specifications for recycled construction products are going to be made freely available from the National Green Specification website (www.greenspec.co.uk), as part of a two-year, DTI funded project being carried out by BRE in partnership with ASWS (Architectural Specification Writing Services).

The project will also provide workmanship clauses for waste management activities on construction and demolition sites. The specifications and clauses will help designers and specifiers to make informed choices in terms of the protection of the environment, material resources, embodied energy, life expectancy and durability.

Recycled product manufacturers are currently being asked to provide information on their products, which can then be advertised on the National Green Specification (NGS) website – this is a free service. A web page will be produced for each product and will contain an image and brief summary, a link to downloadable specifications, guidance notes, literature and links to the manufacturer and suppliers.

This project is part of a wider NGS programme that aims to create and sustain a readymade specification for green products and methods of construction. It is primarily intended for use by architects, civil and structural engineers, manufacturers, suppliers, contractors and sub-contractors, self-builders, clients, and financiers.

Anyone with a recycled product that they would like included on the NGS website, or anyone wanting more details about the project should contact
Katherine Adams 01923 664478
Email adamsk@bre.co.uk



Adding value to UK-grown timber
Green-gluing, the jointing and laminating of 'green' timber, is the subject of a major feasibility study to determine its potential as the basis of a new woodworking enterprise.

The study has been commissioned by the Greenwood Community Forest, which believes the new technology could provide a practical use and add value to low-grade timber in its Nottinghamshire and Derbyshire woodlands. This timber otherwise has little value except as firewood or for chipboard manufacture.

If the study points to the viability of a new enterprise based around green-gluing, then it will be enormously significant to woodland owners throughout the UK and could lead to the replanting, revitalisation and better management of the country's woodlands.

Jointing and laminating timber in its 'green' (wet/unseasoned) state prior to drying allows large cross sections to be built up using lamination, or extended lengths to be produced using finger-jointing. Gluing in the green state increases yield from timber by removing defects such as knots that cause distortion during drying. The removal of these defects prior to drying also results in significant energy savings.

'The new technology provides an excellent opportunity to make better use of poor quality timber and open up new markets for locally grown timber that have until now been difficult to sell to,' says Matthew Cornwell of BRE which is conducting the feasibility study.

Amongst the products that could be made from green-glued timber are high-quality joinery products such as window frames and doors from oak and sweet chestnut, character flooring from oak, ash, sweet chestnut and birch, internal mouldings from oak, ash, sweet chestnut and birch, agricultural joinery (such as gates) from oak, and work tops and table tops from ash, sycamore and birch. Cladding and large cross-section structural beams could also be made from poor-quality timber, coppice and other small diameter round woods.

The study, which is being supported by the Forestry Commission and the East Midland Development Agency (EMDA), will assess the local timber supply chain and market to determine its potential to support a green-gluing enterprise. A full report on the study is expected in June 2004.

For further information –
Matthew Cornwell 01923 664148
Email cornwellm@bre.co.uk

First UK fuel cell trials
In the first trial of its kind in the UK, a fuel cell system developed by Scottish based company Smart Energy Ltd is being trialled in a test house at BRE's Watford site. The fuel cell trial was launched at resource04, an exhibition of renewable and innovative energy efficiency technologies for buildings, by Energy Minister Stephen Timms in June (see page 2).

In this trial, funded by the Carbon Trust, an alkaline fuel cell combined heat and power (CHP) system (with lead acid battery energy storage) is supplying electricity to a full-scale test house that mimics the requirements of a real home with a range of simulated occupancy patterns. Heat produced by the unit will augment the house's gas fired central heating system.

Fuel cells transform energy stored in a fuel into electricity and heat. They are similar to batteries, which also convert energy stored in chemical form into electricity, except that they make use of externally supplied fuel and so do not need recharging.

Among the fuels that can be used is hydrogen, offering the prospect of an almost limitless supply of zero-emission fuel for 'clean' energy generation from renewable power sources. Fuel cells can be produced in a wide range of sizes, so fuel cell CHP plants could be installed in individual homes, large office buildings or small industrial facilities, and run on hydrogen either pumped directly to the plants or converted from waste energy streams or biomass.

The fuel cell unit being trialled will be fuelled with compressed hydrogen supplied by Air Products Ltd. During the study, all the parameters needed to fully evaluate the system will be monitored and recorded, and the technical and economic factors involved in a hydrogen economy and infrastructure will be investigated. Monitoring will be carried out by Scottish and Southern Energy plc, the UK's largest electricity distribution company, providing independent verification of the trial performance.

For more information –
John Hart 01923 664591
Email hartj@bre.co.uk

In brief

Security in the 21st Century office
A one-day conference on the security challenges and opportunities facing the commercial office sector is being held on 1 December 2004 in London. It will address the issues facing those involved in the planning, implementation and management of security for offices in the post-September 11 era.

Sessions will cover designing to minimise security threats in single and mixed-use environments, legal and insurance issues, the burden of responsibility, civil contingency, tall buildings and contending with the chemical, biological and cyber-terrorist threat. Most importantly the conference will attempt to reconcile effective security and business success. It will feature speakers and case studies from the leading players in the office sector who have developed prudent security measures and practices in a positive business environment.

The event will be hosted jointly by BRE and the British Council for Offices. To register an interest and receive a conference invitation Email events@bre.co.uk

Testing innovative floors
When the BBC bought an old postal sorting office (called the Mailbox) for refurbishment, one of the facilities they wanted was a studio area. But the space available was very limited – it had a floor-to-floor height of 6 metres and to make the most use of it the designers, BDP, decided to fit a mezzanine floor at mid-height.

An innovative tight-fit design was needed for this, integrating the structure, the primary and secondary distribution runs of the building services, the ceilings and the raised floor support. BDP's solution was 'The Gondola', a two-way spanning grid (410 mm in depth) suspended via high-level collar connections using Macalloy bars. It uses aircraft wing technology where services are integrated into the supporting structure and the skin contributes to the stability.

It was recognised that the limited floor depth available and relatively long floor spans could mean a problem with the dynamic behaviour of the floors. BDP used calculations and modelling to design them but felt it essential to have these verified by independent tests, and commissioned BRE to carry these out. A programme of tests were conducted to establish the natural frequency and response factors under various live load conditions and the full accumulation of the fabrication and erection tolerances.

The results matched the anticipated values predicted by BDP and The Mailbox is now fully operational.

For more information on floor testing – Tony Woods
Email woodst@bre.co.uk

OFFSITE2005
Modern methods of construction (MMC) are widely accepted as key to accelerating the delivery of new homes and public-sector buildings in the UK, and are increasingly being successfully applied to new developments.

OFFSITE2005, being held from 6–9 June 2005 at BRE, will feature full-scale, interactive demonstrations and displays from the world's leading exponents of off-site manufacture and other MMC.
The event's seminar programme will cover:

- how MMC are contributing to sustainable communities
- achieving accelerated delivery through partnering
- understanding the technical issues relating to MMC
- developing the modern workforce
- global opportunities and applications
- building regulations, certification and quality assurance.

For information on sponsoring, exhibiting and attending the event – 01923 664766
Email offsite2005@bre.co.uk or visit www.offsite2005.com

Environmental issues – they won't go away

Businesses that continue ignoring environmental issues face a bleak future. David Strong discusses with journalist Margo Cole, the environment's growing power in the construction industry.

Environmental issues are rapidly moving into the mainstream, and major players in the construction industry who don't take them seriously are going to get left out in the cold.

This is the warning from David Strong, managing director of BRE Environment. 'Climate change and resource issues are becoming key business drivers,' he explains. 'Any organisations in the built environment sector that doesn't realise what's about to happen is in real danger of finding themselves out of business very quickly.'

He believes the balance has shifted both in political spheres and in society at large to the extent that businesses ignore environmental issues at their peril.

The EU Energy Performance of Building's Directive is a prime example. From January 2006 all buildings, new and old, must be 'energy labelled'. 'Housebuilders are getting twitchy about it because it gives buyers a real way to compare one home with another,' says Dr Strong. 'And in the commercial market, the drive for greater corporate social responsibility means no organisation concerned about its brand equity, is going to want to be the tenant or owner of a poor energy building'.

As the UK's largest construction client, the Government is already committed to encouraging environmental performance by specifying *Excellent* on the BRE-developed BREEAM environmental rating system, for all new public sector buildings and *Good* for refurbishments. From April 2005 the Housing Corporation will be demanding *Good* on the equivalent scale for housing, EcoHomes.

In the future these – or higher – standards are likely to be enforced for private developers too. Earlier this summer the Government-sponsored Sustainable Buildings Task Group recommended that BREEAM and EcoHomes be used as the mechanism for developing a new code for future planning. This could result in major developments such as those planned in the Thames Gateway and Milton Keynes being subject to far higher environmental standards than exist at present. As Dr Strong says, 'when you get local authorities, the Government and planning authorities requiring an environmental rating or code higher than the Building Regulations, then the industry will respond'.

BRE will now be working with Government to fully develop the new code. It is one of the tasks to be undertaken by BRE Environment, formed in April by the merger of the organisation's energy and environmental engineering divisions.

The new group now has more than 200 staff, most of whom are technical experts on issues such as energy technology, sustainable construction and environmental engineering. Their full range of expertise spans the entire building process from planning through procurement, design and construction to operation, refurbishment and, ultimately, demolition.

'We have a critical mass of experts that probably makes us the largest grouping in the UK of built environment professionals working on sustainability issues,' says Dr Strong. 'They are living and breathing these issues on a daily basis and many are recognised as international experts'.

BRE has always played a leading role in research and development of tools and services to reduce the environmental impact of buildings and minimise the impact of climate change. A recent survey by Sponge, a network of built environment professionals with an interest in sustainable development, found that BRE is, 'by far the leading source for resources and support on sustainability'.

That advice includes feasibility studies, whole life costing, environmental modelling, design optimisation, waste minimisation, air tightness testing, materials selection and energy advice. Meanwhile, many of the tools developed by BRE have become industry standards, including BREEAM, EcoHomes, Envest, the *Green Guide to Specification* and SMARTWaste.

Now BRE Environment wants to build on this reputation to offer a wider range of design and consultancy services.

'Ever since BRE was established it has been in the business of offering generic advice,' explains Dr Strong. 'Now clients are starting to come to BRE for specific design advice and support throughout a project.'

These clients are looking for a fully integrated design service to ensure their building will be designed to have the lowest possible environmental impact. It is a role BRE Environment is eager to fulfil, believing that the earlier it can be brought into a building project the less chance there is of mistakes being made. 'There is a truism, which we endorse, that all the really important mistakes are made on the first day of the design process,' says David Strong. 'We are now in a position to be able to challenge and improve the way things are done'.

'The perfect scenario is for us to engage with the client or development team from day one,' says Dr Strong. 'We take account of the client's issues by determining their fundamental requirements for the building and the environmental standards they are seeking to achieve. We also facilitate design charettes, where all stakeholders collaborate in a short, intensive, team-work orientated, multidisciplinary roundtable – the result is a dramatically better building at no greater cost.

'Increasingly, we are undertaking an advisory role which helps clients to procure genuinely sustainable buildings. We are also being asked to act as the design authority and to take a scheme through to full planning (see Hayes Manor School case study – right). This is a new role for BRE, but it does ensure that the design will be fully optimised from a form, function and environmental perspective.'

By retaining an advisory role throughout the procurement and construction phases, BRE Environment ensures that the initial design does not get watered down, whilst also ensuring construction waste is minimised. In PFI, for example, BRE ensures that the PFI specification is drawn up in such as way that the PFI consortium has a very clear steer as to what the client is trying to achieve.

Dr Strong says, 'we act as guardian on behalf of the client so that any design or construction compromises do not substantially undermine the environmental credentials of the building'.

In the past BRE's environmental engineering and energy divisions provided services primarily for other consultants that did not have expertise in specific areas and for contractors. With this new initiative these relationships will continue, but BRE Environment will be working much more closely with developers, procurers and building sector clients, such as local authorities, hospital trusts, education authorities, owner occupiers and institutional investors.

'The clients we want to be aligned with are those who are really serious about procuring buildings with low environmental impact,' says Dr Strong. 'What we're not interested in, is providing tokenistic "greenwash" for developers.

'We're particularly keen to identify clients who are as passionate as we are about developing sustainable buildings and communities. We understand what makes green buildings tick, so if you're entirely serious about these things then you should talk to us.'

For more information contact the
BRE Environment Helpdesk – 01923 664500
Email environment@bre.co.uk

Hillingdon – Hayes Manor School

BRE Environment has been working in a 'design integrator' role for the London Borough of Hillingdon on a project to redevelop Hayes Manor School in west London as a centre for whole life learning.

Initially BRE was appointed to carry out a feasibility study, but this has since been extended to taking the project forward to planning (RIBA stage D).

The phased redevelopment will be built using sustainable principles, and BRE has undertaken the conceptual design whilst advising on all aspects of environmental efficiency from materials selection and natural ventilation to financial and whole life modelling.

'We are currently in a position to start taking the designs through to full planning, and we will then go out to competitive tender for detailed design and build,' explains Geoff Hardwick, director of BRE Procurement. 'After tender evaluation we will work with the client to make sure there is no substantive watering-down of the building environmental features during the build process.

'Upon completion the client will have a highly attractive and accessible learning centre having huge benefits for the local community. The redevelopment will provide at the lowest possible environmental impact, an outstanding whole life learning environment with excellent sporting facilities – it will also be highly flexible in its future use.'

Sustainability checklist

BRE has developed a set of tools that promote sustainable design and development. Among these is the Sustainability Checklist for Developments and its regional equivalent for the South East of England developed with the support of SEEDA. The checklist sets out the steps that large developments and regeneration projects need to follow to meet sustainability targets.

The checklist is designed to be as flexible as possible, so it is equally valuable for new developments on flood plains as regeneration of urban brownfield sites.

In all cases the checklist enables prospective developers to identify all the positive measures that can be taken to reduce environmental impact and enhance social and economic benefits by considering eight issues: land use, urban form and design; transport; energy; impact of buildings; natural resources; ecology; community; and business.

BRE Environment
For more information
contact us on 01923 664500
environment@bre.co.uk

building sustainable solutions at every stage of the building life cycle

Building for people – the real value of construction

Does the construction industry and its clients deliver buildings that users really need and want? If not, what should we be doing about it? Five influential people involved in different aspects of the process were asked about how our homes, schools and hospitals are designed and built ... and how they should be.


01


02


03


04


05

01. Maxwell Hutchinson – radio and television broadcaster, and practising architect who was President of the Royal Institute of British Architects (RIBA) from 1989 to 1991.

02. Sharon Wright – Managing Director of School Works, and a member of the DfES Advisory Group on School Building Design and the Exemplar Design Working Group.

03. Wayne Hemingway – designer and broadcaster who built, with his wife, the globally acclaimed Red or Dead label. They have now set up hemingwaydesign specialising in affordable and social design.

04. Rob Johnson – a main board director of Jarvis plc with responsibility for operational activity in JAS (Jarvis Accommodation Services) and group commercial functions.

05. Tom Bentley – Director of Demos since 1999, and a writer and speaker on subjects including innovation, democracy, education and institutional change. He was an adviser to David Blunkett MP when Secretary of State for Education.

The people listed above were all involved in this year's BRE Annual Conference, *Building for people – the real value of construction*. Full details can be found at www.bre.co.uk/conference.

Designing for people

'People live in low-tech houses built to the lowest standards, and yet they have the most sophisticated car parked outside.'

Institutional buildings – like schools, hospitals and housing – do not feature highly on the curriculum for today's architecture students. As a result, many young architects have little or no interest in designing in these sectors, despite an overwhelming need for better quality of design.

It was not always the case, according to architect and commentator Maxwell Hutchinson. He says: 'When I was training, we were trained to design institutional buildings. Nowadays you hardly find any hospital or housing design in any architectural school. Mainly they are designing iconic buildings.

'We spent one term doing nothing but housing, and we were rigorously schooled in that.'

He also recalls that sociology and behavioural psychology were considered to be part of the architectural process, and vital in understanding how people would use public buildings, and what their needs were.

'That is especially important in hospitals, where the use of colour and space can make such a difference. There are things you can incorporate into the design that will make people feel better.'

Hutchinson's father was a hospital architect, and regularly revisited his buildings to see for himself what worked and what didn't. Maybe it is no surprise, then, that Hutchinson now fears for the future of hospital design. 'It needs a really different political and social attitude towards illness,' he says. 'I don't think this government's attitude towards targets and numbers is going to work.'

With so many new hospitals procured by PFI, Hutchinson is concerned the focus has shifted away from the needs of patients. 'The problem with PFI is that everything is cost driven and target driven,' he says. 'We should start to think more about the ways in which the design actually improves people's health. Rather than just designing a building, hospitals should be designed so they create environments that are conducive to healing.'

Many new hospital buildings are being erected to replace outdated Victorian buildings, but Hutchinson says today's designers could learn some lessons from their predecessors. 'Whatever their faults,' he says, 'the Victorians saw that there were other forces coming to bear on a good state of health – not just medicine.' He highlights the importance given to chapels in Victorian hospitals as evidence that spirituality had a role to play in the healing process.

Hutchinson believes today's society treats illness in a similar way to previous generations' attitude to insanity – as something to be hushed up and kept out of sight. As a result, young architects have little interest in designing hospital buildings.

When it comes to schools, however, there is more evidence that young architects are keen to get involved.

'School design has improved over the last few years,' he says. 'It doesn't surprise me because most young architects have got kids in schools, so they have a direct interface with the school system. They have a vested interest in school building that they don't have in hospitals.'

But, despite all architects having a vested interest in good house design, few choose to get involved in the housing sector. Hutchinson bemoans both the general standard of current house design, and the loss of minimum space standards that at least ensured people had enough space to live in – however poor the general design.

'Today's houses aren't designed for the people who are going to live in them,' he says. 'Some of them look great on plan, but are totally unsuitable to the way people live.

'The planning system has created an incredible shortage in housing, which means that those who provide it don't have to try,' he continues. 'Housebuilders can provide the minimum, and people buy whatever there is because they don't know any different.'

However, he believes the public's apparently insatiable appetite for housebuilding programmes like Channel 4's *Grand Designs* are helping them to understand that they could be living in a different way.

'Britain has the worst new housing in Europe,' says Hutchinson. 'People live in low-tech houses built to the lowest standards, and yet they have the most sophisticated car parked outside. They go from an ergonomically designed, high tech car into a dreadful house.'

But he doesn't blame the housebuilders, who are mainly in it for the money. 'Housebuilding is not a vocation,' he says, 'it's a business.'

Ultimately, Hutchinson believes the situation will change, with design and architectural vision being applied to a wider range of institutional buildings. The problem is inspiring young architects to get involved in these markets.

'Today's role-model architects,' says Hutchinson, 'all talk about society and the cultural context, but they still tend to be doing the major iconic buildings. I don't see them getting involved in housing or hospitals.'

But there is a new breed of young architects working in these sectors and Hutchinson says their achievements should be celebrated and publicised to provide inspiration to the next generation of architects. 'It should be inspirational to become a designer of institutional buildings,' he says.

Designing inspirational schools

'With these enormous amounts of money available, there is a real opportunity to get it right.'

The Government last year announced a massive programme of capital investment for secondary schools in England. Under the banner 'Building Schools for the Future', the programme's stated goal is to rebuild or refurbish every secondary school in the country over the next 10–15 years.

Fourteen local education authorities – responsible for approximately 180 secondary schools – have been told they will receive the first wave of funding, valued at £2.2 billion. The rest will follow in two further waves, taking capital spending to £5.1 billion a year by 2005.

For many, the funding is desperately needed. Most school buildings have seen little or no investment in the last 20 years and are in a serious state of disrepair, which has a knock on effect on the ability of staff to teach and children to learn. Only 14% of the UK's 21,400 maintained schools were built in the last 30 years, and over half are more than 40 years old.

But with the capital investment comes responsibility.

'With these enormous amounts of money available, there is a real opportunity to get it right,' says Sharon Wright, managing director of School Works, a not for profit company that promotes good school design.

The Government has backed up its investment package with a new body, 'Partnerships for Schools', to establish best practice and develop new mechanisms for procuring and delivering the new buildings. Wright says: 'I am delighted to see that Partnerships for Schools is putting much more emphasis on user involvement during the design process. What we need to see now is enough dedicated resources in the system for real participation.'

School Works, which receives much of its funding from the Department for Education and Skills (DfES), says collaboration is the key to obtaining good design, and that the design process must involve school users in the widest sense: pupils, staff – both teaching and non-teaching – and the community.

'There has not been enough involvement in the process in the past,' says Wright, 'and this can be a particular problem with PFI because it is such a cost-driven model. That said, schools have to take responsibility for their role in the design process. They need to be strong clients capable of articulating their needs. 'This has been a problem in recent years,' says Wright. 'Many local authorities haven't built new schools for a considerable period, and many have outsourced this expertise. And individual schools are one-off clients, so they have no experience or understanding of what the process will involve.'

But they really do need to be engaged if they are to get a design that reflects their needs. 'You don't have to design your own school,' she says, 'but you do need to have a very clear vision of what sort of school you want it to be, and how you want to deliver your curriculum and manage yourself, and be able to contribute that to the brief in a way which the design team can understand and respond to.'

School Works uses a variety of techniques for bringing the various parties together and developing an understanding between them. Their first partner school, Kingsdale in south east London, demonstrated many of these.

In the competition to select an architect, rather than asking architects to produce design ideas for the school, they were asked to show how they would engage with the school community. School Works then appointed an interdisciplinary team that included the winning architect, an educational psychologist, education researcher, engineer, construction manager and performance artists.

This team facilitated a three stage process that uncovered the main issues at the school, identified the key education themes and looked at the local community's relationship with the school.

The results indicated clearly what the school wanted to achieve in terms of delivering learning, and then translated these into appropriate design solutions, so the school management and the building were designed to work hand in hand.

Kingsdale was chosen as an M4I demonstration site for its partnering strategy, and the principles applied there have now been taken forward to three more projects, in Newcastle, Bradford and Northampton.

The Newcastle project involves four primary and two secondary schools that are being redeveloped as part of a PFI bundle. School Works organised inspirational tours, workshops, performances and exhibitions to look at generic issues, such as extended community involvement and security. These were followed up by school-specific workshops in which each school came away with an idea of what is really important to them. 'Once they've done that, they can go through the PFI process with clear priorities,' says Wright. 'Each school is different and has a range of stakeholders, so they must be designed individually to meet their needs.'

She has mixed views on the use of PFI to procure school buildings. 'An Audit Commission report on early PFI schemes concluded that design quality was not very good,' she says. 'It has got better, but we need to see more partnership working between the contractor and the school. Senior managers of PFI built schools tell me that an honest and open working relationship is the key to success. We advise schools to chose their partners carefully, paying special attention to how they plan to work with the school and their commitment to providing fantastic learning environments. A contractor told me recently that all he cared about was making a good return for his shareholders. If I was a school I wouldn't want to work with someone who wasn't equally committed to children's education and staff's working environment!'

'Schools are incredibly complex and unique organisations. Some of the problems have come about because the people that are building schools have no real understanding of how they work. The designs have too often been bland, and there is too little opportunity for some of our talented designers to bring forward their ideas because they are not linked to the big consortia.'

The government has come up with a series of 'exemplar designs', created by 11 leading architectural practices, to inject some fresh thinking into the Building Schools for the Future programme. Wright says: 'The exemplar designs are great for stimulating debate, but the worst thing would be for schools to feel they have to copy them. They mustn't use the exemplars as templates, but rather as starting points – they should look at whether the ideas would work in their own contexts.'

Shortage of time and resources might lead schools to grab at the exemplar designs rather than going through a proper process of identifying exactly what is best for them. 'Lack of time to do this properly is the biggest risk in the whole process,' says Wright 'and this is just too important to get wrong. This is our best chance since Victorian times to build schools that will deliver for their communities for up to 60 years.

Of course we don't know what the future might hold, but we can design schools that are flexible, inclusive, and personal to their community. They can showcase the best of the design and construction industry in this country, providing schools that are inspirational and demonstrate that education is valued by all those involved.'

Putting creativity into housing

'There are only certain types of people that like the idea of identical houses with their little bit of grass outside.' Wayne Hemingway is working with Wimpey Homes to develop well designed, stylish alternatives to the traditional new homes available in the UK.

'The majority prefer old properties such as Victorian terraces or conversions.'

Wayne Hemingway has a simple way of identifying the success of a product. 'Generally, if a wide proportion of the public likes something then it is usually good,' he says. As less than 30% of the house-buying public opt for new houses, he takes this as evidence that only a minority of people like the product.

The majority prefer old properties, such as Victorian terraces or conversions. 'These same people wouldn't choose a second-hand car and certainly wouldn't wear second-hand clothes, but they would rather buy an old house. That tells me that the majority of people don't have faith in modern housing,' says Hemingway.

He made his name designing clothes, achieving success with his Red or Dead label. Now, together with his wife Gerardine, he has turned his hand to designing homes and interiors, and is currently working with Wimpey Homes to develop well designed, stylish alternatives to the traditional new homes available in the UK.

'There are only certain types of people that like the idea of identical houses with their little bit of grass outside,' he explains. 'On the whole they're not buying it because they're in love with the design, but because there's nothing else on offer. The majority of people want something they're proud to have and like the look of – it's human nature. Looks are important, and the majority of people don't like the look of the majority of new housing.'

He believes the most creative thing a designer can do is to make houses that people will love without making them expensive, so they are available to first-time buyers and key workers, as well as at the upper end of the housing scale.

As chairman of Building for Life, Hemingway is involved in identifying and celebrating the best new housing developments and explaining to the house building industry why these designs work so well. The organisation – which is backed by the House Builders Federation, the Commission for Architecture and the Built Environment (CABE) and the Civic Trust – has identified themes that must be addressed for good design, rather than setting rules. It also says home owners should ask: 'Is this a place that I'm proud to live in, a place of character and distinction, that lifts my spirits when I turn the corner into my street and when I open my front door?' All too often, according to Hemingway, the answer is no.

One reason for this, he says, is the perception that it is expensive to 'put design' into houses, so housebuilders argue it is not cost effective for volume housing. 'Clever design doesn't have to cost that much,' he says. 'There are compromises that can be made between housebuilders and designers, and if people buy the property at a faster speed then they would have bought the other stuff, that's an extra profit angle. You can be creative in the way you cost these things.'

He identifies three barriers to improving design in volume housing, the first being the planning system and the second – not surprisingly – housebuilders. 'You can't blame them for doing what they do now, because they're making vast profits and keeping the city happy and their shareholders happy,' he says. 'But their duty should be to give people nicer homes. It's the biggest thing you spend your money on, and it should be a joy.'

However the biggest barrier is the house buyers themselves. 'The public shouldn't be so accepting,' says Hemingway.

A shortage of new houses has led to a situation where consumers will buy whatever they are offered. But, says Hemingway, this could change dramatically if the economic situation alters.

'You don't get branding in housebuilding except at the top end of market. In other areas – like cars – branding is well established. The economic situation never stays the same, and there will be more boom and bust in the housing industry. When it comes to bust, companies who the public feel some empathy with will get through better than those who don't.'

He cites the example of Marks & Spencer. 'When they had a really awful period a few years ago, what saved them was the British love affair with Marks & Spencer, so the public was happy to go back to them.'

Hemingway believes the same situation could occur with housing, and says Wimpey's decision to work with his design company and look at new ways of designing new homes will be reflected in the future when times aren't so good. Wimpey contacted Hemingway after he had made outspoken comments about the 'dreadful' state of house design in the UK.

So how does he respond to his new role of poacher turned gamekeeper? 'I imagine a lot of housebuilders think Wimpey are mad to work with us – and vice versa. But I really respect them and what they've allowed us to do and the freedom they've given us. In return we're doing our utmost to increase their shareholder value,' he says.

Hemingwaydesign and George Wimpey City are currently collaborating on an 800-home development known as Staiths South Bank, on the former Garden Festival site in Gateshead. In its promotional literature the development claims to offer the 'design conscious majority' a new choice in housing.

The suburban site has a wider variety of house types and layouts than most, with buyers able to influence more aspects of the finished home. 'We want everyone who buys a house on Staiths South Bank to be able to describe theirs as somehow different to their neighbours,' says Hemingway.

He is not surprised by the popularity of the Gateshead homes, despite their far more modern approach to design than traditional suburban homes. 'People will buy modern,' he says. 'They fill their homes with things from Habitat and Ikea, but all this furniture and interiors stuff has got no correlation to the houses they're going to go in.'

It proves his point, says Hemingway, that the majority of house buyers have got design sense, and would prefer to see that reflected in the homes they buy.

The industry's response to meeting user needs

'What differentiates PFI from other procurement methods is the whole life approach that companies must adopt. We're not just building it and walking away; we're building it and staying with it for 30 years.'

The last few years have seen PFI contractors vilified for many of the problems of public sector building. It is a role they are keen to shed and, according to Rob Johnson, Director of Jarvis Accommodation Services, one that they do not deserve.

'There is a perception that private organisations working in the public field must be interested in short-term gain,' he says. 'My feeling is that because we are taking a whole-life approach to things, we are not focused on how cheap the building is to build, but on how long it's going to last and how robust it's going to be.'

Jarvis is one of the UK's best known – and most prolific – PFI contractors. It has already built or refurbished 88 of the nation's schools – accommodating 68,000 pupils – and has a further 45 in hand. In the health sector the company has completed two new hospitals and is currently building four more. It is also involved in the delivery and management of 20,000 student accommodation units and has built a range of other public sector buildings – including the Army's Foundation College and North Wiltshire Council's offices – all under PFI.

Johnson welcomes recent Government announcements on increased spending for public buildings. 'There has been little or no historic investment in our failing infrastructure,' he says. 'Significant new investment will definitely help to address current infrastructure failings, and will also offer a major opportunity for designers.'

Like many working in this field he believes there is a significant need for customer involvement in the design process, and an awareness that each building – be it a school, hospital or accommodation – is different. However, he says, 'the design should reflect the needs of a modern school or public building and should lead to improvements in the service. The building is there to support the delivery of public services rather than as an object in its own right.'

Much of the criticism levelled at PFI contractors, he says, may derive from unrealistic expectations of what can be achieved. 'The condition of buildings in the public sector is generally pretty awful and therefore has considerable capacity to soak up funds, just to get the maintenance backlog sorted out' he explains. ' At the same time the funds deriving from PFI credits are tight – which means that there is likely to be some divergence between aspiration and practicality .

An inevitable element of compromise often leads local education authorities to opt to refurbish schools rather than rebuild them completely. 'It's a straightforward affordability issue,' explains Johnson. 'If you want to spread the money more evenly across an LEA, or want to get the best for as many schools as possible, you may want to opt for refurbishment as it is seen as being cheaper in the short term and therefore allows more schools into a scheme. However, there is very little opportunity for redesign and modernisation, which would take you forward, so you are just bringing the building up to date.'

Another characteristic of working within the public sector, he says, is the tendency for a 'fragmented client interface', with different users having different priorities in terms of affordability and what is required.

Johnson says this all adds up to an 'expectation management problem', which Jarvis tries to break down through a combination of partnership in both the design and funding; taking a whole-life approach; successful delivery; and compatibility to meet future needs.

The company uses partnering in two ways, both for early involvement and for decision-making throughout the design and construction period. If it is building a school, for example, it will try to understand the aspirations of the school and what the governors, head, teachers and pupils all want from the process and combine this with an understanding of the LEA's strategy and local community issues. It will also consider any environmental aspects or constraints.

Partnering also has a role to play in putting the funding together, according to Johnson, who says: 'Structuring the funding means looking hard at the art of the possible.'

It is vital, he says, that all parties work together during the decision-making process that will decide the design of the building. 'What is very important is the need for a managed and inclusive process that means everybody understands what decisions are being made. Making those decisions in a partnering environment is going to help people through those early stages. You have to have the buy-in of everybody involved – or at least an understanding of what is involved.'

What differentiates PFI from other procurement methods, says Johnson, is the whole life approach that companies such as Jarvis must adopt. 'The difference is we're not just building it and walking away; we're building it and staying with it for 30 years, which means we have to understand the costs involved. If we are building a school, then the end result for us is a consistent teaching environment over the whole life time. The whole point of PFI is that we don't just bring the building up to standard; we keep it there for at least the life of the project.'

He also refutes criticism that says PFI results in unadventurous, staid design. 'The whole-life approach is governed by an output specification with the risk taken by the contractor,' he explains. 'I believe this encourages rather then stifles the innovative use of materials and design.'

In school PFI projects, Johnson says, most LEAs send out an outline of the project based on the sum of money they have available. 'We're in a competitive environment just to get the work in the first place, which encourages innovation and encourages us to make sure we give them what they need,' he explains.

When it comes to delivering the building, Johnson says that partnering and 'deconfliction' are essential, with site-level communication between contractor and client the key to successful delivery.

Looking forward, Johnson says increased investment will have a major impact on public sector building – particularly if it is used for new build facilities designed for modern needs and with adaptability in mind. But, he says, sounding a note of caution, 'firstly, affordability is the ultimate reality check on aspirations and, secondly, we must ensure that these new facilities are maintained at the right standard over the long term. If we do not, we will be back at the current start point in 30 years' time. In these regards PFI offers the best opportunities and safeguards.'

Healthy hospital design

'In the NHS – as elsewhere in the public sector – there is a real struggle going on between the need to renew and rebuild on a cost effective basis and the need to make the buildings flexible, friendly, personalised environments for their users.'

Like many experts in the provision of public services Tom Bentley, director of independent think tank Demos, blames history for the current state of our public building estate. However, he is not referring simply to the dilapidated condition of the building stock, but to the way in which the institutions are run.

'All public service organisations have inherited a factory model which is translated into their building form,' he explains. 'The form has followed the organisational structure.'

The result, he says, can be seen in the similarities of scale and layout in buildings as diverse as schools, hospitals and even police stations. Everything has been designed on a large scale to facilitate the organisation running along the lines of a factory, to make life as easy as possible for the staff, but in the case of hospitals, without much consideration for the patient's experience.

Successive reforms of the NHS are now being followed by a large-scale building programme to replace and rebuild many of these outdated buildings. But, says Bentley, all too often the organisational changes and structural changes are being carried out independently. And where the building does reflect new working methods, health-care professionals are dictating the design, rather than patients.

'In the NHS – as elsewhere in the public sector – there is a real struggle going on between the need to renew and rebuild on a cost effective basis and the need to make the buildings flexible, friendly, personalised environments for their users,' he says. 'Very often this would involve making new organisational demands that would result in changes to the physical experience.'

There have been some significant changes in the delivery of healthcare services in recent years, with the introduction of innovations like NHS Direct, and more home-based care. Bentley says these developments reflect a move towards a more 'self-governing' approach to healthcare in which patients have more say in the nature of their care. They represent this government's stated enthusiasm for 'personalisation' in public services.

However, at the moment personalisation seems to be limited to a choice of schools or hospitals and some input into how they use the existing services. Users – patients, in the case of hospitals – have very little say on what those services are, and no role at all in the way they are delivered, including the buildings they have to use. Bentley argues that there should be far more direct public involvement in the decision-making process, accompanied by new organisational models within the NHS.

Demos favours the introduction of a 'systems thinking' approach, where the organisation is treated as a complex system made up of integrated parts with no organisational structure. Systems thinking involves seeing the connections and relationships between the elements of the organisation, and recognising that it is more than the sum of its component parts.

It is a holistic way of viewing organisations that its proponents believe is more suited to the complex environment of a hospital than the hierarchical and 'vertical' management structures that traditionally operate.

'If you adopt systems thinking, then you believe the organisation behaves more like an organism than a machine,' explains Bentley. 'The current definition of a public service like the NHS is of a vertical model with a vertical structure and a command and control attitude.'

This, he says, is reflected in the buildings, even the new hospitals currently being constructed both under PFI and traditional procurement methods. He argues that systems thinking would create a model in which there is scope for a collaborative approach that would include patients at every stage of the design and delivery of healthcare services.

'We need to take a more holistic view of the influence of the physical environment, for both patients and practitioners,' says Bentley. For example, how do the individual spaces promote healing? How does improved signage and layout help communications and organisational flow? And how does it help the patients to take a more active role in managing their care?'

These are 'positive challenges' for the building industry and for procurers and regulators in the health sector, according to Bentley. And they are challenges that must be met now if mistakes are not to be made on a grand scale.

Investment in hospital building is higher than it has ever been but if the traditional organisational structures remain in place, it is likely our new hospitals will simply be modern versions of the Victorian buildings they replace.

'Buildings reflect what goes on in them,' says Bentley, 'but they also influence what goes on.

'When you go into hospital you usually surrender yourself to the professionals' judgements and needs. It is more geared up to the needs of the organisation than to you. But that doesn't need to be the case. It should be possible to ask what would a hospital look like if it was designed from the patient's point of view.'

So far no-one has tried to find out, although steps have been taken to reconfigure outpatient and waiting areas to reflect the needs of patients as well as practitioners.

Bentley is not looking for a single 'one size fits all' template for modern hospital design. Instead he favours a strategy that would see the lessons learned from one hospital translated into another.

'At the moment all PFI hospitals look the same because they are working to the same building principles and looking at economies of scale. I would like to see rebuilding programmes using best practice, but also being responsive to local needs.'

FRP building components prove their durability

The misconception that construction products made of fibre reinforced polymers are not long lasting, has been shown to be just that in a recent long-term durability study.

The fact that, in many construction applications across the UK, fibre reinforced polymers (FRPs) are exceeding their service lives has been demonstrated in a DTI-funded investigation of long-term performance. The study also found that where failures had occurred, they had resulted from a lack of understanding of the material properties at the initial design stage.

FRPs are relatively new construction materials that have been successfully used over the past 50 years in a wide range of civil engineering and marine applications, including as pipes, tanks, slabs, walkways, bridge decks, gratings, column reinforcing wraps and reinforcing bars for concrete. In addition to these applications their popularity in construction as exterior cladding and modular buildings has increased.

They have particular durability benefits in that they are water resistant, thermally stable and do not corrode.

While exterior FRP components are designed to give service lives of between 30–60 years, little has been known about their long-term performance, and there is a misconception that because they are polymer based they will not last long. This coupled with a lack of relevant standards and design codes has limited the use of FRPs in many construction sectors.

For this reason DTI commissioned BRE to investigate the long-term performance properties of FRPs in construction. The three-year project involved numerous site visits and focused on the weathering of products in service.

Effects of weathering

Weathering of structural FRPs, such as glass/polyester or carbon/epoxy laminates, can cause fading or darkening, yellowing, blooming, loss of gloss and chalking.

These are mainly cosmetic effects that seldom involve a threat to structural integrity. However, they are important issues to consider for some major applications such as exterior cladding. All can generally be avoided by selection of suitable resin formulations, additives and pigments.

Colour fading or darkening without loss of gloss can be due to unstable pigments or pigment combinations that change colour after exposure. This can be prevented by using more appropriate pigments.

Yellowing is usually due to the darkening of the base gelcoat resin, especially in whites. This can be prevented by using a more UV-resistant resin and improved UV stabiliser additives, as well as by ensuring good cure of the resin.

Blooming is caused by migration of an incompatible pigment or additive to the surface of a gelcoat to give a matt, faded appearance. Certain organic pigments can be the cause of this. Bloom can be removed by polishing, but this is only a short-term solution. A suitable choice of the pigment should prevent this problem.

Loss of gloss is normally brought about by erosion of the surface layer of the gelcoat due to chemical and/or physical damage. The colour of the gelcoat then appears to whiten, because of the diffused reflection of light from the matt surface. This phenomenon is most easily observed in mouldings with strong bright colours. On paler colours the effect is less noticeable. Indeed the whiteness of a white structure can even be improved by this because surface dirt is shed, leaving a fresh exposure of white pigment. This phenomenon is termed 'chalking'.

The initial signs of weathering such as the onset of loss of gloss or chalking do not signify the disappearance of the protective gelcoat. The project has identified examples of gelcoats still performing after 30 years in service. The erosion of the gelcoat after many years service can bring about the eventual mechanical failure of the laminate by exposing the reinforcement underneath.

Maintenance

Site investigations found that incorrect maintenance of an FRP structure can impair its performance and service life. Using inappropriate cleaning agents based on strong alkali solvents or abrasives can damage the surface. The occasional use of a mild cleaning agent and the application of wax specially formulated for the upkeep of FRP products, on the other hand, can enhance durability.

Providing building/asset owners with information on proper maintenance can only help to extend the service life of FRP structures (maintenance procedures are detailed in BRE Good Repair Guide 34).

Conclusions

The project concluded that FRP components have good durability, and that:

- FRP structures perform well if appropriately designed
- several structures in the UK have given over 35 years of service and are still meeting performance requirements
- failures that were reported were not due to the material, but to a lack of understanding of material properties at the initial design stage, or poor detailing in some prefabricated sections
- when deterioration occurs, it does not usually affect the structural performance of the component or building.

In almost all applications, FRP durability can be enhanced by imposing a conservative safety factor on the design. In many cases additional durability may be achieved by using a protective coating and/or incorporating light stabilisers and antioxidants. Improvements in resin and manufacturing technology over the last ten years will lead to improved durability of the resulting FRP components and should enable design lives of 60–100 years to be achieved.

Dr Sue Halliwell, the project manager says, 'This project has been significant in gathering data on the performance of FRPs, but on-going monitoring of structures is needed to gather comprehensive data. Work is also needed on predicting the service lives of the newer composites such as those based on natural fibres'.

Findings from this project will contribute to the development of standards and design codes, and should enhance confidence in FRPs leading to their increased use in a greater range of applications.

Further information
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Further reading

BRE Good repair guide 34: Maintenance and repair of FRP structures

BRE Information Paper 11/03: Durability of FRPs in construction

BRE Information Paper 10/03: Predicting durability of FRPs in construction

BRE report 416: Long-term performance in service of FRP in construction

These can be purchased from www.brebookshop.com

Intelligent buildings

Intelligent building technology offers huge benefits, but there are still some important barriers to its wider uptake. Mike Perry discusses these and how they can be overcome.

Although the term 'intelligent buildings' is a familiar one to the construction industry, there remains a lack of recognition of what it means, and most importantly the potential benefits to clients' businesses of specifying intelligent buildings.

Among the primary benefits of intelligent buildings are their operational responsiveness and flexibility. Careful design and procurement can, for example, provide integrated control of building services such as lighting, HVAC, security systems and critical systems. Also, intelligent buildings bring benefits that can not be so readily realised, if at all, with traditional technologies – the ability to rezone areas of a building without relocating hardware and the associated disruption and cost, being one example.

This responsiveness is not limited to building hardware – intelligent buildings can also respond to changing business demands and environmental requirements, or whatever demands are placed on them.

Barriers

The apparent reluctance of clients to adopt intelligent building technology might be a lack of appreciation of the benefits, rather than resistance to the technology. A major barrier to wider uptake is the UK construction's procurement culture – the tendency for construction projects to be predicated on first cost and dispersal of risk, a culture that discourages innovative solutions.

A further barrier is the way that the supply side provides specific solutions – individual companies sell 'silo solutions', with little acknowledgement of how their product or system might impact on the client's overall business process, or how different silo solutions might work together. This acts against the benefits of a holistic approach to project specification, where the requirements of the business drive the design solution and procurement process.

Clients can contribute to the missed opportunities of a holistic approach by disengaging themselves from the design and procurement decision processes.

There are parallels with energy efficient and sustainable buildings. Intelligent buildings are perceived as an alternative to mainstream procurement in the same way that green buildings are. The way in which fee scales are agreed and the concerns about contractual liability, encourage the selection of safe solutions with an identified price tag. Innovative, ie intelligent or green, solutions are often seen as nice alternative options, but at a price and with a higher perceived risk. Intelligent and green building designs and technologies need to displace the established solutions in main stream procurement if this situation is to change significantly.

Changing the culture

A number of things must be done to achieve a change in procurement culture, including demonstrating to the financiers of construction projects that lowest first cost is not the same as lowest risk, or lowest whole life cost.

Some of the client groups most receptive to these arguments are those in the retail and leisure sectors who procure many buildings every year, often as part of a rolling programme. Their buildings incorporate many 'smart infrastructure' technologies, such as sophisticated building energy management and stock control systems. The motivation for the retail sector is that some parts of it, eg groceries, work on narrow margins. To turn a profit the companies must try to minimise their operational costs. Also, as retail chains are often large client organisations commissioning multiple construction projects, they have the clout to control their supply chain and procurements processes.

So, is anything likely to encourage other commercial building clients down this route? The EU Energy Performance in Buildings Directive – due to come into force in January 2006 – could provide the incentive. The Energy Directive may encourage the uptake of intelligent building technology because without smart, responsive buildings it may prove difficult or impossible to meet increasingly stringent building performance targets. The Directive will include a building certification system enabling purchasers, tenants or occupiers to clearly compare the energy performance of one building against another.

Convergence between the Directive and Building Regulations could be the driver commercial clients need to rethink the way they procure new buildings, and could force both intelligent and green building systems into mainstream construction procurement.

To a certain extent it has already happened in sustainability. BRE's BREEAM system for assessing environmental performance is recognised throughout the construction and property sectors as a major factor both in specifying and operating buildings. The Government has set minimum standards in accordance with the BREEAM system for all its new buildings, and some private sector clients are following suit – encouraged, no doubt, by a desire to prove their corporate social responsibility credentials.

So could the same be true of intelligent buildings? It is quite possible that an independently accredited 'smart building' certificate could eventually enter the mainstream as a means of identifying buildings that are equipped with the infrastructure to bring energy and efficiency benefits to their owners and occupiers.

There is no doubt that things will change. Increased pressures at the policy level means clients will have to look to procuring innovative buildings to meet those requirements.

Added to that are the pressures society puts on its buildings to be increasingly responsive to the way we live, work and travel. In the near future we will reach a stage in the development of certain classes of building where, unless supply silos are broken down and people start looking at buildings in a holistic sense, buildings will not deliver the functionality and performance that society demands.

A good example of this is airport terminal design. Modern terminals must cope with large and increasing numbers of passengers in an insecure world. These buildings must be responsive and flexible to be able to satisfy the diverse range of requirements placed on them.

Another driver set to dramatically impact on the type of public buildings we procure is the demographic time bomb that will see a large increase in the proportion of the global population aged 60 and over, including in the UK. It will put huge pressure on, for example, healthcare provision, and begs the question of whether primary healthcare can continue to be delivered in traditional ways.

Smart infrastructure offers the potential for remote delivery of health and social care reducing the increasing burden on primary healthcare and social care services.

In the meantime, though, there are other demands on building owners. People are under increasing pressure at work, so working conditions are very important. In the past we have tended to dismiss the need for a building to respond to individual requirements as a cosmetic argument, but if this is not addressed an organisation's effectiveness can be weakened, for example by high turn over in staff.

The technology exists for clients to have buildings that are as responsive as they wish them to be – limited only by imagination and cost. But clients have got to understand their requirements and be prepared to state them. If they do not engage proactively in the design specification and procurement, they are unlikely to get the building that meets their needs. It is not sufficient to deliver a loose specification and tell the supply chain to get on with it.

BRE and i&i limited are jointly organising a two-day conference in association with the IEE, at BRE on 23 & 24 September to explore intelligent building issues (see page 2).
For details see the website www.ib2004.net or
Email events@bre.co.uk

Recent publications

Guides

Recycling fibre reinforced polymers in construction: a guide to best practice environmental option (BR 467)
FRPs are increasingly used in construction because of their light weight, ease of installation, low maintenance, tailor-made properties and corrosion resistance. This BPEO guide provides information on the disposal and recycling options available for FRP waste, uses of FRP recyclate, ecocomposites, and composite recycling facilities. £35 (£25 for Connect members).

Fire safety of concrete structures: background to BS8110 fire design (BR 468)
Brings together information derived from testing and research carried out over a number of years. £42.50 (£30 for Connect members).

Working platforms for tracked plant: good practice guide to the design, installation, maintenance and repair of ground-supported working platforms (BR 470)
Most ground supported platforms work well – they are critical for plant stability – but overturning of rigs has occurred more frequently than it should. The Federation of Piling Specialists instigated preparation of this guide to promote safety in the design, specification, installation and repair of working platforms. £35 (£26 for Connect members).

Digests
Concise reviews of building technology.

Digest 487:
Part 1 Structural fire engineering design: thermal models
Part 2 Structural fire engineering design: materials behaviour – steel
Part 3 Structural fire engineering design: materials behaviour – masonry

Digest 488 Structural fire engineering design: fire and thermal response
These Digests are part of a suite of related documents containing guidance for the construction industry on structural fire engineering design. The intention is to produce performance based guidance that brings together fire engineering and structural engineering, providing a framework in which designers are free to develop site specific solutions based on real performance criteria.

Good Building Guides
Practical guidance on building design and construction.

GBG 59 Building on brownfield sites
Part 2: reducing the risks
Brownfield sites can contain a variety of hazards that can pose significant risks for developers, designers, house builders, insurers and house owners. This guide outlines the ways in which the risks can be managed and, if necessary, reduced.

Information Papers
The latest BRE research information and how to apply it.

IP7/04 Designing roofs with safety in mind
Report of the findings of a committee of roofing experts who have examined HSE data on accidents with a view to establishing the design decision which led to the underlying cause of the accident. It is aimed primarily at architects and designers of roofs, but is also relevant to anyone working on roof construction including materials suppliers and installers.

IP8/04 Whole building commissioning
Part 1: A guide for clients
Part 2: A guide for designers
Part 3: A guide for specifiers
Part 4: A guide for facilities managers
Approved Document L2 of the Building Regulations, for the Conservation of Fuel and Power in buildings other that dwellings, asks for building services systems including heating, lighting, mechanical ventilation and air conditioning, to be commissioned. The process involves drawing up a commissioning plan, carrying out commissioning so that the installed system performs to the designer's specification, and the production of a certificate conforming that the commissioning has been carried out.

Prices
Digests and Good Building Guides are £12 each, or each part. Information Papers are £9 each, or each part.

Where to get them
These publications are available from:
- www.BREBookshop.com
- Phone 01344 404407
- Fax 01344 714440
- Email BREBookshop@IHSRapidoc.com

BREbookshop.com

Diary of forthcoming events

11 August, 9 September and 14 October 2004 at BRE, Watford
Smart homes need smart controls
A one-day workshop describing the benefits of the European Installation Bus (EIB) – one of the market leaders in European integrated home control systems with over 100 manufactures producing EIB compliant devices – focusing on applications and giving a practical insight into technical operation.

1–2 September 2004 at BRE, Watford
BREEAM Offices assessor training course
Two-day training course to become a BREAM Offices assessor.
Contact: 01923 664462, breeam@bre.co.uk

15 September 2004 at BRE, Watford
Demonstrating value for money
One-day seminar for public sector cleints and their supply chains on best value, PFI / PPP, using benchmarking, and repair and refurbishment.

21–22 September 2004 at BRE, Watford
EcoHomes assessor training course
Covers the technical content of EcoHomes and the details of the assessment process.
Contact: 01923 664462, breeam@bre.co.uk

22 September 2004 in Leeds
Fire safety in hospitals
This one-day conference will explore the need for a fire safety strategy, examine the issues that need to be taken account of when putting together a strategy, and show how the latest fire safety engineering thinking can help provide a safer, more secure environment that meets the needs of patients, hospital staff and others.

23–24 September 2004 at BRE, Watford
Intelligent Buildings 2004
This two-day conference will explore the latest thinking and technology for intelligent buildings. It will feature case studies, live demonstrations and an exhibition, providing invaluable insight into current and future developments (see pages 2 and 14).

30 September 2004 at BRE, Watford
BRE Fire Conference 2004
The conference will cover key aspects of ODPM's research programme undertaken by FRS, the objectives of which are designed to inform and underpin the development of Part B of the Building Regulations and its supporting guidance.

1 October 2004 at BRE, Watford
Structural fire design
Over the past three years BRE researchers, together with senior structural engineers in the construction industry, have produced guidance for the design of structures in fire.

5 October 2004 at BRE, Watford
Innovation in Structural Insulated Panels (SIPs)
One-day conference and live demonstration.

7 October 2004 at the Swallow Hotel, Glasgow
Fire performance of external cladding systems and thermal insulation
Half-day seminar to discuss the second edition of BR 135 *Fire Performance of External Thermal Insulation for Walls of Multi-Storey Buildings*, and the issues related to the fire performance of external cladding systems.

12–13 October 2004 at BRE, Watford
HQI Training
Training workshops offering comprehensive 'hands-on' training using laptop computers loaded with BRE's HQI software v2 and design drawings for a modern housing association scheme. Delegates build a complete HQI score under tuition and guidance from BRE consultants.

4 November 2004 at BRE, Watford
Introductory course to fire and fire testing
A general introduction to fire and the fire testing of plastics, rubbers and textiles. Describes the effects of fire parameters on burning behaviour, the various types of fire tests and their selection to specify materials and products of reduced flammability.

1 December 2004 in London
Reducing the risk
This one-day conference will address the issues facing office designers, developers and occupiers in the post-September 11 era. It will highlight the challenges and opportunities in areas such as designing to minimise security threats in mixed-use environments, dealing with civil contingency and bio-terrorism. It will feature case studies from leading players in the office sector who have developed prudent security measures and practices in a positive business environment.

Further information
For further information on these events and training courses contact (unless otherwise stated) BRE Events – 01923 664800
Email events@bre.co.uk or visit www.bre.co.uk/events

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