BRE

urban regeneration

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Unravelling airtightness

Planning sustainability
Performance-based repair of concrete structures

constructing the future

SUMMER 2003 ISSUE 17

BRE

overview

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Testing a coated window for transparency to radio waves

Better radio communications in buildings

A new research project funded by the DTI's Radiocommunications Agency is investigating techniques for improving radio reception in buildings that currently block or degrade transmissions – including mobile phone signals.

A team led by ERA Technology aims to devise inexpensive panels based on Frequency Selective Surface (FSS) technology, which can be applied to existing buildings in the form of wallpaper and window coatings, and to floor and ceiling tiles. The study will also examine the possibility of incorporating FSS structures into the fabric of new buildings.

Current radio systems, including mobile phone networks, are designed to give coverage of the vast majority of building interiors despite blocking effects. If buildings can be made more transparent to the signals, it will be possible to use fewer base stations to cover a given area or to radiate less power from existing sites. This will reduce radio "pollution", enhance spectrum efficiency and could, for example, improve penetration of radio frequency communication signals used by emergency services into lifts, stairwells and basements of buildings.

The project team includes BRE, which will take responsibility for building design issues and the practical application of frequency selective materials to buildings. This includes determining if new materials comply with standards and regulations, addressing installation issues in existing and new buildings, looking at their impact on the quality of the indoor environment, and assessing their long-term performance – issues that are fundamental to assessing the viability, cost benefit and future uptake of this technology.

Other team members include QinetiQ and the University of Kent.

For more information –
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Assessing heat-treated timber for cladding

The performance of a modified timber product that has undergone thermal treatment to improve a number of its properties is being assessed, especially for use in cladding.

The timber product, called ThermoWood®, is manufactured using a method developed and patented in Finland. The wood material is heated to a temperature of at least 180°C while being protected with steam.

This treatment makes the wood more stable in changeable climatic conditions, improves its thermal insulation properties and darkens its colour. If carried out properly, thermal treatment also makes the wood more resistant to decay, reducing the need to use preservatives and so enhancing the timber's environmental performance. The dimensional stability produced by the treatment will give this product an advantage over many traditional timbers used for cladding, due to the reduction in movement.

End uses for heat-treated wood include exterior cladding, windows, doors, joinery, garden furniture and interior applications such as flooring.

ThermoWood® has been developed by Finland's Technical Research Centre (VTT) and a group of Finnish industrial forest products companies. Launched in Europe by several companies, ThermoWood® (a registered trademark owned by the Finnish ThermoWood Association) is currently produced in Finland – but other heat treatment process techniques are being developed and marketed in other European countries.

The assessment is being carried out by BRE in partnership with three of Finland's leading forest product companies – Finnforest, Stora Enso Timber and UPM – as part of the project "Testing of ThermoWood for cladding".

For more information –
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Crime and security in hospitals

The cost of crime in hospitals can be huge, potentially running to millions of pounds a year in large urban hospitals. There are also hidden costs, such as those of high staff turnover and sick leave due to injury or stress. But hospital security is frequently overlooked and under-resourced.

A London hospital recently commissioned BRE's Crime Risk Management Unit to provide an overall picture of crime and community safety issues in and around the hospital. The hospital managers wanted to identify the impacts of crime, including the operational and financial costs. This information can be used to justify more resources for preventing crime and fear of crime by making a clear business case for crime prevention investment.

The main security problem with hospitals is their public nature – they are like open, self-contained mini-cities that combine many users under one roof. Control of movement of people is difficult and usual methods of access control are only partially effective. Potential offenders can move through the hospital unchallenged. Hospitals also contain many items that are desirable and easily transportable, for example drugs, computers and TVs. The diverse types of crime experienced include theft, assaults, car crime and drug abuse.

Following its ground breaking research in this area, the Crime Risk Management Unit now offers a consultancy service for hospitals, which includes:

- a Crime Prevention Through Environmental Design (CPTED) survey of the hospital and surrounding area, including car parks, transport systems and approaches to the hospital
- a quantitative analysis of reported crime to reveal trends, crime hot spots, etc
- a survey of the experiences and perceptions of staff, patients and visitors
- a management review to put actual costs on crime and its possible impact.

A fundamental feature of the service is the setting up of partnerships linking the hospitals with their local communities, including businesses, Crime & Disorder Reduction Partnerships, local boroughs and schools, etc.

For more information –
Sharon Monahan, 01923 664999
E-mail monahans@bre.co.uk

Left to right: Tom Bostock – Partner, Reiach and Hall; Bob Wilson – Director of Estates, University of Glasgow; and Jonathan Fair – Commercial Director, BRE Energy Office

Energy Updates

BRE Energy in Scotland

An Energy Division Office has been established at BRE Scotland in East Kilbride. "The Energy Office will be concentrating on energy efficiency issues, renewable energy and sustainable development fields, building on both existing and new business relationships," says Jonathan Fair, its recently appointed Commercial Director. "Our support of the Scottish Design Awards 2003 demonstrated our commitment to the burgeoning market in Scotland," he explained, "whilst celebrating the highest standards of design in the built environment."

Reiach and Hall Architects received the BRE sponsored Best Public Project Award at the Scottish Design Awards, for their work on the University of Glasgow's Wolfson Medical School. Allan Murray Architects and Arcade Architects received commendations in this category.
For more information –
Jonathan Fair
E-mail fairj@bre.co.uk

INREB

The Faraday Partnership project on Integrated New and Renewable Energy in Buildings (INREB) is focusing its research and training activities on five building scenarios, selected to ensure that the project retains industry relevance. The scenarios and main activities are:

1. Sustainable urban block. Running an international design competition for an urban block on a 2.2 hectare site in Manchester. The brief will be available in September 2003.

2. Existing high-density housing. Reviewing a major housing provider's stock and options for increasing energy efficiency and renewable energy.

3. Large-scale communities. Examining (predominantly) new, out-of-town settlements such as Ashton Green in Leicestershire where the aim is to build a 100% renewable energy community. Inspiration will be drawn from European projects such as Kronsberg sustainable communities in Germany. Reviews of these projects will be presented at a conference at BRE on 15 July – contact Cara Scott on enquiries@inreb.org for details.

4. Suburbia. Estimating the average carbon dioxide emissions from typical UK dwellings under standard occupancy, and then assessing typical packages of measures to achieve 60%+ reductions in carbon dioxide emissions.
5. Commercial, retail and industrial. Investigating the opportunities offered by the extensive roof areas of large "shed" buildings for incorporating technologies such as photovoltaics.

For more information –
Paul Evans, 01923 664506
www.inreb.org

Renewable energy grant scheme

The first round of the DTI's Clear Skies renewable energy grant scheme has granted over half-a-million pounds to not-for-profit organisations.

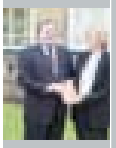
BRE, the scheme's managing agent, received more than 40 applications from not-for-profit organisations wishing to install renewable energy technology in their communities. The external selection panel met on 3 June and agreed that 22 of the applications fulfilled all of the conditions and will be good value for money.

A total of £514,802 has been granted to registered charities, housing associations, local authorities and schools during this first round of applications. The grants vary from £5000 to £100,000. The successful applicants are planning to install wind turbines, ground source heat pumps, solar panels for generating hot water, and biomass boilers. There were no successful applications in this round for installing micro or small-scale hydro schemes.

The deadline for the next round of applications is 1 August. Applicants can apply for grants of up to £100,000 or 50% of their project costs, which ever is lower. Householders can apply at any time and their applications are processed within a week.

For more information –
0870 243 0930 or www.clear-skies.org

News from BRE Certification and LPCB



OFFSITE03
At the end of the recent week-long OFFSITE03 event that was held at BRE, John Prescott visited the exhibition and was presented with his copy of the LPCB *Red Book*. Carol Atkinson, Managing Director of BRE Certification/LPCB, is pictured handing John Prescott his personal copy of the *Red Book* (left) – he jokingly asked whether he could go in the *Red Book* if he was "certified"!

"Several of our approved companies had stands at the exhibition which was a huge success" said Carol Atkinson. They included Weber sbd, Beamlock, MiTek, Fusion, Terrapin, Thermonex and Space 4.

New smoke alarm approval scheme
LPCB has launched a new certification scheme for smoke and/or heat alarms intended for use in the home. It conducts the testing for the scheme through the laboratories of its sister company, BRE, and is the only UK Certification Body that can undertake all the necessary testing for approval of domestic alarms in-house. In-house testing means that LPCB can offer a fast cost-effective turnaround – which is so important to manufacturers wishing to get their product to market as quickly as possible.

LPCB has years of technical expertise in fire detection technology and can trace its origins back more than a century to the introduction of engineered fire protection systems in the 1880s. "This wealth of knowledge, plus an efficient service, must make LPCB the number one choice for manufacturers looking for approval of their domestic smoke and heat alarms", says Angela Richards of BRE Certification/LPCB.

Security
As building owners come to terms with life post -9/11, the demand for proven security products and services has mushroomed. As a result, large numbers of manufacturers have been putting their products and systems to the 1175 test. In order to keep up the pace of new approvals, it is recommended that specifiers keep an eye on www.redbooklive.com.

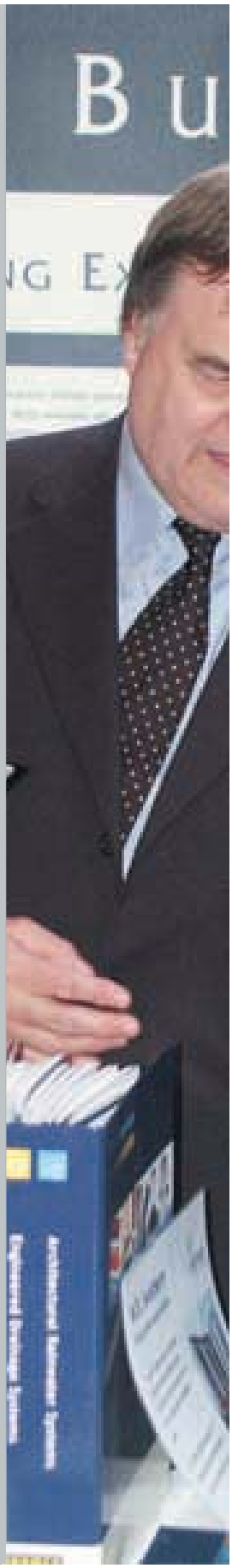
"Specifiers may also be interested to learn that we have published a booklet outlining the full scope of our security services and expertise," says Angela Richards, "which is considered by many to be second to none amongst UK Certification Bodies". A copy of this booklet can be downloaded free of charge from www.redbooklive.com

For more information –
01923 664100 or www.redbooklive.com

Interesting developments in LPS 1181
BRE has just completed a three-year sponsored research programme for the Association of British Insurers on the fire performance of sandwich panels.

The main conclusion from this work was that sandwich panels used in the food processing industry performed differently in fire conditions because they are supported from outside the enclosure.

FRS/LPCB has responded to this by producing a stand-alone standard, LPS 1181:Part 2, for sandwich panels used for food factories and cold-stores. Further parts are being developed and these will be highlighted in the next issue of *constructing the future*.



Extinguishing office fires
A new video by the makers of *Front Room Fire* demonstrates how to safely handle small office fires using water fire extinguishers and, in the case of electrical fires, carbon dioxide extinguishers.

The video, *It happens every day – how to use fire extinguishers in your office*, was filmed in a demonstration office built in the BRE Fire Division's Burn Hall.

It follows the experiences of two trainees in dealing with recreated, but real, fire situations. After demonstrations by an expert, they are taken through the following key steps to enable them to successfully and safely deal with a small fire in an office:

- where to place the extinguisher
- what to consider with regards to their own safety
- which extinguisher to use and why
- how to test and use the extinguisher safely and efficiently.

The video provides further guidance including raising the alarm and calling the fire brigade, locating escape routes out of the building and learning where the nearest fire extinguishers are to be found.

Fire extinguishers are estimated to save the UK economy over £500m and prevent some 24 deaths and 1,629 injuries a year, according to a survey by the Fire Extinguishing Trades Association and the Independent Fire Engineering and Distributors Association.

The video is available from BREBookshop at www.BREbookshop.com, or tel 020 7505 6622

Martin Wyatt and Guy Hammersley of BRE with Watford MP Claire Ward and Deputy Prime Minister John Prescott

And now for OFFSITE*05*
Following the success in May of the five-day off-site construction showcase event, OFFSITE03, plans are already underway for OFFSITE05 in May 2005.

Deputy Prime Minister John Prescott, Housing Minister Lord Rooker and Sustainable Energy Minister Lord Whitty, were among the more than 3000 visitors to OFFSITE03. "I have been impressed by my visit today," said Mr Prescott, "there are some great ideas here and now we need to take them into the long term."

The first event of its kind in the UK, OFFSITE03 was host to full-scale exhibits, demonstrations and displays from nearly 50 leading companies in the off-site construction sector. In addition, some 80 presentations were given in a series of seminars during the event.

The high level of attendance at the exhibition reflected the growing importance of off-site manufacturing to the construction industry. "We were delighted by the visitors we met at OFFSITE03," said Robert Clark, the Commercial Director at Fusion, one of the main exhibitors and sponsors of the event. "They were exactly the type of people who we wanted to come and see our product – specifiers, influencers, clients – as well as direct customers."

This view was shared by many of the participants. "We recorded over 100 positive enquiries during the course of the week, from architects, contractors, local authorities, housing associations and house builders", said Alan Hodge, Weber 's Commercial Director. "Of these, 20 had projects ranging from schools and hospitals to housing and commercial buildings. An excellent event!"

The event was held at BRE's site near Watford and organised by BRE and Mtech Group. The main sponsors included: BCA/Concrete Thinking, Fusion, Haironville TAC, Metek, Terrapin and Van Elle.

For information on sponsoring or exhibiting at OFFSITE05 –
Kellie Percival, 01923 664766
E-mail percivalk@bre.co.uk

Tube furnace

Aircraft passenger health and comfort

Transmission of infectious diseases on aircraft

In view of the current interest in the transmission of infectious diseases, an expert from the RAF Centre of Aviation Medicine will speak at the forthcoming conference *Air Quality in Passenger Aircraft*, to be held at the Royal Aeronautical Society on 16 and 17 October.

Wing Commander Martin Connor's presentation will outline recent advances and current understanding of the issues involved, with particular reference to SARS and the transportation of patients with infectious diseases.

His presentation will be part of a two-day conference that will also present information from recent studies of cabin air quality. The conference will set out solutions for improving technology and providing a safe and healthy cabin environment for passengers and crew. Closing presentations will outline the proposed aviation Standard for air quality.

For more information –
01923 664766,
E-mail events@bre.co.uk. or visit the website at www.bre.co.uk/aviation

Testing starts in new aircraft environment rig

Intensive testing in BRE's new on-site aircraft test facility started in June. Utilising the forward section of an Airbus A300 fuselage, this unique rig is being used to test key aspects of an aircraft's internal environment during real-time, simulated flights carrying passengers and crew.

The work is being carried out as part of two EU-funded projects: FACE, which aims to improve environmental comfort for passengers; and HEACE, which looks at the impact of the aircraft environment on flight and cabin crew.

Cabin crew and volunteer passengers will take part in simulated flights of up to 3.5 hours. Typical environmental conditions (eg temperature, humidity, noise and vibration) will be set up for each stage of the flight, from take-off through to landing, with the crew/passengers reporting on the effects. Eighteen "flights" are planned, which will run to the end of July.

For more information –
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Toxicity test becomes standard

Exposure to toxic gases and smoke is the main cause of injury and death in fires. Since the 1950s, annual toxic smoke deaths have increased fourfold, and injuries by a factor of forty. Despite this, there are currently no regulatory controls on toxic smoke emissions for construction products or building contents, and there have been no generally accepted methods for testing or hazard assessment. A problem with test development has been that the yields of toxic fumes from burning materials are very much affected by the combustion conditions in the fire.

Now, for the first time there is a standard method for small-scale testing of toxic emissions from building products under realistic fire decomposition conditions. The test will provide data for performance-based hazard assessments for use in product specification and fire engineering design.

The FRS tube furnace has been used for many years for research on toxic combustion products. It has recently been developed by Professor David Purser with support from the ODPM framework, to enable toxic smoke and gas yields to be measured over a wide range of combustion conditions occurring in full-scale fires.

This has now been published by the British Standards Institute as a method of determining toxic product yields in fire effluents (BS 7990: 2003). A variant of the method for estimating toxic potency of fire effluent has been published by the International Electrotechnics Commission as a Technical Specification (IEC 60695-7-50 TS), with a view to developing it into a full international Standard.

For more information –
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In brief

Composites guides

A project by NetComposites and BRE aims to create simple paper and web-based guides to help composites companies and their clients understand and determine the sustainability impacts of the decisions they make about materials, processes and products.

While the environmental, social and cost benefits of composite materials are fairly well understood, there is less understanding of some of the implications of, for example, the:

- use and emission of VOC's during manufacturing
- resource consumption during the production of man-made and natural fibres and resins
- recycling, recovery and reuse of the material
- costs and opportunities for more environmentally sound composites products.

To address such issues, potential alternatives have been developed (eg low-styrene resins, closed-mould processes, natural fibres), but there is confusion in the industry over the economic, environmental and social benefits of these and their effects on the processes, products and through-life performance.

The guides will give simple ratings for process and product choices, based on life cycle data from a variety of processing routes, resin systems and reinforcements.

For more information –
Jane Anderson, 01923 664396
E-mail andersonj@bre.co.uk

Unlocking whole life value

A new PII project aims to promote sustainable, value-based procurement to designers clients and contractors by increasing their understanding of Life Cycle Assessment (LCA) and Whole Life Costing (WLC) concepts applicable to all buildings and infrastructure.

Existing information will be repackaged to answer the questions:

- what represents value to clients?
- what tools are available to measure value? (eg WLC and LCA)
- when should I use these tools?
- what information will they give me?
- can I use them for existing buildings and structures?
- where do I get the data I need?
- when do I need to involve other team members?
- can I integrate the results to obtain Whole Life Value?
- how do I demonstrate the business benefits?

This will be done through a guide, *Unlocking Whole Life Value in Infrastructure and Buildings*, that will include two practical tools to assist practitioners use the information, five case studies illustrating the use of the techniques on infrastructure and building projects, and a series of events.

For more information –
Suzy Edwards, 01923 664390
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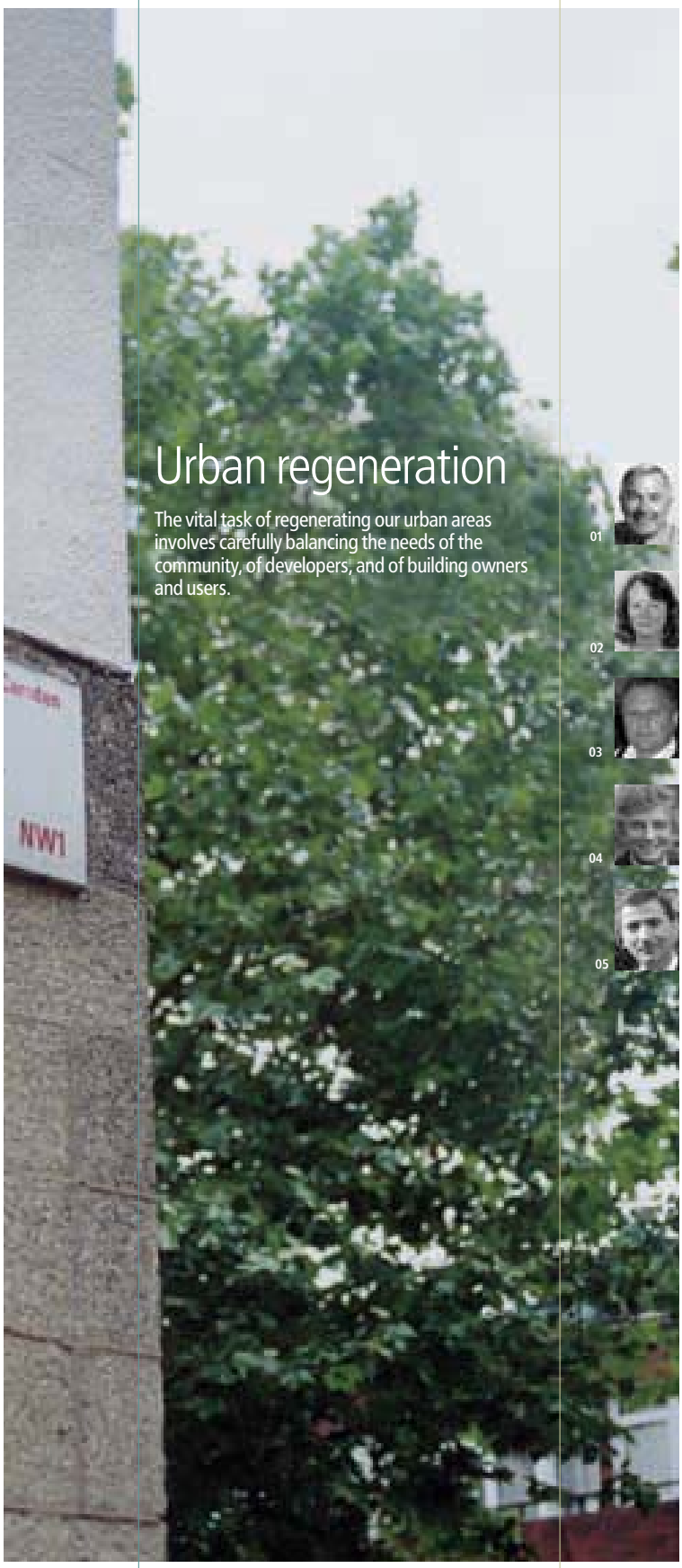
Safe water temperatures

The Child Accident Prevention Trust, the Thermostatic Mixing Valve Manufacturers Association, BRE and others are working on guidance for safe water temperatures. It will be published as a BRE Information Paper in the autumn to coincide with the launch of the Housing Health and Safety Rating Scheme and the new TMV2 Certification Scheme for domestic thermostatic mixer valves. The new rating scheme will affect all social housing providers. The guidance will help them to select appropriate products for particular applications and situations, and to understand the devices that can provide safe wate temperatures.

For more information –
John Griggs, 01923 664543
E-mail griggsj@bre.co.uk



Urban regeneration

The vital task of regenerating our urban areas involves carefully balancing the needs of the community, of developers, and of building owners and users.

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We asked construction journalist Margo Cole to interview five influential figures in the field with differing viewpoints on this complex issue. Representing developers, academics and consultants, they are:

01. Alan Cherry MBE, DL – Chairman of Countryside Properties PLC, one of the UK's leading housing and property development companies. Countryside Properties is a developer specialising in the creation of sustainable communities, and urban and rural regeneration.

02. Anne Power MBE, CBE – Professor of Social Policy and Director of the post-graduate MSc/Diploma in Housing at the London School of Economics, and Deputy Director of the ESRC-funded Research Centre for Analysis of Social Exclusion.

03. Paul Murrain – Director of the Urban Programme for The Prince's Foundation. He has 25 years' experience in urban design advice, leading design teams, and consultation and academic research projects related to new urban settlements, and large-scale residential and mixed-use developments in the UK and abroad.

04. Ko Blok – Chairman of ERA Bouw B.V. in the Netherlands. ERA Bouw act as both contractor and developer, specialising in refurbishing existing neighbourhoods and developing new buildings in former brownfield, industrial areas.

05. Guy Hammersley – Chief Operating Officer of BRE and a member of the BRE Board. Formerly, as Managing Director of BRE Construction Division, he was responsible for BRE's structural engineering, materials, geotechnical and construction process business.

The five articles that follow summarise the interviews. The interviewees were also the speakers at BRE's Annual Conference that this year addressed the issue of *Urban regeneration – the impact on our industry*. Their presentations at the conference can be viewed at www.bre.co.uk/regeneration.

Urban regeneration – a great opportunity

01. Alan Cherry MBE, DL – Chairman of Countryside Properties PLC, one of the UK's leading housing and property development companies. Countryside Properties is a developer specialising in the creation of sustainable communities, and urban and rural regeneration.

Housing developers have been seen as preferring to build on greenfield land. I truly believe, however, that urban regeneration is a great opportunity for the industry

Alan Cherry, Chairman of Countryside Properties, believes that urban regeneration offers a real opportunity for all those involved in the development industry. "Housing developers have been seen as preferring to build on greenfield land. I truly believe, however, that urban regeneration is a great opportunity for the industry."

Countryside Properties has successfully made the transition in recent years from being a housebuilder and commercial property developer, to a specialist development company recognised in particular for developing sustainable communities, and urban and rural regeneration. The Group is now seen as one of the leaders in its field, and is responsible for some of the UK's most successful and innovative schemes, including the Greenwich Millennium Village, St Mary's Island at Chatham Maritime and East Manchester's Sport City.

Cherry says other developers are becoming increasingly involved in urban regeneration, but believes too few in the UK have the full range of skills and experience needed to successfully create sustainable communities. The Urban Task Force, of which Cherry was a member, highlighted the need for education and training to create a pool of people with the specialist skills needed to ensure that urban regeneration in the UK is carried out in a responsible way.

Cherry says: "We are going to have to train and retrain many people throughout the development industry – and that includes builders, architects, surveyors and engineers."

Development should be community driven

He believes some development has failed in the past because the schemes have been building driven rather than community driven. Too much emphasis has been put on the construction of the housing units, instead of the wider issues that create a sustainable community.

"The decline of heavy industry has led to a lot of deprivation in our towns and cities," he says. "As greenfield development has increased over the last 50 years, those people that could afford to move out did, leaving behind those that couldn't afford to."

"There are significant areas in our towns and cities that offer opportunities for regeneration," he continues, "but it has to be done in a sustainable way, not just environmentally, but also socially and economically. The emphasis must be on the creation of communities of enduring value where people, if they choose, can stay throughout their lives, with a variety of homes and tenures that meet their requirements throughout their lifetime."

This mix of different house designs and sizes is essential if residents are to be encouraged to stay in the area as they move through their lives. But just as important is the establishment of other facilities that contribute to creating a community: inward investment that will give prospects and career opportunities for young people; good recreation and leisure facilities; and a secure environment where people feel safe walking to and from work and school. Open spaces and community facilities where people can interact are also vital to creating what Cherry calls "people places".

It is these elements that have made villages successful and sustainable for hundreds of years and what makes them so attractive to people looking for a home even now.

But knowing how to create these environments requires the expertise that Cherry says is often lacking in today's development industry.

Traditionally, he says, areas designated for regeneration are the subject of a masterplan in which different areas are assigned to a variety of developers for different uses, such as retail, leisure, commercial or residential. These uses were not mixed together or integrated.

According to Cherry, this approach ignores the importance of creating sustainable communities and the expertise needed to facilitate it. "Developers have to get involved at the earliest possible stage because it is the planning, design and conceptual aspects that are so important," he says. "You need someone that has the vision and understanding of what makes up a sustainable community development."

He describes the role of Countryside as "master developer" on many of the large schemes it is involved with. St Mary's Island, Chatham Maritime, for example, is a partnership with SEEDA in which the company has contributed its expertise at every stage of the development.

Commercially viable

One vital aspect of having a developer on board at an early stage is that they can ensure the scheme will be commercially viable. "We're commercially driven," says Cherry. "These days you're not going to get large amounts of Government money for a regeneration project, so it has to be capable of attracting investors and it's got to be capable of attracting people who, from choice, will want to invest there."

Equally vital in terms of creating sustainable communities is getting the right mix of housing types and tenures on each development. Cherry says each development and even each block or terrace should contain a varied mix of households and tenures. If only one tenure type is provided, be it owner occupied or affordable, the development will soon become a "social ghetto". Instead, he says, every development should provide a mix of tenures with high common design standards. He firmly believes that it should not be possible to distinguish the tenure of the home by its appearance.

At Greenwich Millennium Village, for example, the entire development features fully integrated mixed-tenure housing to the extent that a terrace of eight houses might be made up of four that are owner occupied, two in shared ownership and two rented through a housing association. As a result the development contains a viable mix of different family sizes and incomes.

In conclusion, Cherry believes that communities have become less inclusive, and an economic, social and environmental equilibrium needs to be found in creating sustainable new communities. As he says, "We all have a part to play in ensuring a more sustainable future, and developers like ourselves have a major role."

Social exclusion and sustainable development – regeneration at the core

Urban regeneration is not a choice, it is a necessity, according to Anne Power, Professor of Social Policy at the London School of Economics. "In a land-short, land-hungry country where we are reaching the limits of environmental tolerance, we have no choice but to reuse and recycle what we so badly damaged in the last 200 years," she says in her book *Boom or Abandonment*.

So, while many may dream of a place in the country, the reality is that, in the future, they are more likely to find themselves living at or near the centre of a large town or city. The challenge for developers, therefore, is to make these places attractive and to ensure there is suitable provision for all sectors of the housing market.

Already, the success of metropolitan developments at the upper end of the range has proved that there is a market for city centre living. Power says: "Now it is the absolute prize to live in London – even in poor areas, like Southwark, Tower Hamlets and Islington."

What these popular areas – and similar developments in cities like Glasgow and Manchester – have that is lacking in the suburbs are the transport links that make workplaces easily accessible. In addition they often benefit from a mix of new and renovated property, and money has been spent on improving the streetscape through tree planting and creation of public and community space.

But another element that is essential, believes Power, is employment. "It all hinges heavily on jobs," she says. "As that process of improvement happened the jobs grew. As we make inner neighbourhoods more successful, we drive more people in and create jobs alongside."

Higher density living

If people are to live in regenerated urban areas, though, they will have to learn to live in closer proximity to their neighbours. City centre living involves far higher density living than life in the suburbs.

"It's too easy for developers to simply take the areas around our big cities and produce low-density replica housing in the same way they have for the last 50 years," says Power. "They make a lot of money, but it's not people's aspirational style."

For example, in a Mori survey by developers in 2001 for the *Sunday Times* of housing preferences among young potential home owners, their top choice was terraced housing, closely followed by apartments at high density in urban areas. In *Boom or Abandonment* Power says: "For some people suburban housing may not be ideal – too spacious, too far from amenities, too much gardening, too few local buses, shops, health or other services. Inner neighbourhoods in contrast offer accessible local firms, smaller houses, proximity, amenities, services and public transport."

She adds: "Developers find it much harder to imagine going into an existing neighbourhood and putting a three-storey modern house into an existing historic area. They don't see themselves that way because it's not how they operate at the moment."

But that attitude will have to change, as much of the land available in the future will be small infill sites in the middle of existing communities. "In the future I see that as being the main way of producing housing of quality in a way that is viable," says Power. "If we continue to build better quality houses around the outskirts of our cities it will always be the better-off who will live outside and drive in. It creates a vicious circle, and that is what needs addressing."

Over the past 20 years much of the urban regeneration focus has been on large-scale developments on old industrial sites, such as London's Docklands. "But," says Power, "the real emphasis should be on regenerating existing neighbourhoods."

She claims there are 3,000 neighbourhoods in the UK that are difficult to live in and difficult to reuse. Social exclusion is not going to be tackled without finding a way of improving these neighbourhoods and the lives of those who live in them.

The unpopular slum clearance policy of the 1960s showed the detrimental impact of wholesale demolition. Since then, there has been more of a focus on renewal of inner city areas – with mixed success.

It could be worse

In *Boom or Abandonment* Power says: "One thing is clear – inner city conditions would certainly be a lot worse had it not been for virtually continuous attempts to maintain or improve conditions, equalise performance and target reinvestment efforts at the areas in most serious decline." She says the collapse of American inner city ghettos is a sharp reminder of the consequences when government abandons a neighbourhood – fuelling more abandonment and accelerating sprawl.

She is optimistic that success in regenerating half-abandoned housing points to a better future for inner cities – but only if the approach to rescue existing buildings is more consistent and more long term. One positive example is Glasgow, where many historic tenements – previously classed as slums – were converted in the 1970s and 1980s into popular, modern, mixed-tenure flats through the creation of community-based housing associations.

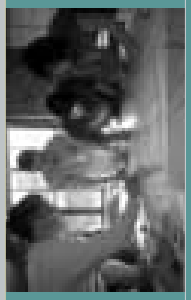
Work to make old tower blocks more secure and attractive has also proved successful in neighbourhoods throughout the UK.

Selective demolition can also have a role, as long as it is part of an improvement scheme in which important community elements are retained. "For example," says Power, "removing maybe one in four – or even every other row – of small, dense terraced streets can create a new park or play area, more or larger gardens or a wider street with front gardens. The street patterns are retained, and those residents who do want to stay in the area can."

"Such schemes," says Power, "must be brokered on a local scale. They must also be accompanied by a more selective housing policy that sees a far greater mix of tenants, rather than allocating purely on the basis of acute need.

02. Anne Power MBE, CBE – Professor of Social Policy and Director of the post-graduate MSc/Diploma in Housing at the London School of Economics, and Deputy Director of the ESRC-funded Research Centre for Analysis of Social Exclusion

In a land-short, land-hungry country where we are reaching the limits of environmental tolerance, we have no choice but to reuse and recycle what we so badly damaged in the last 200 years



Town making principles – vital for successful regeneration

03. Paul Murrain – Director of the Urban Programme for The Prince's Foundation. He has 25 years' experience in urban design advice, leading design teams, and consultation and academic research projects related to new urban settlements, and large-scale residential and mixed-use developments in the UK and abroad.

In the rush to regenerate our inner cities and urban areas, it is vital that we do not ignore the importance of tradition in the way that regeneration is undertaken

"In the rush to regenerate our inner cities and urban areas, it is vital that we do not ignore the importance of tradition in the way that regeneration is undertaken," says Paul Murrain, director of the urban programme for the Prince of Wales' Foundation for Architecture and the Built Environment. "The Foundation's aim is to re-establish the continuum of a living tradition into the core of urban development and regeneration."

"There are fundamental principles embodied in tradition that are as relevant today as they always were," says Murrain. "They inform the making of towns and buildings in the context of contemporary culture."

He argues that, within the current debates on urbanism and sustainability, a thorough understanding of traditional urban structure, forms and building types has a vital role to play in the realisation of that agenda.

"This should be understood as a living tradition that informs and guides – but also adapts to – contemporary lifestyles and technologies," he explains. "At the Prince's Foundation we believe that work and livelihood in the post industrial economy is best served by traditional urbanism."

Traditional urbanism

Murrain's assertion that the principles of traditional urbanism are a vital component of the sustainability agenda comes from analysing what makes traditional urban developments – our historic towns and cities – successful. "They work because they are based on spatially efficient settlements, an interactive accessible public realm, the close proximity of a variety of uses and tenures, and an adaptable building stock," he explains.

These same principles must be carried forward into new developments, he argues, adding: "Any new, sustainable technology is welcomed, but never at the expense of those traditional fundamental qualities."

Most experts in urban regeneration call for new developments and communities to be "sustainable". Murrain says the best way to achieve this is to identify and work with the existing heritage and tradition. "It is essential to realise that a living tradition is, by definition, sustainable in that it has survived as a canon of knowledge, constantly refined, for generations," he says. "It is arrogant in the extreme to ignore that fundamental."

The Foundation is keen to empower people in the development of new facilities created by urban regeneration, by involving and engaging them in participatory processes whenever possible. However, Murrain says participation does not end with the process. "We also believe that the built environment must be understood as a participatory product," he says, "in that the physical environment sets constraints on what you can and cannot do. The built fabric stays around relatively unchanged far longer than the time span of those involved in the process – which is why we believe that the continuum of tradition must inform all our deliberations."

According to Murrain there are some vital lessons to be learnt from tradition, such as the way in which spatial relationships powerfully influence the way we encounter each other, so we should consider these spatial arrangements before any other physical attributes. He also says that, historically, successful places have been built using a limited number of standard building types, and that we have developed a limited number of ways that these limited number of types can properly be put together to form larger components, such as neighbourhoods, towns, cities and regions. "There are not only rules with respect to the organisation of the type itself, but also rules about relating or connecting one type to another," he says. "And the rules about connecting types affect the rules about the types themselves, and vice versa."

Following on from this, he argues, the rules that most affect the order of the whole supersede those that affect the individual type. So, for example, the requirements of the street dictate those of the building. But at all times there is a fit between the order of the whole and the order of the parts, with each seeming to reinforce the other.

Murrain says it is only possible to read – and therefore understand – urban places when the individual elements have been properly put together, as is the case with any language. And how do you learn a language? By copying until you master it, and then making it your own – ie by referring back to the successful tradition of the past and using this to inform the development of the future.

Fragmentation in regeneration projects

For too long, he argues, different professions involved in the regeneration debate have been using their own languages and addressing their own audiences. "This destructive tendency has led to an increasing fragmentation of the public realm in far too many regeneration projects," says Murrain. "What makes successful urban places can be demonstrated easily enough, but is increasingly difficult to achieve as we move ever more towards a litigious society that makes the necessary interactions impossible on the grounds of protecting us all from ourselves."

"To prevent this," Murrain says, "urban design codes are vital to create a set of rules that are understood and shared by all those who have a stake in any regeneration project, and to start ensuring a common language emerges."

Regeneration experiences from the Netherlands

The Dutch Government identified urban regeneration as a priority in 1994, when it announced the introduction of the "Grote Steden Beleid" (major cities policy). This five-year programme initially covered the Netherlands' four biggest cities, but has since been extended to take in a total of 26 cities.

Under the policy, funding is available for developers working in the areas identified as being appropriate for regeneration. But according to Ko Blok, Chairman of contractor/developer ERA Bouw, "There is not much money, so we have to be very creative".

ERA Bouw is one of the leading Dutch firms in the regeneration market. It specialises in two distinct sectors: refurbishing and remodelling existing run-down neighbourhoods; and undertaking new construction on former industrial sites – predominantly disused harbours and ports.

The company was founded 40 years ago as a partnership between a large construction firm and the housing authority in Rotterdam. Its remit was to produce and erect industrial housing in the Rotterdam area where, as in many European cities, there was an acute need for housing that could be built quickly and cheaply.

Ironically, many of the areas ERA Bouw now redevelops are projects that date back to this time. And, while the UK Government is now encouraging housing developers to embrace off-site manufacturing techniques, industrial housing has yet to be reintroduced in the Netherlands.

Problems from the sixties

"We have a lot of these industrial housing areas from the sixties where there are now a lot of problems," says Blok. "There is too much cheap housing, and the areas have a very high concentration of immigrants and poor people, which has created social problems. In all our big cities we have these areas and these problems."

ERA Bouw has become expert at investing in and building solutions to these problems – always working in co-operation with the local housing authorities, which are usually the buildings' owners.

One solution, says Blok, is to "redefine the people who live there in terms of factors like education and income". Having identified the different markets, the company remodels the neighbourhood to take account of the different housing types and tenures required by these occupants, with particular emphasis on giving people the opportunity to buy a house if they wish to.

"Most of these houses are currently rented," says Blok. "but many people might want to get into house ownership but stay in the same area. We do this by either demolishing and rebuilding or by changing the existing buildings."

The company is currently working on a massive scale in the south east of Amsterdam, where one development houses 150,000 people, with 43 different nationalities represented. All the existing buildings are large industrial-built complexes that went up in the 1960s, with each block containing up to 900 apartments.

ERA Bouw is undertaking selective demolition and remodelling that includes demolishing sections of these large low-rise blocks to split each one into two or three separate blocks. At the same time it is building new family houses to widen the range of homes available in the area and to diversify the community.

"It will become a totally different area," says Blok. "The location is very good and the Municipality of Amsterdam has done a lot to increase the image of the area by building a new soccer stadium and a new commercial area, and also by ensuring there are good transportation links."

As an investor, ERA Bouw must ensure that it works in a cost-effective way. It partners with housing corporations to provide affordable housing, but depends mainly on sales income for its funding. It undertakes a great deal of market research before getting involved in regeneration schemes, and has acquired significant experience in understanding – and targeting – the different sectors in the market.

People stay in their communities

Blok says the regeneration is allowing people to buy homes in the community where they have their roots. "We have second and third generation immigrants who are educated and have a good income. They want to live in those areas where they have their social and religious infrastructure, and they like to have home ownership status."

He says 80% of the people who buy houses in these regenerated schemes come from the area, while the other 20% are often family members who moved out when they could not find suitable accommodation or buy their own house. "The role of social, religious and family infrastructure should not be ignored in urban regeneration," says Blok.

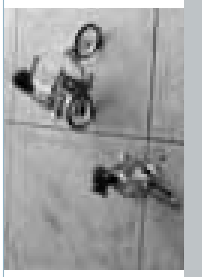
ERA Bouw's other major market – regeneration of former industrial areas such as ports and harbours – also sets it apart from other Dutch housing developers. "In the last ten years most developers have focused on new areas on the outskirts of our big cities," Blok explains. "We decided in the early nineties to specialise in urban areas."

These new developments – the equivalent of dock redevelopment in London, Liverpool and Glasgow – are particularly popular with both young people and "empty nesters". "These people really want to live in the city," says Blok. "It's not a very large group yet, but it's growing."

Over-demand on suburban housing is forcing the regeneration market to speed up in the Netherlands. ERA Bouw is one of the biggest players, understanding both the marketplace and the close relationships needed with municipalities and housing corporations needed to make the developments work.

We have a lot of these industrial housing areas from the sixties where there are now a lot of problems. There is too much cheap housing, and the areas have a very high concentration of immigrants and poor people, which has created social problems. In all our big cities we have these areas and these problems

04. Ko Blok – Chairman of ERA Bouw B.V. in the Netherlands. ERA Bouw act as both contractor and developer, specialising in refurbishing existing neighbourhoods and developing new buildings in former brownfield, industrial areas.



An integrated innovative approach to urban regeneration

For too long, attempts at urban regeneration have focused on tackling just one element at a time. The development and construction industries in particular have tended to focus purely on the design and construction of buildings without taking account of the wider social and economic issues.

But successful regeneration is only possible if the industry, government and individual communities adopt an integrated approach that acknowledges that all solutions are interlinked.

In 1998 the Government formed the Urban Task Force to examine the causes of urban decline and recommend solutions to bring people back to towns and cities. The task force's final report confirms that urban policies are not just about bricks and mortar, but about improving people's prosperity and quality of life.

Recommendations from the report have been incorporated into the Government white paper *Our towns and cities: the future*. In his forward to the white paper, Deputy Prime Minister John Prescott says: "We must address not just housing and planning, but education, transport and fighting crime as well. That is how we can achieve an urban renaissance for the benefit of all."

It is an approach that BRE endorses, and a process in which the organisation can play an important role. It has developed a suite of tools, expertise and advice that helps those in construction – developers, owners/users, designers and builders – to understand and respond positively to the challenges of urban regeneration.

Communities, mobility and inclusion, and environments

BRE's Chief Operating Officer Guy Hammersley says: "The end product may be a building but, in order to create the right building, you have to take account of three major issues: communities, mobility and inclusion, and environments."

Previous examples of urban regeneration – dating back over the last 50 years – have failed to give appropriate weight to the needs of existing communities. "However well motivated," says Hammersley, "a development will never succeed if it has been designed for the community – instead of by the community."

One area that often dissuades people from living in a city is the fear of crime. "Security is a key issue in the viability of city living," explains Hammersley. "But there are many ways of approaching the issue of security within the design of a building or development. One of the best ways of creating a safe environment is to ensure that it is a 24-hour community."

He stresses the importance of creating long-term cultural shifts in a community, rather than short-term cures. "One answer would be to install steel security doors, but the long-term solution is to enable the development of neighbourhoods where these aren't needed," he says.

BRE advises on crime and security, and also produces specifications and checklists that enable developers to understand the needs of communities. As an adviser on PFI specifications, for example, BRE's stance on new schools is that they should be focal points for the community, incorporating "learning villages" and on-line centres for the whole community, as well as facilities such as healthcare for the schoolchildren.

Through the Centre for Sustainable Construction BRE has also produced a "checklist for development" that indicates the facilities that communities need in order to function sustainably.

Hammersley says the issues of mobility and inclusion go hand in hand. "Mobility needs to be inclusive, providing resources for all – not just car owners," he says. "Transportation has to be integrated, so people have access to a range of systems, such as car, bus, rail and tram systems."

This has been proved at New Addington, a large social housing area with a population of 25,000 on the outskirts of Croydon, which has been revitalised by the construction of the town's Tramlink. Before the tram system was built, the only way for residents of New Addington to reach the centre of Croydon five miles away was a car or bus journey that could take over an hour.

Now they are linked to the centre with a service that takes just 17 minutes, making it possible for residents to access the full range of facilities – shops, businesses and services – in the town.

"But," says Hammersley, "the issues of mobility and inclusion should also be addressed by ensuring new developments include local shops, services and work opportunities. Homeworking should also be provided for in future homes to increase potential for access to employment without the need to travel."

BRE's experience in the environmental aspects of construction and development are well known – to the extent that its BREEAM assessment scheme for environmental sustainability is the benchmark for new buildings. But the organisation is keen to promote environmental sustainability at both the local and the global levels.

Balance between regeneration and environmental impacts

"There will always be a balance between the need to regenerate communities and areas and the environmental impact of such regeneration," says Hammersley. "There is also a balance between the initial and long-term impacts. This is a highly complex issue with significant interactions between the elements."

Factors to be considered include embodied energy in construction materials, energy consumption in buildings, recycling waste from demolition, designing buildings for future "deconstruction", use of brownfield sites, and minimising noise, dust and disturbance from the construction process.

Taking into account factors such as these indicates the complexity of the task of sustainable urban regeneration. "Buildings should be developed in response to all these issues," says Hammersley. "Urban regeneration is a solution comprising a complex interplay of issues, but solutions can still make good business sense."

05. Guy Hammersley – Chief Operating Officer of BRE and a member of the BRE Board. Formerly, as Managing Director of BRE Construction Division, he was responsible for BRE's structural engineering, materials, geotechnical and construction process business.

We must address not just housing and planning, but education, transport and fighting crime as well. That is how we can achieve an urban renaissance for the benefit of all

Fibre reinforced polymers – construction material for the 21st century

While fibre reinforced polymers (FRPs) have been successfully used in construction for several decades – mainly for architectural applications such as cladding – they have not become established as a major structural material. Sue Halliwell looks at the inherent advantages of FRPs which have led to their re-emergence in recent years, and at the way forward.


Window

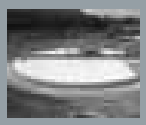

Architectural moulding


Primary structures


Decking


Modular structures


Bridge enclosure


Odour containment enclosure


Footbridge


Masts and towers

The advantages of FRPs over traditional structural materials have long been recognised in high-technology engineering sectors – the aerospace and automotive industries for example – where the use of composites continues to expand. They have made particularly rapid progress in weight sensitive applications, where increased propulsion costs from added weight exceed higher material costs.

As confidence in the performance of FRPs grows in these sectors, their use (once mainly confined to secondary structures) is increasingly being extended to safety critical primary structures where the cost implications of failure are far greater.

Construction – slower uptake

FRP materials are also making inroads in construction but, for a variety of reasons, at a slower rate. Large segments of the construction industry, on both the supply and demand sides, tend to be more conservative in their support of new technology and innovation. Being less technology conscious and less technology driven, the industry has been less willing to invest in research and development and take the commercial risks associated with innovation.

Selection of construction materials is traditionally based on initial capital costs and benefits. Only recently has there been a move to selecting material – albeit at the initial planning stage rather than at the tender award stage – on the basis of whole life costs and benefits, or total annual cost of ownership.

Different requirements

The demands on the construction industry differ in many respects from those on the aerospace and automotive industries. Infrastructure applications such as bridges, for example, are frequently large one-off projects. They have long service lives and need high levels of structural reliability throughout because shortcomings in structural performance are very expensive to rectify. This, and the fact that their size and locations often make access costly, means that the frequency of maintenance cycles needs to be minimised.

Infrastructure operating costs are primarily due to maintenance and repair associated with corrosion and structural degradation (eg fatigue), and any resulting disruption and loss of service. With increasingly busy networks characterising modern infrastructure, disruption costs from loss of service of an element in the network often greatly outweigh the direct costs of maintenance and repair. In these circumstances, the ratio of operating cost to capital cost can be as high, if not higher, than in vehicular applications.

The final assembly and installation often take place in relatively hostile and unpredictable environments. The speed and reliability of the joining and installation processes are therefore significant factors in the overall cost-effectiveness of a construction project.

The advantages of FRPs

FRPs offer several important advantages over traditional materials for construction projects, such as:

- Time saving – low-weight materials allow fast construction in time-tight projects
- Durability – especially in harsh environments
- Repair – easier repair of structures in situ
- Strengthening – easier strengthening of structures in situ
- Tailor-made properties – for example, where an especially high level of performance is needed in one particular aspect
- Appearance – a much greater variety of colours, shapes and textures available
- Blast/fire – blast or fire resistance where required
- Radio transparent – for telephone masts or military structures
- Low maintenance – in conditions where difficult access makes maintenance difficult.

Uses of FRPs in construction

Applications of FRPs in buildings include, in order of increasing structural demand, window and door frames, architectural mouldings, secondary structures such as wall, roof and floor panels, gratings, parapets, etc, and primary structures for monocoque modular buildings.

Applications in infrastructure include bridge enclosures, footbridges, vehicular bridges, aerodynamic fairings, reinforced concrete forms, lighting columns, pressure vessels, odour containment roofs and enclosures, etc.

Pin-pointing the economic benefits

If the construction industry is to benefit more fully from FRPs' advantages, designers need to identify existing and new applications where these bring significant economic benefits. For example, the benefits from low-density and high-specific strength are greatest in structures in seismic regions, in high-rise buildings, in decks and aerodynamic fairings for long-span bridges, and in rapid deployment buildings, etc.

The advantages of corrosion resistance, on the other hand, give greatest value in process plants, structures in marine or industrially polluted atmospheres, and steel bridge enclosures.

The benefits of rapid installation and cold-joining are greatest where there is an interaction between building the structure and installing plant and equipment, and adding architectural finishes. This is the case with many buildings, but also process plants, offshore installations and in ship building. And the benefits offered by the ability of FRPs to form complex three-dimensional shapes can be exploited in architectural and mechanical engineering applications.

The way ahead for FRPs in construction

The greater use of FRPs in construction requires improved reliability and reduced relative cost through:

- developing better and more cost-effective FRP structural systems that fully exploit the advantages of FRPs when used either on their own or in combination with other materials
- improving performance with better design methodology
- achieving the most cost-effective manufacturing processes that are appropriate for the structural systems and their potential production volumes
- increasing the availability of off-the-shelf components and systems that can be used to meet a wide range of structural needs.

It is also very important to fully promote the advantages of FRPs – through demonstration projects, etc – in order to improve market awareness.

A report giving comprehensive information on the potential of FRP materials in construction will be published later this summer. This report is the culmination of work funded by the Foundation for the Built Environment.

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Unravelling airtightness

September 30 marks the end of the "honeymoon period" for compliance with Building Regulations' airtightness requirements by new commercial and public buildings over 1000m^2.

Since 1 April 2002, when Part L2 of the Building Regulations came into force, new buildings with excessive air leakage have no longer been acceptable. All new commercial and public buildings over 1000m^2 must be tested by an accepted testing body for airtightness.

Part L2 now specifies using an air permeability formula that measures the envelope of walls, roof and ground-floor area. The new regulations require that air permeability should not exceed 10m^{3}h^{-1}m^{-2} at an induced pressure difference of 50 Pascals across the extended envelope.

No more "reasonable compliance"

Until 30 September 2003 the Government is prepared to accept a standard of "reasonable compliance". If a building fails its first airtightness test, reasonable compliance can be demonstrated by conforming to one of the following:

- air permeability on re-testing has improved by 75% of the difference between the first test and the target standard of 10 m^{3}h^{-1}m^{-2}
- air permeability on re-testing is within 15% of 10m^{3}h^{-1}m^{-2} (ie less than 11.5m^{3}h^{-1}m^{-2}).

After 30 September, a building will only comply with regulations if it meets with the standard of 10 m^{3}h^{-1}m^{-2}.

Why bother about air leakage?

Air leakage wastes energy and money. A leaky building loses a lot of heat, so the heating system has to work harder than necessary to keep the building at a comfortable temperature. This results in high heating bills and can be uncomfortable for occupants, with draughts and inconsistent temperatures. For all of us, leaky buildings mean increased emissions of carbon dioxide – the primary contributor to global warming.

Air leakage can be defined as the entrance or escape of air through gaps and cracks in the building fabric. It is driven by wind pressure and temperature differences between the inside and outside of the building, and is therefore variable and uncontrollable.

Some typical air leakage paths are shown in the diagram (left).

Compliance with Part L2 will minimise air infiltration and leakage, resulting in:

- reduced energy costs
- properly controlled ventilation
- reduced carbon dioxide emissions
- smaller plant and plant rooms
- less degradation of the building fabric
- reduced risk of condensation
- improved insulation
- increased occupant comfort, health and productivity.

What designers and contractors must do

Airtightness should be addressed during the design stage of the building's development, ideally at the concept stage. Air barriers must be:

- made up of impermeable material
- continuous
- of sufficient strength
- long-lasting – they must not dry out or crack
- able to allow for movements in components
- able to be applied in areas that are difficult to access
- accessible for maintenance or replacement.

Designers must decide which surfaces are to form the airtight barrier and which materials to use. The following need to be sealed:

- riser shafts
- service penetrations
- hollow concrete beams (at ends)
- window and door frames (to the inside surface)
- underside of metal roofing.

It should be remembered that plant rooms, etc will be outside the air barrier.

Some methods of sealing are shown in the diagram (lower left).

The person carrying out the building work, usually the main contractor, is responsible for achieving compliance with Part L2. Once construction has started, contractors should carry out quality checks to make sure that air barriers are being installed properly. A final inspection should take place shortly before the airtightness test.

Testing for airtightness

Airtightness tests should be carried out in accordance with CIBSE Technical Memorandum 23. The Building Regulations recommend that testing is carried out by a competent body* appointed by the main contractor. The method used is "pressure testing".

Pressure testing uses a large fan system to pressurise the building. The system is connected via flexible ducting to a wooden template that is temporarily sealed into an existing doorway. All external doors, windows and trickle ventilators are closed and all the internal doors are wedged open. Mechanical ventilation openings are sealed with polythene sheet and tape or other appropriate materials. Smoke extract fans/vents are closed but not sealed, and other integral openings (eg lift shafts) are left unsealed. Checks are made during the test to spot and correct any extraneous effects, such as a window or door blowing open, or any temporary sealing failure.

A test can take as little as two hours for a straightforward case, and good preparation by the contractor makes all the difference. More complicated or less well-prepared cases may take up to a full day.

An air leakage audit can also be carried out using small smoke tubes, infrared thermography or large-scale smoke tests (or a combination of the three). It will highlight any potential air leakage paths and enable remedial work to be carried out whilst access is still relatively easy.

It needn't be difficult

Before the new regulations came into effect in April 2002, it was reckoned that more than 50% of buildings would fail to comply with Part L, so there are important implications for everyone involved in the design and construction of buildings. But achieving total compliance with Part L2 is not difficult, as long as the issue of airtightness is borne in mind at all stages of the building process. The essential message is: build tight – ventilate right.

*To help contractors get in touch with a competent testing body, an independent organisation called the Air Tightness Testing and Measurement Association (ATTMA) has recently been set up. Members of ATTMA already hold or are in the process of obtaining UKAS accreditation for their airtightness testing services.

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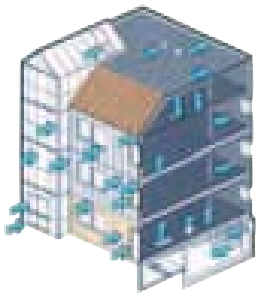
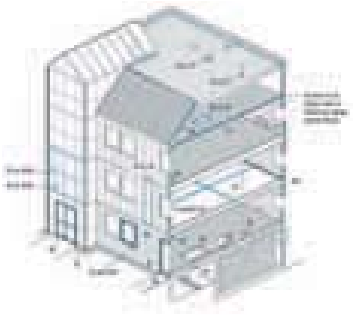
Infiltration paths for a hypothetical office building



1 At junctions between elements
2 At joints between walling components
3 Around windows, doors and roof lights
4 Through gaps in membranes, linings and finishes
5 At service penetrations
6 Around access and emergency openings
7 Through permeable materials



B Breather membrane
P Plaster adhesive
F Flashing
G Gasket
M Polymeric membrane
P Plaster
S Elastomeric sealant
SF Foam sealant
V Vapour control layer
W Weatherstrip (some are sealants or gaskets)

Planning sustainability

Planning has a major role to play in achieving sustainable development, explains Elizabeth Wilson, Chairperson of the Planning Officers' Society Sustainability Group.

With the Planning and Compulsory Purchase Bill currently being debated, the Planning Officers' Society (POS) has reiterated its aim to ensure that planning makes a major contribution to achieving sustainable developments from national to local levels, in ways that are fair, equitable and achieve the social, environmental and economic aspirations of all sectors of society.

Best practice

Whilst the Bill – which aims to speed up the planning process and make it more predictable – is being debated nationally, at the local level there is much positive work being done to promote sustainability. The Sustainability Group of the POS is helping with this in two ways. Firstly, it is looking to disseminate best practice in co-ordination with other agencies, such as BRE, so that practising planners everywhere do not have to "reinvent the wheel" when developing their own assessment processes, Supplementary Planning Guidance notes and other procedures and policies.

Policy making and development control provide opportunities to address sustainable development in planning, such as through planning authorities negotiating Section 106 agreements with developers, as arranged in the Town and Country Planning Act 1990. For example, the London Borough of Merton has led a new approach to renewable energy in its Unitary Development Plan (UDP). Using the Government's Climate Change Programme and Regional Planning Guidance as the driver for change, Merton has already negotiated the implementation of the policy with a new factory.

Another example of policy making is the London Borough of Croydon's deposit draft UDP which now includes the policy: "The Council will expect all development (either new build or conversion) with a floorspace of 1000m^2 or more, or ten or more residential units, to incorporate renewable energy production equipment to provide at least 10% of the predicted energy requirements."

EcoHomes

In the South West of England, North Somerset Council has reported a Section 106 Agreement to create the largest EcoHomes scheme in the UK so far. The agreement for a scheme in Portishead ensures developers will deliver 1470 new homes to the BRE's EcoHomes "Good" rating. A further 30 homes will achieve an "Excellent" rating, with one kept for a year as a visitor centre.

Sustainability criteria for the scheme which contribute to the EcoHomes rating include:

- brownfield site
- orientation to achieve maximum solar gain and good daylighting
- low environmental impact materials
- high levels of insulation and high performance glazing
- energy efficient boilers and white goods
- water efficiency and grey water recycling
- fact sheets given to householders containing advice on use and maintenance
- good pedestrian, bus and cycle routes.

Improved public transport is being explored, with developers making a contribution towards additional bus services, and a strategic transport link study that will investigate the reopening of the old Portishead to Bristol railway. Part funding is also being provided for a household waste recycling facility.

North Somerset Council and the developers are organising a conference to outline how the sustainability agenda is being delivered in Portishead.

Details of these and other progressive policies and practices can be found at www.wellbuilt.org.uk to help local authorities interested in more sustainable construction. More details on EcoHomes can be found at www.bre.co.uk/ecohomes

Sustainable drainage

The second area of interest for the Sustainability Group is the work on sustainable drainage systems (SUDS) by a national working group of representatives from government departments, agencies and local government. They are designing a Framework to help developers promote and implement SUDS. A consultation document has been produced, available on the Environment Agency website, with comments invited until August 2003.

The consultation paper aims to focus attention on the need for SUDS to be recognised. It provides a set of core standards, technical advice and agreements leading to a Code of Practice between the organisations/agencies involved. A number of possible SUDS devices are highlighted, ranging from pervious surfaces, filter drains, swales, rainwater reuse and green roofs. It concentrates mainly on above ground issues.

The paper places planning as central to SUDS – from a recognition of the role of strategic planning to the importance of legal agreements. The Planning Officers' Society Sustainability Group is examining the consultation paper closely, but this is an issue that needs to be considered by local authorities corporately as there are issues of adoption and maintenance.

For more information –
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Artist's impression of part of the Portishead EcoHomes housing scheme

Picture courtesy of:
Portishead Quays Consortium
North Somerset Council
Barton Wilmore Architects

Performance-based repair of concrete structures

A four-year programme to improve the durability and effectiveness of repairs to concrete structures is now underway – Stuart Matthews reports.

The European Commission is providing four years' financial support to establish an international network in which hundreds of participants will collaborate on the issue of performance-based rehabilitation of reinforced concrete structures.

The network, known as CON REP NET will help to foster technological co-operation between research centres, universities, knowledge and industrial organisations and property owners, primarily in Europe but also with participants from around the world.

Rehabilitating buildings and infrastructure

Rehabilitating existing buildings, structures and facilities is critical to maintaining an effective operational infrastructure in Europe. It is estimated that more than 50% of Europe's annual construction budget is spent on the rehabilitation and refurbishment of existing structures – a figure that is certain to increase as the existing infrastructure ages.

One aspect of these works is the repair and rehabilitation of concrete structures that can be subject to a number of deterioration processes. The premature failure of some repairs and the uncertainty with some aspects of the performance of rehabilitated concrete structures, increases the difficulties that building and infrastructure owners have with managing their assets.

There is an enormous amount of repair work to be done. As well as infrastructure, large numbers of public buildings and other national facilities need cost-effective rehabilitation. To take just one instance, in the Czech Republic it is estimated that works on dwelling blocks alone will cost some 2.5 billion over the next 25 years. This situation provides both challenges and opportunities to the European concrete rehabilitation industry.

Among the key challenges are those of improving the durability and effectiveness of repairs to concrete structures. A better balance must be struck between ensuring longevity and shorter-term financial considerations – issues that also apply to other construction materials.

Reliable information on which rehabilitation processes are most effective is needed, along with activities to promote current best practices. Also, improved rehabilitation strategies and methods must be devised in order to get better value for the money spent and the resources applied.

Performance-based approach

Adopting a performance-based means of rehabilitation will provide a rational approach that could give a strong stimulus to future development. There are potentially large gains to be made. For example, it has been estimated that applying performance concepts to new construction could reduce total construction costs by as much as 25% in the long term.

With the involvement of stakeholders throughout the supply chain, the network aims to improve the performance of rehabilitated concrete structures by looking at past and current performance and at ways of improving future performance. This will include:

- cataloguing the performance of previously rehabilitated concrete structures
- mapping research technology and development activities concerned with deterioration and rehabilitation of concrete structures
- Improving the understanding of current industry practice and drawing on the state-of-the-art in research
- developing benchmarks for the performance of rehabilitated concrete structures and current industry practices
- exploring performance-based concepts to improve the delivery of durable and effective repairs
- identifying future research technology and development required to support implementing performance-based concepts for rehabilitating concrete structures
- examining and promoting ways of introducing performance-based concepts into future European and ISO standards.

The findings of this work will be widely disseminated.

The network

CON REP NET comprises three groups of members: a consortium of seven principal partners, including BRE as the network co-ordinator, about 40 members, who will contribute their experience and knowledge, and more than 300 participants who will contribute to and benefit from network public activities and events.

The first event involving members was the network launch in Madrid on 6–7 February 2003 hosted by Institute Eduardo Torroja. The meeting began by reviewing members' expectations for the network, their role and their aspirations of participation.

The technical discussion sessions considered past, present and future performance issues. Topics of immediate focus included suitable sources of key data required, structures, specification for data to be collected, methods of collection and peer-review criteria, together with obtaining agreement for access to this. Dissemination plans and actions were reviewed.

For information about, or to participate in the network –
John Morlidge, 01923 664366
E-mail morlidgej@bre.co.uk

CON REP NET work programmes

Work package (WP) no and title	Content	Contribution to objectives
WP1: Network management	Steering committee, secretariat, website, communications infrastructure	Provides the basic infrastructure needed to operate the network
WP2: Past performance and practices	Catalogue of past performance, review of problems in achieving durable rehabilitation of concrete structures, identification of success factors in creating durable repairs and rehabilitation, benchmarks, and other factors, such as value for money.	Definition and understanding of the problems to be addressed, recognition of good performance achieved and relevant factors
WP3: Current performance and practices	Current industry practice, research reviews, best practice guidance and benchmarks, mapping of research and technological development (RTD) activities, Standards and regulations.	Definition of current practice in respect of answering the problems defined in WP2 and drawing out the success factors
WP4: Future performance-based concepts	Client aspirations for durable rehabilitation of concrete structures, development of industry response and methods of delivery, vision for performance concepts to achieve durable rehabilitation of concrete structures, future RTD needs, co-ordination of RTD and other activities, standardisation and continuing professional development issues.	Promotion of new and improved rehabilitation strategies and methods of delivery
WP5: Dissemination, communication, RTD exploitation and intellectual property rights	Promotion of findings from the technical activity areas (WPs) to the target audiences by means of a programme of activities, materials and publications.	Facilitate the transfer of information and understanding through the supply chain and from research to practice

Recent publications

Books

Control of dust from construction and demolition activities (BR 456)
Outlines dust control measures for specific processes, and gives advice on pre-project planning, implementation and site management, together with checklists for use by all sizes and types of construction activity. £29.95

Domestic energy fact file 2003 (BR 457)
Gathers together in one volume data on important trends related to domestic energy use, and in particular on the measures that have been taken to improve energy efficiency. Covers the period from 1970 (just before the first oil crisis) until 2001, the latest year for which most of the figures are available. £34

Digests
Concise reviews of building technology

Digest 475 Tilt of low-rise buildings with particular reference to progressive foundation movement
Guidance on assessing the significance of tilt of low-rise buildings resulting from foundation movement. Covers investigation if tilting appears to have taken place, how to monitor ongoing tilt, and remedial action. It will help building professionals, property valuers and insurance advisers to assess the significance of tilt and the need for expert advice.

Digest 476 Machine strength grading of timber
Aims to improve knowledge of the process of machine strength grading and highlight the benefits. Explains some aspects of statistics, the concept of distribution, and modification and adjustment factors which are integral to timber grading practice.

Digest 477 Wood-based panels: oriented strand board
Describes this relatively new product and provides information regarding its performance. Provides guidance on the use of OSB and how to select and specify the different grades in accordance with the European Standard EN 300. Demonstrates how mandatory compliance with the Construction Products Directive can be achieved by using the new European Harmonised Standard.

Good Building Guides
Practical guidance on building design and construction

GBG 55 The Quality Mark Scheme
The Quality Mark Scheme has been introduced to give reputable tradesmen the opportunity to demonstrate their professionalism and clearly distinguish themselves from the cowboys. It has been developed by representatives from the construction industry. This Guide describes the procedures for consumers and tradesmen and gives details of the warranty cover.

GBG 56 Off-site construction: an introduction
Introduction to the techniques and methods of off-site construction and suggests how these might be adopted within the modern construction process. Benefits include increased productivity and product quality. Eight pages

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

IP 4/03 Deterioration of cement-based building materials: lessons learnt
The damaging reactions included are: sulfate reactions (thaumasite and delayed ettringite formation), steel-slag expansive reactions (infill and industrial waste deposits), and acid attack on concrete. Recommendations on how to avoid damage are given.

IP 5/03 Precast hollowcore slabs in fire
Following concerns expressed in the media in relation to the performance of hollowcore slabs in fire, two full-scale fire tests were carried out at BRE's Large Building Test Facility. This paper explains the background to the work, describes the test parameters in some detail and summarises the main test results and conclusions from the project.

Prices
Digests and Good Building Guides are £10.50 each. Information Papers are £7.50 each.

Where to get them
These publications are available from:
– www.brebookshop.com
– BRE Bookshop, 151 Rosebery Avenue, London EC1R 4GB
T 020 7505 6622, F 020 7505 6606

BREbookshop.com

A wide range of construction publications is available online at www.brebookshop.com

Diary of forthcoming events

15 July 2003 at BRE, Watford
Building sustainable communities
Conference aiming to demonstrate how new urban development can contribute to the building of sustainable communities in the UK. Will include presentations on exemplar urban projects across Europe that have been successful in achieving sustainability. For a programme and booking details see www.inreb.org
Contact: Cara Scott, 01923 664512, enquiries@inreb.org

16-17 October 2003 at the Royal Aeronautical Society, London
Air quality in passenger aircraft – providing a safe and comfortable cabin environment
Two-day conference presenting important new information that has emerged from recent studies. It will also give delegates a clear picture of work being done around the world by governments, aircraft manufacturers and airlines. Most importantly, it will set out solutions for improving technology and providing a safe and healthy cabin environment for passengers and crew. Closing presentations will outline the proposed aviation standard for air quality.
Contact: Events, 01923 664775, events@bre.co.uk, or visit www.bre.co.uk/events

30 October 2003 at BRE, Watford
Controlling pollution emissions from construction – new guidance
Conference on the issues of air and noise pollution emissions from construction sites, which can cause nuisance and risks to the health of site personnel and local residents. Construction projects will increasingly need to demonstrate that their emissions of these pollutants are within acceptable and legal limits.
Contact: Events, 01923 664775, events@bre.co.uk, or visit www.bre.co.uk/events

Training courses

19 August and 30 September 2003 at BRE, Watford
Smart homes need smart controls
One-day workshop describing the benefits of European Installation Bus (EIB), focusing on applications, and giving a practical insight into technical operation.

11-15 August and 22-26 September 2003 at BRE, Watford
Building Services Integration with EIB
Course is designed to provide extensive insight into the technical operation of EIB, and the design and commissioning of EIB installations. The content is evenly divided between developing theoretical understanding and practical skills, and prepares delegates to sit the EIBA Partner exam.

13 August at 2003 at BRE, Watford
Safe working
Training course to raise awareness of health and safety issues and make people aware of their responsibilities.

14 August 2003 at BRE, Watford
Construction site fire safety
While most construction and safety professionals will be familiar with general health and safety issues, this course will give them the opportunity to focus on the specific risk of fire during construction and refurbishment works.

10 September 2003 at BRE, Watford
Construction health, safety and welfare
This course allows delegates to be aware of health and safety hazards as part of their responsibilities on construction sites.

11 September at BRE, Watford
Fire safety awareness for personnel
Course aiming to provide personnel with a basic understanding of fire safety in the work environment.

11 September 2003 at BRE, Watford
Fire safety awareness for fire wardens or persons in charge
This course is a continuation of Module 1, Fire Safety Awareness for Personnel.

22 September 2003 at BRE, Watford
ISO 9000 – an overview and the changes
All ISO 9000 registered organisations have to update their Quality Systems to meet the new requirements and to retain their ISO 9000 registration beyond the year 2003.

24-25 September 2003 at BRE, Watford
Improving business performance with ISO 9000: 2000
Two-day course to help delegates develop a strategy of gaining real business benefits from the standard.

24-25 September 2003 at BRE, Watford
BREEAM for Offices assessor training course
Two-day training course to become a BREEAM assessor.
Contact: 01923 664462, breeam@bre.co.uk

30 September 2003 at BRE, Watford
Dampness and cracking
Course equipping delegates to: examine buildings for defects, use diagnostic inspection methods, select appropriate equipment for examining defects, recommend remedial action and identify sources of further information.

For information on the above training courses contact (unless otherwise stated) BRE Training, 01923 664800, E-mail train@bre.co.uk, or visit www.bre.co.uk/training

BREconnect

BRE Connect is a new subscription scheme that gives unrivalled access to BRE's expertise on buildings, construction, energy, environment, fire and risk.

For £120 a year BRE Connect subscribers receive:
– all BRE Digests, Good Building Guides, Good Repair Guides and Information Papers such as those listed on this page – totalling at least 50 publications each year – all building to form an invaluable reference tool
– a CD-ROM each year containing every BRE publication from that year in pdf format
– preferential pricing on a range of BRE books and other publications – such as those listed on this page – for which subscribers pay around half the full price
– discounts on a programme of BRE events. BRE Events are accredited to Continuous Professional Development (CPD).

For more information –
Alan Wakeford, 01923 664234 E-mail wakeforda@bre.co.uk

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