CONSTRUCTING THE FUTURE

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Issue 31

Fire as a sustainability issue

Fire safety in schools, hospitals and transport

Wireless fire detection systems

Fire legislation

New National Centre for Excellence in Housing

Green buildings worldwide

Sustainable communities

The Carbon Mixer

SPRING 2007 ISSUE 31

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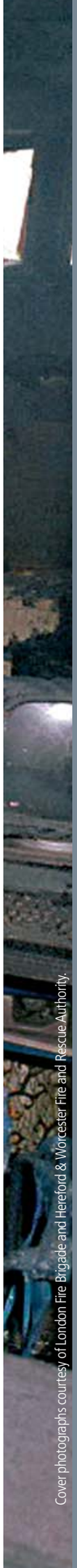
Constructing the future is published by BRE, the UK's leading centre of expertise on the built environment, construction, energy use in buildings, fire prevention and control, and risk management. BRE is owned by the BRE Trust, a registered charity with a mission to champion excellence and innovation in the built environment for the benefit of all.
ISSN 1465-3788

Editor: Tom Harvey, E harveyt@bre.co.uk
BRE: www.bre.co.uk
Design: OPX, London, T 020 7729 6295, www.opx.co.uk
Printing: Croxsons Sheetfed, T 01494 777900, E info@croxsons.co.uk



Cover photographs courtesy of London Fire Brigade and Hereford & Worcester Fire and Rescue Authority.

Comment

Loss

The very word 'fire' for me conjures up images of pain, suffering and the anguish of loss.

Loss of friends and loss of my life as I knew it.

On an almost weekly basis I deal with the survivors of fire. I work with the surgeons who help reconstruct the outward images of these people, and with the agencies whose work it is to assist them to rebuild their lives. I help charities and agencies whose aim it is to ease the pain and suffering of the families who have been touched by the havoc and devastation fire can inflict on any one of us.

Fire safety should be a priority for us all: to protect our lives, our property and our environment. Our future as a society depends on it!

As someone whose life has been forever altered as a direct result of the catastrophic effects of fire, I feel that we must all take an active role in our own protection and that of the world around us. Please take on board the articles and advice in this fire-themed issue of *Constructing the future* if you want the future to be a safer place.

Simon Weston
OBE

Simon Weston OBE

In 1982 Simon was aboard the Sir Galahad when it was bombed by Argentine planes. The burns he suffered have required a series of operations, which continue to this day. Despite these injuries and the physical and mental suffering they have caused, Simon 's life is an example of great personal triumph and courage.

In 1988 he co-founded the charity Weston Spirit with two friends. Based on their personal life experiences, they wanted to offer inner-city youth a real alternative to exclusion, apathy, unemployment and a potential life of crime – see page 12.

Sustainable housing

Stewart Milne demonstration house
Stewart Milne Group has agreed to build an innovative demonstration house on the BRE Innovation Park, which will be launched at the OFFSITE2007 event in June.

The house will showcase the Group's future Timber Systems products and processes. 'The single biggest area of future impact on our business will be the environmental agenda driven by climate change and the Government's commitment to reduce carbon and secure the planet's resources,' says Timber Systems and Group MD Glenn Allison. 'We intend being the industry leaders that provide a platform to meet those needs and our presence on the BRE Innovation Park and at OFFSITE2007 will be the first of many initiatives we will be taking.'

For more information on OFFSITE2007 – www.offsite2007.com

PassivHaus tour over-subscribed
A recent fact-finding visit to German PassivHaus dwellings in the Hannover region proved of great interest, and in fact was unable to accommodate all who wanted to join it.

Hosted by proKlima, the regional climate protection agency, the tour included a full explanation of PassivHaus principles at a workshop on day one, with visits to a number of PassivHaus homes the following day.

'PassivHaus has been phenomenally successful in establishing construction standards for new houses in Germany,' says David Strong, Managing Director of BRE Environment, 'which result in CO_2 emissions of about a quarter of those currently mandated in other Northern European Counties. PassivHaus is based on a "whole house" approach to design. This results in extremely energy efficient new homes (which don't need a conventional central heating system) and very high standards of indoor air quality with major benefits in terms of health and comfort – including a significant reduction in childhood asthma.'

A second PassivHaus tour is likely to be organised. Contact 01923 664800, email events@bre.co.uk to be added to the list for this.

Towards zero emission refurbishment
A new project aims to help meet the challenge of refurbishing UK housing to produce energy efficient, low carbon emission homes of the future.

Nearly one third of UK carbon emissions are from housing. We can and should build new houses to rigorous energy efficiency standards, but at current rates of demolition and new build, it will take 1000 years to completely renew the UK housing stock – so most of the homes standing today will still be in use in 2050.

The challenge is to refurbish the homes of the past as homes for the future. How do homeowners, tenants, housing managers, landlords and builders decide what needs to be done and how it should be achieved? What are the costs, the paybacks, the technical constraints? How should they weigh up the environmental impacts of materials, water and energy use?

T-Zero is a 3-year project funded by the DTI Zero Emission Enterprise programme. Through consultations, reviews and case studies it will develop a suite of web-based decision-making tools and other support to help make low emission refurbishment a reality.

The project is looking for case studies in low-emission housing refurbishment – to become involved visit http://projects.bre.co.uk/t-zero

New grants for renewables

Applications for grants are now being accepted for Phase 2 of the DTI's Low Carbon Building Programme (LCPB), which will provide around £50m of grants over the next two to three years to encourage uptake of renewable energy technologies in the UK.

Phase 2 grants are available for the installation of microgeneration technologies in public sector buildings, including local authority housing, housing association properties and schools. The scheme is also open to buildings belonging to charitable bodies. Applicants can receive up to £1m of grant money for the following technologies:

- solar photovoltaic
- solar thermal hot water
- wind turbines
- ground source heat pumps
- automated wood pellet stoves
- wood fuelled boilers.

BRE has been appointed by the DTI to manage grant applications as well as provide the technical assessments and checks. The LCBP is the replacement for the DTI Clear Skies and Solar PV grant programmes. Phase 1 came into operation in April 2006, making some £28.5m of grants for microgeneration technologies available to householders and community organisations.

The LCBP is an important part of the Government's drive to reduce carbon emissions and raise awareness of available free, clean sources of energy. Announcing the launch of Phase 2 on 11 December, Trade and Industry Secretary Alistair Darling said, 'It is vital that we cut the CO_2 emissions from our buildings if we are to reach the UK's 60% reduction target by 2050. Combining energy efficiency measures with the fitting of microgeneration technologies on schools and other public sector buildings can and will make a real difference.'

The ability to sell excess electricity produced by some of these technologies back to the National Grid is another benefit of having them installed. The announcement in the Chancellor's pre-budget report that income tax on these re-sales will be scrapped, will make the technologies even more cost effective and financially appealing.

For more information on the grants and how to apply for them, visit www.lowcarbonbuildingsphase2.org.uk

New design guides

Sustainable domestic and low-rise buildings
A new guide to the design of sustainable domestic and low-rise buildings aims to help building professionals with the selection and specification of structural elements, materials and finishes.

The book covers, in a single volume, key elements of building design: site investigation and preparation, site environment and orientation, foundations and basements, walls (external and separating), windows and doors, floors and ceilings, roofs, and building services, as well as chapters on modern methods of construction and access.

It includes numerous keypoints, checklists and tables, and over 200 illustrations. Fully in line with UK regulations and standards, the guide is based on sustainable design requirements, in particular how to achieve a long life, limit maintenance requirements, reduce defects and design for the future.

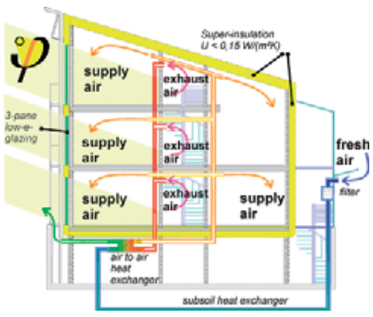
Designing quality buildings – a BRE guide, published by IHS BRE Press in January 2007, is available from www.BREBookshop.com or 01344 328038.

School design
Two companion publications (BR491 and BR492) derived from a Schools Design Forum Workshop held in September 2006, provide a stimulating and wide-ranging insight into how the built environment can play its part in making the learning environment more sustainable.

The Schools Design Forum is an initiative by the BRE Trust and the Sustainable Development Commission, to progress the aims of the Government 's Building Schools for the Future programme. The Forum brings together leading practitioners who are committed to bringing about a change in the way sustainability is understood, delivered and shared in schools.

IHS BRE Press has published a report summarising the outputs of the workshop (BR 492) along with a detailed record of the event (BR491), both of which are available from www.BREBookshop.com or 01344 328038.

PassivHaus technical sketch



How will older homes achieve modern energy efficiency?

Ground loop trench for ground source heat pump

Schools Design Forum report

Launch of Greenbooklive.com

BRE Certification is launching www.greenbooklive.com, a new source of reference information for specifiers of environmental products and services.

Greenbooklive.com is a free online database designed to help specifiers and end users identify products and services that can help to reduce environmental impact (energy, emissions, waste and water). It also provides manufacturers and suppliers with an opportunity to demonstrate their environmental credentials. Each section contains information on a specific product and technology as well as the criteria that are used to underpin the listing.

Greenbooklive.com lists products and services in areas such as microgeneration, recycled and reclaimed building products and products with an environmental profile (life cycle assessment). It also includes companies with ISO14001 'environmental management systems' certification and details of a new scheme, LPS 2060 *Approval scheme for Waste management contractors*. The intention is to significantly expand coverage to include all areas of building and building products. Companies wishing to be considered for a listing in the book should contact Malcolm Anderson at BRE Certification – 01923 664100, Email enquiries@brecertification.co.uk

Greenbooklive.com builds on the success of the Red Books which are the internationally recognised essential reference source for fire and security products and services, backed by leading insurers – visit www.redbooklive.com

LPCB launch new product standard: LPS 1276

LPCB has announced the publication of LPS 1276: *Requirements for the certification of above ground suction tanks for automatic pumps for use in automatic sprinkler system installations*.

LPS 1276 replaces LPS 1254 and has been created to accommodate the new requirements for water supplies for sprinkler systems, as specified in 12845. LPS 1276 and LPS 1254 will co-exist for 18 months from November 1 2006. Manufacturers are invited to apply to be re-assessed to LPS 1276. At the end of this period, LPS 1254 approvals and listings to this standard will be withdrawn.

LPS 1276 together with all LPCB standards are available to download for FREE at www.redbooklive.com.

For more information on LPS 1276 – Simon Bird, birds@bre.co.uk

Expanded fire test facilities

To meet the ever increasing demand for testing and approval of external wall insulation and curtain walling systems, BRE Certification has invested over £100,000 in expanding its test facilities.

Furthermore, in order to meet market demand for certification schemes to cover fire performance of composite systems, BRE Certification has also launched a new scheme as part of the LPS 1181 series of fire growth tests for approval of construction product systems. LPS 1181 Part 4 covers systems tested to BS 8414 –1:2002 (masonry backed systems), with a part 5 scheme in preparation to cover BS 8414 –2: 2005 (lightweight structural frames).

For more information – Email enquiries@brecertification.co.uk

UK GBC calls for a radical transformation

At the inaugural meeting of the not-for-profit UK Green Building Council (UK GBC), Founding Members called for the organisation to act as the UK champion for sustainable buildings, and to bring about a transformation of the market for sustainable products.

'There are hundreds of individuals, businesses and groups in this country that are already working to reduce the environmental impact of buildings. But if we are serious about improving the way we design, deliver and manage our buildings, we need to join together to pool our skills, energy and resources. That is the only way we will be able to drive forward the step change in performance that is so urgently needed.' says Patrick Bellew of Atelier Ten.

'We have seen what has happened in America since the US GBC was formed in 1995,' says David Strong, Managing Director of BRE Environment. 'This shows that even a difficult market can be transformed by creating a green building movement. The US GBC has nearly 7000 member organisations with 91,000 individuals actively involved. 12,000 delegates attended the 2006, GreenBuild conference and 500 companies exhibited their products. In a handful of years the States has built a market that is thriving and an industry that is delivering demonstrably more sustainable buildings and construction products.'

The UK GBC will offer different categories of membership so that it can engage the many existing groups with an interest in sustainability. It will encourage the professional institutions, trade associations and specialist interest groups to participate in its committees and expert panels. Initially, four sub-groups will be established to provide input and support associated with: advocacy, marketing, technical issues, and education, training, best practice dissemination and research.

Peter Rogers, Chairman of the UK GBC Interim Board, sees this inclusive approach as key. 'The UK GBC will stimulate the demand for sustainable construction in the UK and ensure that the whole of the supply chain – designers, contractors and product manufacturers – will respond to new market opportunities,' he says.

The UK GBC is a unique voice for the built environment community. A Chairman is being sought and the process of recruiting a Chief Executive has started. Founding Members, now over 30 in number, have pledged £30,000 each over the first two years and this start-up funding of over £1 million will enable the Council to become fully established.

Those interested in becoming UK GBC members, can register their interest at www.ukgbc.org/membership. A launch event for the Council takes place at Ecobuild on 28 February. All registering an interest in membership will receive an invitation to this event. The UK GBG secretariat can also be contacted by emailing secretariat@ukgbc.org.

UK Green Building Council
for a sustainable built environment

Code for Sustainable Homes welcomed

Sustainability experts at BRE have welcomed the launch in December of the Code for Sustainable Homes. The new Code, which is an important tool in the Government's plan to minimise the environmental damage caused by new developments, will ensure that all new homes in England have sustainability designed in, right from the start. It means that the UK will continue to lead the world in setting standards for the design, construction and management of sustainable buildings.

The Code for Sustainable Homes (CSH) is based on EcoHomes, with BRE and (D)CLG having worked closely together to ensure the new assessment method meets the latest regulatory requirements and addresses the issues that emerged from an earlier industry-wide consultation.

The Code will replace EcoHomes for new homes in England from 1 April 2007, and will run as a fully functional scheme with a network of Licensed Assessors ready to provide Code certification from Spring next year.

'This move clearly demonstrates the Government's intention to tackle the environmental impacts of new construction,' says BRE Chief Executive Martin Wyatt. 'BRE is delighted that its EcoHomes system has been used as the basis of the Government's new Code, and we are sure that the existing assessor network of UKAS accredited competent people will rise to the challenge of delivering the Code.'

Many house builders currently using EcoHomes will find the Code very familiar, but there are some differences, the main one being new mandatory levels of performance across six key areas – energy efficiency, water efficiency, surface water management, site waste management, household waste management, and use of materials.

Under the Code compliance should be reviewed at the design stage, and final certification carried out upon completion of construction (under EcoHomes most homes are certified at the design stage). New points for Lifetime Homes, Security and Zero Carbon Technologies have been added and only the EcoHomes transport credits have been omitted.

A number of free events will be held to explain the Code. Details of these can be found at www.bre.co.uk/events.

EcoHomes and EcoHomes XB will continue to be used to assess refurbished and existing homes in England, and new homes in Scotland and Wales where the Code does not apply. All of the BREEAM schemes for non-domestic buildings will be updated and launched in early summer as usual.

For more information – visit www.planningportal.gov.uk, email csh@bre.co.uk

School of the future

A representative segment of a school of the future is being designed and built for the OFFSITE2007 exhibition at the BRE Innovation Park. Re-Thinking – a specialist consultancy from Willmott Dixon – and its partners, which include White Design and Max Fordham, will use the building to demonstrate all of the principles that would be incorporated into a full-size school.

Sustainability is at the core of the school's design, using materials chosen not only for their low environmental impact, low maintenance and aesthetic quality, but also with future recycling in mind. Built out of the latest in modern methods of construction (MMC), this project will prove that MMC can be materially sustainable and low in embodied energy, as well as cost effective and beautiful.

Solid wood construction technology from Eurban – made from cross-plied off-cuts that would otherwise be regarded as waste – will be extensively used. The building arrives on site 'flat packed' with even the electric runs pre-routed. This system dramatically reduces on-site construction time and costs and gives an earlier return on investment while increasing build quality.

The Eurban method has great flexibility, for example it omits roof trusses or other projections that would normally inhibit expansion of the school. In addition, the planning of all service and environmental control areas into one zone allows greater flexibility and manipulation in teaching areas to suit individual needs.

Lighting to the rear of the classrooms will be supplied through a combined natural ventilation and daylighting 'chimney', which will bring light down from roof level and demonstrate that ground-floor classrooms can be daylit even in a three-storey school.

The building will act as an interactive teaching and learning tool. Its occupants will experience the building 'breathe' as the windows and blinds open and close, regulating its internal environment automatically. The children will be able to quantify the energy needed to power the school through an interactive control panel, and the rainwater harvesting pipe and other services will be exposed.

To combat dehydration in children, a recognised problem brought on by poorly designed toilet facilities, this school will feature volumetric toilet pods, as used in the hotel industry. These allow flexible design options such as placement within classrooms for primary schools, and provide high quality, robust, fun and easy to clean facilities.

For more information – Jaya Skandamoorthy, 01923 664582, Email skandamoorthyj@bre.co.uk

Standing up to earthquake and fire

Tests are being carried out on newly developed connections between the beams and columns of buildings, which have been designed to help buildings withstand earthquakes and resulting fires.

Earthquake tremors set buildings in motion (swaying) because the ground underneath them moves in many directions. This can cause failures in the building structure, resulting in death and injury, serious structural damage and even collapse. To counter this, many buildings are now being designed to survive earthquake tremors, primarily to prevent loss of life.

Large-scale experiments on two types of ductile and fire resistant composite beam-to-column connections are now being conducted. These connections have been developed through a collaborative European research project, funded by the Research Fund for Coal and Steel, in which the UK project partner has been BRE.

The first stage of experiments involves simulating the effects of an earthquake using an equivalent static load. The value of the applied load and subsequent deformation and rotation of the connection, has been derived from dynamic tests carried out on similar test specimens by research partners from the Universities of Trento and Pisa.

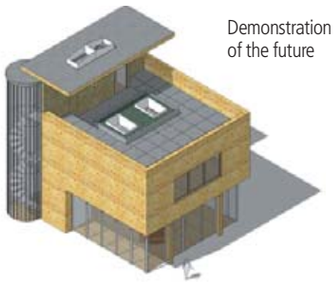
The damaged test specimens are then fire tested using a purpose built connection furnace. The specimens are required to maintain load bearing capacity for a period of exposure equivalent to 15 minutes in a standard fire test.

To date, static and fire testing of 'Type 1' specimens has been completed. These consist of a partially reinforced concrete-encased column connected to section beams acting compositely with a concrete floor slab using either a profiled steel sheet or a prefabricated slab as permanent formwork to the in-situ concrete slab.

The results of this work, which is supported by the BRE Trust, have so far been encouraging – suggesting that the connections have sufficient inherent fire resistance to survive the design seismic load followed by a fire. The next part of the project will see BRE conducting experiments on 'Type 2' specimens formed using a concrete filled circular hollow section column welded to the supporting beams.

The work is expected to be completed by summer 2007, and the final report will indicate whether these types of connections can really stand up to the combined effects of earthquake and fire.

For more information – Tom Lennon, 01923 664573, lennont@bre.co.uk



Demonstration school of the future

In brief

BRE Ireland announced

BRE and partners, the University of Limerick (UL) and Limerick Institute of Technology (LIT), have announced the creation of BRE Ireland. This collaboration aims to establish a new, independent, authoritative Irish body that will set the standard for sustainability, innovation and enterprise in Irish construction. Launch events are being held on 21 February 2007 in Limerick and 1 March 2007 in Dublin.

For more information – mckeownl@bre.co.uk

CoRE

Construction, civil engineering, maintenance, housebuilding and refurbishment contractors in London, the South East and East of England are benefiting from the CoRE construction resource efficiency project. CoRE is offering free licences for BRE's SMARTStart waste monitoring software, which companies can use to generate waste performance indicators, demonstrate efficiency improvements and earn credits for the BREEAM, EcoHomes and CEEQUAL environment rating schemes. As well as saving resources and money, CoRE is a way of 'getting ahead of the game, in the run-up to the introduction of mandatory Site Waste Management Plans in 2007, according to Matthew Hampshire of Defra's Waste Management Unit.

For more information – www.smartwaste.co.uk/core.jsp

Energy efficient building components

BRE and partners from around Europe are collaborating on a project to encourage the use of energy efficient construction products and a greater awareness of environmental labelling. As part of this work a number of UK GREEN-IT workshops are being held, the next of which will be at BRE Watford on 16 February 2007.

For more information – www.bre.co.uk/events, tel 01923 664800, email events@bre.co.uk

BRE Scotland Annual Conference

BRE Scotland's third Annual Conference at the newly refurbished City Halls in Glasgow on 26 October attracted a wide range of delegates from government, research and educational establishments and the construction industry.

Speakers in a programme that was commended for its relevance to today's issues, included:

- Sebastian Toombs, Chief Executive of Architecture and Design Scotland (A&DS) and the Conference chairman, who demonstrated the need to consider not just the physicality of buildings but also the well-being of the people who live in them.
- Bob Laverty, Chief Executive of Raploch Urban Regeneration Company (RURC), who gave an overview of the importance of community engagement in the regeneration of the previously socially, economically and environmentally degenerated Raploch area in Stirling.
- Donald Canavan, the Project Director, Keppie Design on Scottish Natural Heritage's (SNH) new Headquarters at Inverness, who described how SNH had wanted the building to create an environment that reflected the benefits of a sustainable community.
- James Fisher and John d'Este-Hoare of BRE, who describe the Sustainable Development Checklist tool that has been developed by BRE.

All of these presentations are available at www.bre.co.uk/service.jsp?id=830

FIRE SAFETY

Fire at the Buncefield Depot oil storage facility near Hemel Hempstead in December 2005 (Photograph courtesy of the Royal Chiltern Air Support Unit)

FIRE AS A SUSTAINABILITY ISSUE

It is time that fire was much more widely recognised as a key sustainability issue argues Martin Shipp**.**

While the issue of sustainability is driving the agenda of many organisations, particularly government departments, fire safety and protection is not yet appearing on these agenda. But fire is a key sustainability issue, both in its own right and as a secondary issue in new sustainable technologies and materials.

Fire as a primary sustainability issue

Pollution

The environmental impact of fires is well established, although it is not clear whether any detailed (quantified) studies have been carried out. Fires produce carbon dioxide (CO_2) and other pollutants (H_2S, NO_x, SO_2, etc). Forest fires, for example in Indonesia, are a major source of CO_2 and other pollutants, and it is estimated that fires in coal mines in China are contributing as much CO_2 to the atmosphere each year as all the road vehicles in the USA. The fire that followed last year's explosions at Buncefield in Hertfordshire produced so much smoke that homes shadowed by the smoke plume remained frosty for the whole of the following (sunny) day.

The smoke produced from burning PVC can be highly toxic and the presence of dioxins in fire residues has been long recognised. Some fire retardants (PCBs) have been identified as being significantly damaging to the environment. This risk needs to be assessed against the environmental damage from a fire.

The contamination of the water table and rivers by water used in fire fighting has been recognised as a problem for many years, but is now subject to a protocol between the Environment Agency and the Fire Service. In some instances, such as tyre dump fires, where there are risks of run-off pollution to rivers or the water table, it may be best to leave the fire burning – but then large quantities of CO_2 and other toxic gasses pollute the atmosphere.

In addition, the damage caused to a building by a fire can result in the exposure or distribution of hazardous materials, notably asbestos or other toxic chemicals or agents.

Quality of life

The need to protect against death or injury from fire might be expected to be as significant an issue – with regards to quality of life – as that of security. About 900 people are murdered each year in the UK, most by a family member or friend, while around 700 die in fires each year, many as a result of arson. The physical and emotional injuries from fire may require long-term medical care, and can severely affect the victim's quality of life and that of their family.

In addition to being traumatic, fire in the home can destroy irreplaceable possessions as well as other material goods. Home owners are often not insured against such losses, despite their impact on family life, finances and children's education.

Businesses and communities

Many businesses that have a fire never re-open. As well as the immediate loss of business, there may be irrecoverable long-term loss of business as previously loyal clients find alternative suppliers. Fires at some premises – sports centres, schools, theatres or shopping centres for example – can affect the whole community. Local inhabitants may have to travel to alternative, more distant venues, and social structures (especially in schools) may be disrupted.

The direct losses to business and the community from fire are very significant – the total cost of fire in England and Wales in 2004 has been estimated at £7.03bn. Of this £2.52bn are attributed to the consequences of fire (including criminal justice costs), the others are those 'in anticipation of fire', for example the fire service. Direct losses include building fabric, equipment (eg machinery) and contents, as well as the immediate loss of business.

As well as the direct losses from fire, consequential losses can be even greater. These can include long-term loss of client confidence, loss of clients to competitors, the costs of transport (for both staff and clients) and health service costs and legal fees.

Fire as a secondary sustainability issue

New technologies

There is a need to monitor the fire safety implications of new sustainable technologies and materials, because sustainable energy sources may themselves produce fire risks. There have been a number of fires involving wind farms and there are likely to be related fire issues with other new power-generating technology. Photovoltaic cells and other electronic control equipment contain substances that can be very harmful when exposed in a fire, and new, secondary 'transportable' fuels (such as LPG, Hydrogen and Biogas) have associated fire risks that need to be monitored and are already the subject of research.

On the upside, if there is less energy being used or dissipated, or less equipment left on stand-by, there is a lower fire risk.

Thermal insulation

It is generally recognised that increased thermal insulation will result in shorter times to flash-over, but this is not an issue that has been fully researched and its effect on injuries and fire deaths is unknown. Polymeric insulation materials often result in easier ignition, faster fire growth, and greater (and more toxic) quantities of smoke and toxic gases.

Sandwich panels are popular because of their very good thermal performance but the fire problems associated with certain types of panel, involving combustible cores, are well known and well publicised. Similarly, partially filled wall cavities are often filled with combustible PU foam – fire stopping is essential but often neglected. Cladding systems including polymeric materials are being added to existing buildings to improve thermal performance (energy efficiency). There have been some well known incidents involving cladding of this type with substantial fire damage and potential for injury, but there do not appear to have been any deaths or injuries as a result.

Ventilation

There have been a number of fires involving ventilation extract fans, for example from enclosed bathrooms. Mechanical extract systems are an ignition risk unless properly maintained (and kept cool). There are also potential fire-spread risks associated with insulation around ventilation ducting. Fatal fires have also resulted from faulty wiring and over-heating of cables and ventilation appliances in which the use of inappropriate insulation was a factor.

Perhaps of greater importance is the risk of ventilation systems spreading smoke beyond compartment boundaries, or providing extra air for a fire if the system does not shut down.

New materials

The increased use of polymeric materials generally, for insulation or soundproofing, results in easier ignition, faster fire growth, and greater (and more toxic) quantities of smoke and toxic gases. There are concerns regarding the increased use of highly combustible recycled, non-conventional and non-traditional materials – such as rubber tyres, bales of hay or straw – where again fire safety implications do not appear to be fully formed. New materials, new designs or new criteria to respond to global warming need to be similarly monitored. New exotic sustainable materials may contain substances that are directly hazardous to health when exposed to fire, or contaminate the water table or rivers. There can be a release of heavy metals from electronics in fire.

In the drive to meet Approved Document L requirements, lightweight construction methods appear to be gaining in popularity. Many of these involve combustible materials, such as timber, or slender structural members which readily collapse in a fire. Panels frequently warp when heated leading to effects such as delamination, increased exposure to oxygen and (particularly where combustible fills are used) to greater fire growth and spread. Improvements to fire stopping, fixings and compartmentation are being researched.

The introduction of new sustainable materials and products may result in more complex, technical buildings, with consequently greater financial losses if a fire occurs. However, some new technologies and smart materials offer opportunities for more rapid detection and more limited fire spread, with reduced financial losses.

Conclusions

Fire is an extremely destructive force that can devastate the environment, people, property and buildings, and its effects can continue for years after the event. There is little doubt that we all need to do everything we can to prevent fire and protect our families and businesses. Legislation goes some way to preventing fire and protecting us from the effects. However the use of approved products that have been certified to recognised schemes run by BRE Certification not only give confidence that they are compliant with national legislation but that they go above and beyond those requirements in many cases.

BRE's research and testing of new technologies together with its dynamic approach to certifying environmentally friendly and innovative products gives a great platform for producers and users to achieve the re-assurances they seek on the performance of their products. BRE Certification's schemes can cover all aspects of the product from component and systems approval through to the installation and maintenance, for both environmental and operational performance.

The current Regulatory Reform (Fire Safety) Order requires businesses to make sure that a rigorous risk assessment has been conducted to ensure the safety of the occupants and users of their buildings. The use of certified products can significantly ease this process.

In providing a safer and more fire-free environment we are also going a long way to achieving a more sustainable environment.

For more information – 01923 664100,
Email shippm@bre.co.uk

Martin Shipp is BRE's Technical Director in the field of fire safety.

HEALTHCARE FIRE SAFETY

With a £10 billion healthcare facility construction programme currently in progress, fire safety is one of the most demanding design considerations – David Charters **explains.**

Not only is the NHS believed to be the third largest employer in the world – after the Chinese Army and the Indian Railways – it also treats over a million people each year. The days when hospitals were 'hotels for the marginally unwell' are long gone and most patients are now highly dependent on staff for their well-being and safety. In spite of this high dependency, hospitals are roughly seven times safer than hotels when it comes to fire safety.

The provision of healthcare has evolved over the centuries, but rarely, if ever, has the rate of change been so rapid. The dynamics behind this are many and varied, and include:
- increased demand
- new treatments
- finite financial resources.

Key to the changes are the 'NHS Plan' and a £10bn construction programme of new healthcare facilities. There are about 6,000 fires a year in NHS premises and fire safety is one of the most demanding design considerations. Guidance for fire safety in healthcare premises is provided by FIRECODE which is in the process of being revised (see table). FIRECODE is supported by the Department of Health's National Fire Policy Advisory Group (NFPAG).

Fire safety engineering

FIRECODE provides guidance on every aspect of healthcare fire safety from design to management. For the design of new buildings, FIRECODE allows alternative fire solutions using fire safety engineering. Fire safety engineering tends to be used when:
- the design of the healthcare premises is complex or innovative
- existing codes restrict design flexibility
- issues beyond life safety need to be considered
- the code compliant solution is unnecessarily costly.

Following the widespread use of fire safety engineering in other building sectors, this approach is now more generally employed in healthcare projects. The unique nature of healthcare premises means that there are both potential benefits and pitfalls when using fire safety engineering.

In healthcare premises, fire safety engineering tends to be used on buildings that comprise:

new hospitals that include:
- non-standard layouts
- large developments, and/or
- atria

non-standard healthcare buildings, such as:
- university hospitals
- ambulatory care and diagnostic
- diagnostic and treatment centres

existing hospitals where compliance with the prescriptive guidance in FIRECODE is not possible or overly costly, such as:
- high rise hospitals
- hospitals on restricted sites.

To support the application of fire safety engineering, BRE provides alternative fire safety solutions to NHS Trusts, third party review of fire strategies for PFI projects and complex fire analysis such as Computational Fluid Dynamics (CFD). In addition, on behalf of the Department of Health, BRE is now drafting guidance on fire safety engineering in healthcare premises.

Evacuation

Fire safety in healthcare premises cannot normally be based on the immediate and total evacuation of the building as practiced in other occupancies. Patients and residents with restricted mobility or who are bed-bound cannot readily negotiate escape routes. This means that one of the analytical methods that healthcare fire engineering is not yet benefiting from, is that of evacuation.

Evacuation methods that have been developed for other building types are not applicable to many healthcare premises and what information is available tends to be dated and derived from a small sample of experiments. A deeper and more quantified understanding of patient evacuation will help to realise further benefits in the form of revised guidance and the application of fire engineering. This is now the subject of a BRE Trust research project which will report this year.

New Fire Safety Order

The NHS and other healthcare providers are now also coming to terms with the new Fire Safety Order which came into effect on 1 October 2006. The previous method of fire risk assessment is now replaced by a more general fire risk assessment method using a five-step process (see page 11). The healthcare guidance in support of the Fire Safety Order was drafted for the Department of Health/Department of Communities and Local Government by BRE. BRE also organised a range of road-shows on the Fire Safety Order, and provides training courses on fire risk assessment, fire safety design and fire safety management in healthcare premises.

Care homes

Of course, fire safety is not just a vital healthcare issue in hospital buildings. On 31 January 2004, a fire at the Rosepark Care Home caused the deaths of 14 elderly residents. This fire is still subject to legal process and BRE has played a major role in investigating the incident through reconstructions of the fire, fire modelling and a review of fire safety management. The fire is likely to be subject of a Public Inquiry and has already led to changes to fire safety in residential care premises.

For further information – 01923 664100, email chartersd@bre.co.uk

Dave Charters is Director of Fire Engineering at BRE.

New title	Replaces
HTM 05	
01 Managing healthcare fire safety	Policy & principles
02 Guidance in Support of Functional Provisions	HTM 81 Firecode: fire precautions in new hospitals HTM 85 Fire precautions in existing hospitals Nucleus fire precautions recommendations
03 Operational provision	
Part A Fire engineering provisions and General fire precautions	HTM 83 Fire safety in healthcare premises – general fire precautions
Part B Alarm and detection systems	HTM 82 Alarm and detection systems
Part C Textiles & furnishings	HTM 87 Textiles and furniture
Part D Commercial enterprise	FPN 5 Commercial enterprises on hospital premises
Part E Escape bed lifts	FPN 3 Escape bed lifts
Part F Arson	FPN 6 Arson prevention and control in NHS healthcare premises
Part G Laboratories	FPN 10 Laboratories on hospital premises
Part H Reducing unwanted fire calls	FPN 11 Reducing unwanted fire signals in healthcare premises
Part L Fire statistics	FPN 9 NHS healthcare fire statistics 1994/95

New Firecode HTM 05 suite (2006) Publications in new series will be released within the next year

FIRE SAFETY IN TRANSPORT

New European directives are likely to change the design and operation of railway rolling stock throughout Europe over the next few years, as Sarah Colwell **reports.**

The recently published Stern Report outlined the Government's wish to see a 60% reduction in CO_2 emissions by 2050. If this target is to be achieved, we will all have to look at a range of both simple and, in some cases, radical changes to the way we live and conduct our businesses. A key area that contributes to CO_2 emission levels and also strongly influences our general quality of life, is the way we travel.

Transport methods have changed significantly in recent years with increasing levels of air travel and private car ownership. Our desire to reduce the impact of this on the environment is leading to a number of changes in the way transport solutions are now presented.

Increasingly, innovations in material technology and energy sources are being employed in the transport sector to improve sustainability and reduce environmental impact. This has led to a greater emphasis on the use of mass transit systems. However, of overriding concern in the design of all mass transit solutions – be it infrastructure in the form of road or rail networks, or the design of passenger cabins in railway rolling stock or aircraft – is safety. Of particular concern, both for the safety of passengers and environmental impact, is the threat posed by fire, either accidental or by deliberate ignition.

The introduction of the two European interoperability directives for railways, one for high-speed trains and the other for conventional applications, means that the traditional approach to the design and operation of rolling stock throughout Europe is likely to undergo major change over the next few years. This, it is hoped, will provide equal opportunities for suppliers and operators in this market.

These directives are being implemented through a series of seven CEN Technical Standards (currently at draft standard stage prCEN/TS 45545 series) which may replace national standards and codes of practice when they are eventually published as full standards. In the UK this would be BS 6853 – *Code of practice for fire precautions in the design and construction of passenger carrying trains*. The CEN documents cover the range of fire safety related issues from management of the system to the fire performance specifications and test methods.

The importance of fire safety in the rail sector in the UK has been demonstrated by several major incidents, including the King's Cross underground fire in November 1987 in which 27 people died, and the Ladbroke Grove rail incident in October 1999 where thirty-one people lost their lives. In addition, the fire in the Channel Tunnel in 1996 resulted in significant losses due to business interruption, although fortunately no lives were lost. BRE has undertaken work for the Channel Tunnel Safety Authority, including design reviews, standard setting, testing and commissioning reviews.

With the introduction of the new CEN standards, the fire performance test methods and categories of performance used for the various products will be very different from those we currently recognise in the UK market. Therefore many of the suppliers of equipment to the railway industry are already beginning to look at these new standards to ensure they are aware of the potential implications for their business if they should become widely adopted in the future.

Information on standards, together with lists of approved products and services, can be accessed free of charge at www.RedBookLive.com

For more information – 01923 664100, email colwells@bre.co.uk

Sarah Colwell is a Principal Technician at BRE.

FIRE SPREAD IN CAR PARKS

A current research project aims to provide the latest information on fires involving cars in car parks, so that fire safety guidance can be reviewed and, where necessary, updated. Martin Shipp **reports.**

A fire recently broke out in a car park beneath an apartment building in France. It destroyed a dozen cars, and more were damaged when the ceiling collapsed. Fortunately nobody was hurt but seventy people were evacuated from the building and were not allowed to enter their apartments for some time due to the smoke damage.

Although fires in car parks are rare and there have been few deaths or injuries recorded to date in the UK, there are concerns regarding new and emerging risks from modern cars and alternative fuels.

Up-to-date information needed

There is a need to gather up-to-date information on fires involving cars in car parks so that the current fire safety guidance can be reviewed and, where necessary, updated. The Department for Communities and Local Government – (D)CLG, Sustainable Buildings Division has therefore commissioned BRE to carry out a project titled *Fire spread in car parks*.

The basis for the existing guidance in Approved Document B (AD B) for fire safety strategies in car parks relates to fire initiation and fire growth, involving cars that were designed decades ago. There is increasing concern about the consequences of fires in car parks associated with modern car design (eg plastic fuel tanks), and how these fires may spread to other vehicles parked nearby. This concern has recently been heightened by the entry into the market place of cars powered by alternative fuels such as LPG.

It is essential that the Building Regulations (via AD B) are able to offer the best practicable and proportional guidance for the fire safety and fire protection of buildings that are above, or contain, enclosed car parks. The overall aim of the (D)CLG project is to gather information on the nature of fires involving current car design, and use this new knowledge as a basis – where necessary – for updating current guidance in AD B (and possibly AD A – *Structure*) on fire safety strategies for car parks. There may be other issues relating to AD B, particularly B4 – *External fire spread* – and AD A, should the use of alternative fuels lead to an increased risk of explosion.

Project work

The project work involves a desk study to gather relevant information, and review statistics and literature on all relevant issues, followed by a workshop, computational modelling and full-scale experimental studies. The project is being advised throughout by a group of stakeholders.

While this work is necessarily focusing on concrete structures, because concrete is the most widely used material, it will include all other forms of construction such as steel frame, brick/block and timber. The project will report on any other relevant issues that are identified in the course of the work, such as the implications for Part A in the context of accidental loadings.

The review will encompass all aspects of fire safety in car parks, and include case studies of actual incidents, fire safety strategies, European and/or international experience, the effectiveness of detection and ventilation provisions in car parks, the effectiveness of sprinklers, and fire fighting issues.

The analysis will examine the findings from all of the tasks with the aim of establishing the:

- severity of car fires in modern car design, the potential for fire spread and fire sizes, and benchmarks for car fire size given a range of vehicle types
- combustion products produced by such fires, and the likely survivability
- potential hazards arising from fuel leakage/spillage in unventilated/underground/enclosed car parks
- additional hazards arising from cars designed to use alternative fuel(s), the potential explosion effects of cars powered by alternative fuels, and other risks of cars powered by hybrid systems – eg using a diesel or petrol engine as a primary power supply, combined with a secondary power supply using batteries
- need or otherwise for different considerations for underground, enclosed and open-sided car parks.

Proposals will be made for what new or revised guidance might be appropriate, including for AD B, AD A, and BS 7346 -7; 2004 (*Components for smoke and heat control systems – Part 7: Code of practice on functional recommendations and calculation methods for smoke and heat control systems for covered parking areas for cars*).

As well as informing (D)CLG of any changes needed to current guidance, the findings will also provide a knowledge-base for fire safety engineering solutions in car park design. It is hoped that this important project will make a significant contribution to the safety of car parks in the future.

Contact us

We would be interested in hearing from anyone with case studies or information with regards to the design of cars and trends in design, including dimensions, fuels and internal/external materials etc.

Also of interest is any information regarding the design of enclosed car parks and trends in design, including the various (non-fire) issues that have to be considered in car park design. Please send any comments to shippm@bre.co.uk or call 01923 664100.

Martin Shipp is BRE's Technical Director in the field of fire safety.

Photograph courtesy of London Fire Brigade

FIRE IN SCHOOLS

Fire is a major problem in schools, but much can be done to minimise the risks as Steve Seaber **explains.**

Each year there are some 1300 school fires in England and Wales costing around £75,000,000. It is estimated that about 100,000 pupils are likely to be affected by large school fires. Historically most school fires have occurred outside of school hours, but an increasing number are now taking place during the school day which creates a greater risk to life.

Whilst the often significant direct losses in terms of buildings and equipment are easily quantified, the consequential impact of a school fire can be more serious and long lasting. These include the:

- loss of student's coursework
- loss of teaching material
- psychological impact on students and staff
- disruption caused by temporary accommodation or even transfer to alternative sites
- local loss of community facilities.

How and where they start

Fires can potentially break out in a wide variety of locations in a school, and whilst many are accidental, arson presents a particular risk in schools with over 60% being started deliberately. This figure is much higher in some areas of the country. Two thirds of these arson attacks occur outside of school hours, the majority of these occur within the school holidays or at weekends. However, the number of daytime fires is increasing and these mostly occur during the lunch break or immediately after the end of school.

The most recent fire statistics indicate that daytime fires in schools break out most commonly in the following areas:

- unsupervised stock and store rooms
- concealed areas and alcoves
- cloakrooms
- toilet blocks.

Evidence suggests that arson attacks often follow a series of other events and fits in to a pattern of other anti-social behaviour. This often starts with incidents of graffiti and minor criminal damage and vandalism attacks in the school grounds. Over a period of time there are occurrences of more serious damage to the external structure and then forced entry, vandalism and theft. The final stage in this is the setting of large fires inside the school building.

Minimising the arson threat

Schools can reduce the threat from arson by preventing unauthorised access to their premises. During school hours this means a level of control over where people can enter the premises and a requirement for visitors to check in. Some schools require pupils entering the school outside of the normal start time to register at reception.

At night the threat can be minimised by having a close-down procedure that secures the premises and ensures that no combustible materials are left outside. Security lighting can also help to reduce the potential for an arson attack.

Curriculum material has been developed to help raise pupils' awareness of the damage deliberate and other fires can cause, and the potential for loss of life. This material is made available by local fire authorities. As well as making pupils more fire safety conscious at school, it can improve their awareness of the hazards of fire, and the actions to take, in the home.

During school hours the likelihood of a fire starting and being unnoticed by staff or pupils is relatively low. An important exception to this might be a store room containing a large amount of stock in which a fire could go unnoticed until it is large enough to take hold and spread. Automatic fire detection systems should be considered for such areas particularly where escape routes may be affected.

Fires can also develop rapidly in science laboratories, food technology classrooms and workshops due to the use and storage of flammable liquids combined with hot processes.

There are also some seasonal hazards in schools – for example, displays of pupils' work or scenery for school plays can increase the fire loading in the building. It is important that such materials are not placed on escape routes, but if it is it should be treated with proprietary fire retardant.

In the event of a fire

The design of schools takes account of the need to prevent fire growth and uses passive fire protection and compartmentation. Fire compartmentation is a barrier, such as a wall, which prevents the fire spreading to other parts of the school (eg adjoining rooms or floors).

This form of fire protection relies on the integrity of the walls, floors, ceilings and closed doors, which are built into the design of a school, or barriers and shutters that are activated in the event of a fire. Fire doors are only effective if they are fully closed and maintained to give a good fit. For these to remain effective throughout the life of a school it is essential that there are good fire safety management and maintenance regimes. If the doors are of poor fit, warped or damaged in some other way, they must be repaired or replaced.

When a fire does occur in a school, the immediate behaviour and action of staff, pupils and visitors is vital in ensuring that people are able to escape quickly and safely. The size and complexity of the school will determine the type of fire alarm that is required. In larger schools automatic detection may be fitted. A number of Local Education Authorities and PFI providers are now fitting sprinkler systems, primarily for property protection where arson is considered to be a threat. This policy is encouraged by some insurance companies providing cover for schools and local authorities.

An effective evacuation is dependent on staff understanding the procedure to be followed and for pupils and staff to rehearse the fire drill on a regular basis.

It does, however, have to be led and monitored by the 'responsible person' (often the head teacher).

Fire risk assessment

In October 2006 the Regulatory Reform (Fire Safety) Order came into force, requiring those responsible for premises, including schools, to carry out fire risk assessments, and to take action to minimise the fire risk and put in place an emergency plan should one occur.

Where the school facilities are used by community groups or hired out at nights and weekends, the risk assessment needs to take account of these users, who also need to fully understand the security and fire safety arrangements.

Advice available

For those managing existing schools, advice is provided in the *Guidance document for education premises* available from www.communities.gov.uk. This is one of a series of guides written by BRE for (D)CLG to assist those responsible for complying with the RRFSO.

Advice for those planning new schools or extensions to existing schools is provided in the Loss Prevention Council Design Guide that has been developed to minimise property damage and help business continuity in the event of a fire. See www.brebookshop.com for details of the guide. The DFES guidance document for new schools, BB100: *Designing and managing against the risk of fire in schools*, due to be published in 2007, will also assist with such projects.

Information on standards and approved products and services suitable for use in schools can also be found at www.RedBookLive.com.

Steven Seaber is a BRE Associate.

WIRELESS FIRE DETECTION SYSTEMS

Wireless fire detection systems now offering a reliable alternative to traditional systems can have many advantages, as Harbinder Bharj **explains.**

Fire detection systems installed in buildings have traditionally been 'hardwired', ie they use cables to physically connect various fire sensors, system components and control panels. These have proven to be very robust and reliable. More recently, radio linked or 'wireless' fire detection systems have offered a credible alternative, with comparable performance and features to those of conventional hardwired systems.

In the UK, wireless fire detection and security system solutions have been around for more than 15 years. Since those early days the technology has advanced considerably with systems growing ever more sophisticated and reliable. Many of the major fire detection system manufacturers are now developing, selling and supporting wireless products.

When building a fire protection system the designer can choose from a wide variety of wireless fire detection components, similar to those offered by conventional hardwired systems. These include control and repeater panels, smoke and toxic gas sensors, heat detectors, manual call points and sounders.

A wireless system can vary from the very simple, containing one control panel and a few sensors covering a building, to a fully networked system of many control panels and several thousand smoke detectors, spanning a site of many buildings. They can also be integrated and mixed with existing hardwired systems.

All these factors combined have resulted in greater confidence and acceptance of wireless systems for use in fire protection.

Operational frequencies

Wireless fire detection components operate using integrated, low power, short range radio devices for transmitting and receiving either unidirectional or bidirectional communications.

In Europe they operate principally within the licence free harmonised frequency bands of 433 MHz and 868 MHz. Other operating frequencies are in use in the rest of the world, with some overlaps around the 433 MHz band. So, with careful consideration manufacturers can design products to operate globally.

Advantages

Wireless fire detection systems have a number of advantages making them a preferable alternative to hardwired systems:

- ease of installation – since wires are not involved, installations can be normally carried out in a fraction of the time
- substantial cost savings from reduced installation and commissioning time, and the lack of a need for expensive fire rated cables
- minimum disruption to business operations, which may otherwise be compromised during installation works for hardwired systems
- they are ideal for retrofitting fire detection systems in buildings
- the structural fabric of the building is protected and undamaged, as boring, drilling, cable trays and conduits are eliminated – so building refurbishment costs are reduced or negligible
- wireless systems are very flexible and can be easily moved or upgraded as the building use changes
- system installations are scalable in line with building fire protection demands
- system installations are easier to maintain and reconfigure
- wireless systems can be linked to the existing hardwired fire detection systems through interfacing gateways, or with electronic security and building management systems.

Disadvantages

Wireless systems may be prone to interference problems in areas with a high level of radio frequency signals or 'electronic smog'. Manufacturers have started addressing this with improved radio receiver designs, or by using new signal modulation and transmission methods.

Most wireless system components will be battery powered and the batteries will need replacing at some point. This can be an arduous and disruptive task for a complex system.

With a conventional system removal of a system component (eg smoke sensor) from its mounting location will generate a fault warning at the control panel. This may not be the case in wireless systems, as the panel will be monitoring the component rather than its location. This may impact on the area protected against fire if the component is moved from its intended location. Some manufactures have introduced tamperproof functions on the wireless components to overcome this.

Radio signals may be attenuated or completely blocked in large concrete buildings or metallic structures, or when structural changes are made on buildings. These can normally be overcome with careful radio profiling of the environment and judicious placement of wireless components.

Typical applications

Wireless fire detection systems are suitable for almost all buildings types and environments where a conventional hardwired system may be used, but there are applications to which wireless systems are particularly well suited. Some examples are:

- hospitals, clinics and residential homes, which require minimal disruption to their services, so installation and commissioning times are important
- buildings with open plan interiors and offices (as many modern buildings have), the layout of which may change with business demands – wireless fire protection systems are flexible enough to change easily with them
- heritage and listed buildings where the building structure cannot be damaged or altered and wireless systems are the only practical solution
- temporary installations and structures such as exhibitions, tents and building sites where wireless systems are ideal in plush buildings (eg hotels, stately homes) where maintaining the beauty of internal structures and fittings is of primary importance, and installations should not diminish these.

European Regulatory Framework

Wireless fire detection components and systems placed and used in most of the European marketplace must meet with the requirements of relevant harmonised standards. These allow a presumption of conformity against the essential requirements of the applicable European directives:

- EN 300 220 Parts 2 & 3, Radio and Telecommunications
- EN 301 489-3, Terminal Equipment (R&TTE) Directive
- EN 50130-4, Electromagnetic Compatibility (EMC) Directive
- EN 60950 / EN 60065, Low Voltage (LVD) Directive)
- Relevant EN 54 standard series (CPD directive)

The EN 54 standards relate to performance testing of various types of fire detection equipment and components. Currently only EN 54 Parts 3, 4, 5, 7, 10, 11 and 12 are harmonised under the CPD directive.

Many more will be added over the coming years, an important one being EN 54-25, which specifically deals with the evaluation of fire detection systems and components that use radio links.

In the UK, systems designed to conform to the installation and reliability requirements of BS 5839-1:2002 should also comply with Loss Prevention Standard LPS1257:2006, dealing with requirements and testing procedures for radio linked fire detection and fire alarm equipment. The requirements of LPS 1257 were included in BS 5839-1:2002 to ensure a degree of reliability of wireless systems, and to cover the intervening period whilst EN 54-25 was in preparation. In time, BS 5839-1:2002 will be amended to replace LPS 1257 with EN 54-25.

Testing wireless systems

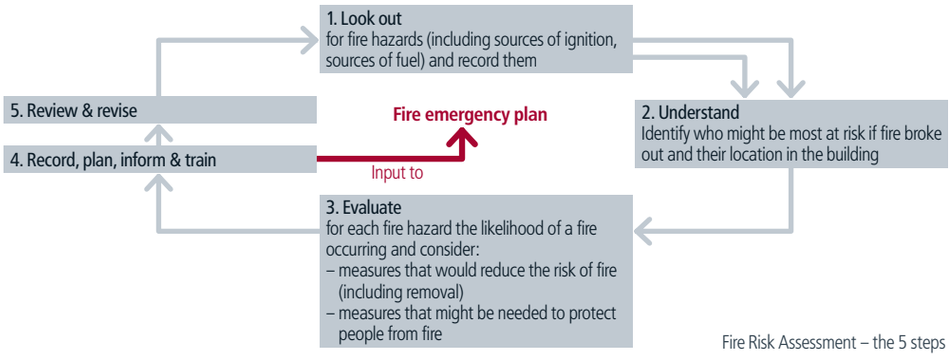
BRE Certification evaluates fire detection systems to the EN 54 series standards, amongst many others, as well as operating the LPCB approval certification schemes. To supplement these, BRE is investing in equipment and testing facilities for evaluating wireless fire detection systems to EN 54-25 (draft).

BRE's experience in the fire and buildings industries, means that its engineers and scientists are well placed to help with all aspects of understanding the regulatory and testing requirements of this burgeoning industry. Wireless systems, when properly installed and maintained, may offer a number of significant advantages and flexibility over conventional wired systems.

LPCB's certification schemes can cover all aspects of the product from component and systems approval through to installation and maintenance. These schemes give consumers and end-users the reassurances they seek when selecting and managing such systems.

For further information – 01923 664 100, email enquiries@lpcb.com, or visit www.RedBookLive.com

Harbinder Bharj is BRE's EMC Laboratory Manager.



Fire Risk Assessment – the 5 steps

NEW APPROACH TO FIRE LEGISLATION

The introduction of the Regulatory Reform (Fire Safety) Order 2005 in October last year heralded a major change in fire safety legislation in England and Wales, including the requirement that a person responsible for a building must carry out a fire risk assessment – Steve Seaber **reports.**

The Regulatory Regulatory Reform (Fire Safety) Order 2005 came into force on 1 October 2006 in England and Wales. It is significantly different to previous fire safety legislation replacing a number of other fire safety laws with a single consolidated piece of legislation with fewer enforcers.

Under previous legislation the enforcing authority inspected the premises and advised the owner or occupier of the fire protection that was required. When this work was completed satisfactorily a fire certificate, or licence, would be issued by the appropriate authority.

The Order follows the principle introduced in other safety legislation and particularly by the Fire Precautions (Workplace) Regulations 1997. The person responsible for the building must carry out a risk assessment of the premises and take necessary actions to minimise the risk. Fire certificates are no longer issued.

Unlike previous legislation the Order requires consideration of all people who are 'lawfully' on the premises (or who may be affected), not just employees. It applies to all places where people go to work (unpaid or paid) or for leisure, or any other legitimate purpose, thus covering virtually all premises except private dwellings, although it does apply to the common areas of flats or maisonettes. Another major change is that it places the prevention of fire on an equal footing with the protection of people from a fire, which was the focus of previous legislation.

For most premises the legislation will be enforced by the local authority fire and rescue service, although the M.O.D. Fire service and Crown Premises group will be the enforcing authority for their premises. The HSE will act as the enforcing authority for certain high-risk premises like nuclear power plants.

The inspection and enforcement programme to be followed by the local authority fire and rescue service, is determined as part of the Integrated Risk Management Plan that they are required to produce each year. In developing the plan they consider a range of factors in their area, including the nature of risk, the frequency and location of incidents and changes in demography or other local profiles. This information is then used to identify any changes in resources for operational and other activities. It will also be used to set targets and programmes for community fire safety and fire prevention activity. Fire and rescue services may consider the following factors in developing their inspection regimes, but this list will vary according to locally determined priorities and resources:

- sleeping accommodation (particularly high risk, such as residential care and houses in multiple occupation)
- premises where a fire occurs
- high hazard premises
- premises with poor fire safety management arrangement (for example one with frequent false alarms)
- premises with poor adherence to current or previous fire safety requirements
- premises of a type at which a number of fires occurred
- a proportionate sample of all other types of premise covered by the Order.

The (D)CLG took action to raise awareness of the requirements prior to the introduction of the Order. It has also prepared 11 guides covering the range of premises to which the Order applies:

1 Offices and shops
2 Factories and warehouses
3 Premises providing sleeping accommodation
4 Residential care premises
5 Large places of assembly
6 Small and medium places of assembly
7 Theatres and cinemas
8 Educational premises
9 Healthcare premises
10 Transport interchanges
11 Open air events

The guides are written in two parts, the first based on a five-step risk assessment process outlined below, and the second part containing detailed guidance on specific areas of fire protection and technical matters. The guides have been written to ensure that the generic fire safety guidance is consistent, and include checklists and diagrams to help with this. Each guide also contains specific diagrams, case studies and technical information relevant to the particular type of premises covered by the Order.

Five step approach to fire risk assessment

1. Identify fire hazards
- Sources of ignition
- Sources of fuel
- Sources of oxygen

2. Identify people at risk
- People in and around the premises
- People especially at risk

3. Evaluate, remove, reduce and protect from risk
- Evaluate the risk of a fire occurring
- Evaluate the risk to people from fire
- Remove or reduce the fire hazards
- Remove or reduce the risks to people
- Detection and warning
  - Fire-fighting equipment
  - Escape routes
  - Lighting
  - Signs and notices
  - Maintenance

4. Record, plan, inform, instruct and train
- Record significant findings and action taken
- Prepare an emergency plan
- Inform and instruct relevant people
- Co-operate and co-ordinate with others
- Provide training

5. Review
- Keep assessment under review
- Revise where necessary

The guides have been written to assist a lay person to carry out a fire risk assessment on a premises for which they are responsible. Where somebody feels that they do not have the skills to carry out the required risk assessment, or in more complex premises, they are advised to appoint a competent person to undertake this work.

A number of organisations are offering to carry out fire risk assessments and it is important to ensure they are independent and qualified. Risk assessments provided by suppliers of fire protection equipment may require an expensive purchase by the buyer and may not identify all their risks.

BRE has established a-one day fire risk assessment awareness course, and a four day modular course entitled 'How to become a fire risk assessor'. Those attending the latter can undertake an Assessment of Competence and complete an induction course in BRE fire risk assessment methodology and procedures. Successful completion qualifies them to be BRE Licensed Fire Risk Assessor, or to become a BRE Associate and carry out work on BRE's behalf.

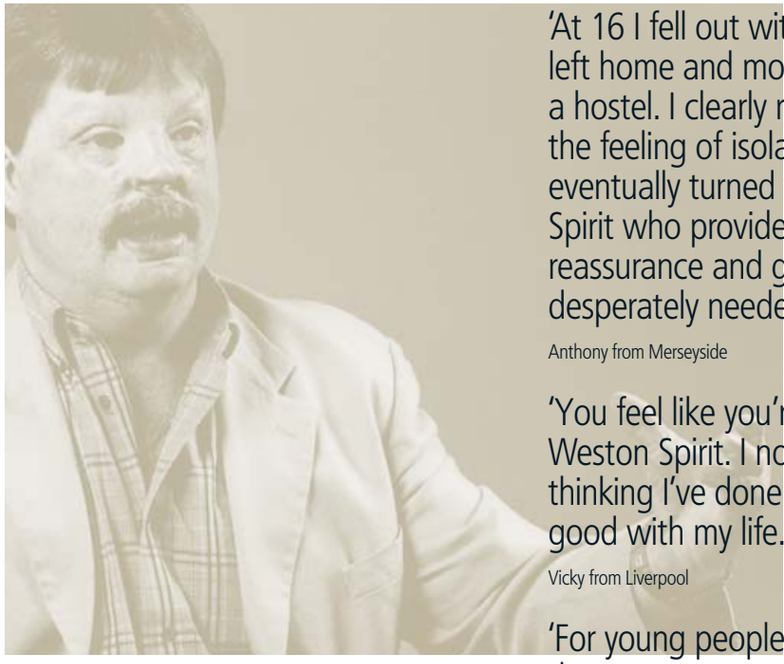
In addition to this training, BRE is able to provide individuals or teams of people to conduct fire risk assessments in more complex premises.

For more information on fire risk assessment training visit www.bre.co.uk/events, tel 01923 664800 or email events@bre.co.uk

Steve Seaber is a BRE Associate.

WESTON SPIRIT

The Comment on page 1 of this issue of *Constructing the future* was written by Simon Weston**. As well as a powerful voice on fire safety issues, he is an active supporter of work to help vulnerable and at risk young people.**



'At 16 I fell out with my parents, left home and moved into a hostel. I clearly remember the feeling of isolation until I eventually turned to Weston Spirit who provided the support, reassurance and guidance I desperately needed.'

Anthony from Merseyside

'You feel like you're someone at Weston Spirit. I now wake up thinking I've done something good with my life.'

Vicky from Liverpool

'For young people in my area I felt there were not many choices. A lack of money in the community meant we had a lack of facilities for young people to follow their dreams. Weston Spirit made me look at myself in so many ways. It helped me realise that in this life you only get out what you put in.'

Leon from Liverpool

There are currently thousands of young people in the UK who need support. Some are vulnerable or at risk, out of work or being bullied at school. Others are unhappy at home, suffering is silence or isolated from their families and communities. Many need help on their journey to adulthood.

Weston Spirit is a national youth charity that aims to tackle these issues. Offering a real solution in some of the UK's most deprived areas, the charity engages, supports and motivates young people to direct their energies into something more positive – benefiting themselves and their local communities.

Co-founded in 1988 by Falklands war veteran Simon Weston OBE, Weston Spirit was created to offer inner-city youth an alternative to apathy, unemployment and a potential life of crime. Its original aims – 'personal development, confidence and self-esteem' – remain at the heart of the charity today.

18 years on and Weston Spirit has worked with more than 75,000 young people around the UK. It has 11 centres around the country where teams of youth workers deliver the charity's 'life-changing' youth programmes to young people who need its support. 'Weston Spirit believes that every young person deserves a chance – and that chance starts with them understanding and believing in themselves,' says Simon Weston.

From long-term support to one-day short courses, Weston Spirit provides young people between the ages of 13–25 with an effective way to improve their confidence and self-esteem. Each programme is designed to help them gain essential life and social skills, and find ways to deal with their problems and enable them to go on to realise their full potential.

Weston Spirit relies on the generosity of its funders to continue to engage, support and motivate more than 7,000 young people every year. To support this, the charity has launched its 18th birthday Life Line Appeal to raise more than £1m to protect and develop its services for the young people who need it the most. Just £10 will pay for a contact session for one vulnerable young person.

Weston Spirit would be pleased to hear from anyone who is wanting further information or considering making a contribution to their vital work with young people around the UK. Visit www.westonspirit.org.uk or speak to Nick van Breemen – 0151 258 2607, Email nickvb@westonspirit.org.uk or Julie Harrison – 0151 258 2619 or julie@westonspirit.org.uk

Co-founder and Vice-President of Weston Spirit, Simon Weston, with young people from Cumbria

ACTION ON HOUSING

On 12 December 2006 the National Centre for Excellence in Housing was launched under the Chairmanship of Nick Raynsford MP. With the target of a step change in the production and quality of new and refurbished homes by 2010, it has a tough job, but already strong support from many leaders in the housing sector.

Nick Raynsford MP speaking at the launch of the National Centre for Excellence in Housing

It is widely accepted that many parts of the UK have problems with housing. For example, an estimated 1.5 million households are now waiting for affordable homes, and much of the existing housing stock is old and difficult to bring up to modern standards.

Alongside the established challenges are newer expectations for the sector. In particular how to meet the requirements set out in the new Code for Sustainable Homes and the specific government targets for delivering new homes that are carbon neutral.

While much is being done to address these strategic issues, more can be done to accelerate change and develop a coordinated and effective response to them. 'Housing plays a major role in the nation's health and well-being,' says former housing minister Nick Raynsford MP, 'yet how much support is given to the people and organisations who deliver high quality homes and a good environment?'

The recently launched National Centre for Excellence in Housing has been formed to provide a strong supportive framework for the whole sector, developing practical and workable solutions for the nation's housing problems.

BRE and NHBC have played a central role in the early development of the National Centre, through a joint venture partnership. This builds on the successful joint working between the two in developing the NHBC Foundation – the organisation that underpins research and development in new housing.

The whole housing sector

The work of the National Centre will encompass the three main housing activities – new housing, refurbishment, and repair and maintenance. This reflects the increased awareness of the importance of maintaining stock properly and ensuring that upgrading is done in a way that not only improves the standard of homes, but also makes the best possible contribution to environmental targets.

At the launch of The National Centre for Housing Excellence, its Director Anna Scothern said, 'We plan to elevate the importance of repair and maintenance and its key role in sustaining pride in our communities. We will explore value for money and the effectiveness of different maintenance strategies, while at the same time seeking out solutions and product types that have proven abilities to extend maintenance cycles and reduce whole life costs.

'In terms of refurbishment we plan to raise awareness of the growing evidence of successful refurbishment of older properties. In support of this we will gather evidence on the financial and environmental case for retention of older buildings which can have positive impacts on national and local housing supply.'

On the key issue of sustainability Scothern said, 'Climate change confronts both newly built and existing homes, and delivering sustainability whilst addressing housing needs requires a policy framework that looks at both. More than ever those that are taking the lead on housing must be supported by authoritative practical guidance so they can make the best possible decisions.

'The National Centre for Excellence in Housing, together with the NHBC Foundation, will focus efforts on the themes of sustainability and sustainable development. To this end I am pleased to announce that the NHBC Foundation has earmarked a substantial part of its research funding for this purpose.'

Housing sector backing

The National Centre for Excellence in Housing is bringing together unique combinations of experts in focus groups that are committed to working together to encourage new thinking and generate new ideas. The groups will be time-limited and briefed to provide practical outputs for the industry.

The launch of the National Centre provides an exciting opportunity to harness leadership together with expertise and experience from across UK Housing to really shape the agenda for the future. 'I am delighted that some of the most senior and expert people in the housing market are backing the National Centre,' said Anna Scothern. 'We need the research, the partnerships, and the agenda-shaping activities that the National Centre will undertake if we are to meet the significant challenges and take the opportunities ahead.'

The National Centre will encourage the adoption of best practice in design and construction. While stimulating innovation, it will be rigorous in ensuring that new technology provides robust and practical housing solutions. To build awareness of existing best practice and encourage more rapid engagement with new proven technology and methodologies, the Centre will invest strongly in their dissemination.

Engagement

During the next 12 months the National Centre plans to carry out an extensive industry and other stakeholder engagement programme on the areas of:

- achieving sustainable new housing
- sustainable upgrading of existing housing stock
- land supply, use and planning
- efficiency of design and construction
- delivering what people want.

For example, on the issue of delivering what people want the National Centre is supporting a new award next year, the 'Mail on Sunday's New Home of the Year Award', where architects are invited to submit a design for a standard three-bedroomed, carbon neutral house. Readers will choose from a shortlist of ten designs that they would most like to live in or have in their town. This winning design will then be built on BRE's Innovation Park as a prototype and rolled out as part of a development for sale.

'Our targets are to achieve a step changes in the production and quality of new and refurbished homes and to help ensure a stable and affordable housing market by 2010,' says Nick Raynsford. 'The strands of work being developed by the National Centre will underpin success by enabling us all to take urgent and concerted action for the benefit of all supplier, client and user stakeholders.'

For more information visit the National Centre for Excellence in Housing website www.homein.org, tel 01923 664775, Email info@homein.org

The National Centre for Excellence in Housing

Goals
To achieve a step change in the production and quality of new and refurbished homes, and to contribute to a stable and affordable housing market by 2010.

To this end the National Centre will:
- Constantly identify challenges facing the UK housing sector and keep these under review by a core group of key industry leaders.
- Identify areas where new research is needed and make recommendations on key research outputs that would particularly benefit decision making and progress in the sector.
- Encourage the exchange of knowledge between experts and stakeholders across the sector and seek consensus on areas of uncertainty.
- Support the development of new skill sets to enhance leadership, management or project delivery across the sector.
- Facilitate effective and informed debate and decision making by developing a series of focus groups and interactive events.
- Provide evidence-based feedback on policy impact including market successes and failures using special surveys.
- Build an increasingly comprehensive databank on successful housing design and construction to aid decision making and stimulate interest in innovations and new design concepts.

The issues
Climate change
The Stern Review: economics of climate change, presents an urgent and undeniable challenge to ensure that homes, both new and refurbished, meet exacting standards in terms of carbon emissions. Hard facts need to be sought to enable the right decisions regarding retention or demolition of older stock which contributes disproportionately to the overall carbon emission level.

Affordable homes
1.5 million households are now waiting for affordable homes. This number is increasing every year and it is estimated that only the supply of 70-80,000 new affordable homes every year will satisfy the need.

Age of UK housing
The UK has one of the oldest age profiles of housing in Europe. Over 20% of housing predates 1919 and over 50% is more than 40 years old. There are huge practical difficulties associated with bringing older homes up to, or close to, modern standards of performance.

Efficient methods of construction
The interest in efficient methods of construction continues to grow and we are seeing the emergence of many new volumetric, panellised and hybrid forms of construction. Some of these systems promise rapid on-site construction times and high build and finish quality.

The structure
Core group
A core group of key opinion leaders which meet quarterly, chaired by Nick Raynsford MP, provide a strategic steer to the operation of the National Centre and ensure that key issues and challenges to the housing sector are kept under review.

Focus groups
Linked to the core group are a growing number of specialist focus groups empowered to investigate specific issues and topics, some related to the promulgation of success and others looking for solutions to problems associated with housing.

The focus groups are made up of experts from disciplines that could assist in achieving the group's objectives. They are time-limited and responsible for delivering practical recommendations or verifiable guidance that the sector can engage with.

Anna Scothern, Director of the National Centre for Excellence in Housing

SUSTAINABLE COMMUNITIES – NOT ROCKET SCIENCE

Construction industry professionals need to get out of their specialist silos and talk to each other and the wider community if the mistakes of the past are to be avoided, argues Lynne Ceeney **of BRE.**

Construction industry professionals generally operate in specialist teams that work separately at different points in the construction process. While these teams are usually very good at what they do, their habit of working strictly within professional boundaries – often called 'silo working' – can lead to unnecessary expense and poor performance, and even to completely missing the overall project objectives.

Not only is this bad for business, it also makes it unlikely that the sort sustainable developments that enhance the lives of their occupants, their locations and the environment, will be achieved. Construction can learn a lot from other industries about the benefits of multi-disciplinary working and the hazards of not doing so.

As long as it's black

In 1913 Henry Ford created the assembly line, with parts created separately and then put together sequentially to create a finished product. The construction industry also tends to work in this separate, sequential way. For a standard product ('…any colour as long as it's black.') designed to meet known objectives, this is a very effective form of working. But of course buildings, developments and communities are not standard – they have different relationships with the existing built and natural environment, are individually designed for particular needs and circumstances, and should be adaptable to changing requirements.

A study in the1990s showed that Mercedes Benz took three times the number of hours that Toyota did to engineer and manufacture a luxury car. This is because Japanese engineering teams work together to achieve joint objectives and to solve problems collectively. Their effective cross functional teams compare with the single discipline teams of many western manufactures which don't talk to each other – resulting in cycles of re-working and redesign that are not efficient, not quick, and certainly not cost effective.

Not rocket science?

It is not only in the car industry that separate teams can cause serious problems. A spectacular example involved NASA and Lockheed Martin who provided separate teams for the technical support and flight operation of the Mars Orbiter in 1999. Everything seemed fine until near the end of the 286-day flight when it was found that the Orbiter had drifted about 60 miles off course – a tiny percentage of the total distance travelled, but enough to destroy the $125 million craft because it broke up in Mars' atmosphere.

The cause was embarrassingly simple. Lockheed had supplied thruster information in imperial pounds, but NASA had been expecting it in metric Newtons and had programmed the thrusters accordingly. The problem was not spotted during the flight because the trajectory shift was so gradual.

The result was a very expensive systemic failure where responsibility fell between two specialist teams. No-one had checked the assumptions made by the teams, and apparently it was no-one's fault – NASA said that Lockheed had not made a mistake, but neither had NASA.

Traditional teaching and professional institutes tend to focus on particular specialisms and therefore cover only certain parts of the whole picture. To some extent this has to be the case because there is a limit to how much information any one person can take in. That is why interdisciplinary team working is so important – it allows the wider picture to be seen.

Who is responsible?

There is an ever increasing demand for buildings and developments that both perform better when in use and are more sustainable. This involves issues that cut across the specialist disciplines and for which, therefore, no single specialist is responsible.

For example, who is responsible for energy efficiency? Is it the architect, the mechanical and electrical engineer, the HVAC specialist, the builder or the facilities manager?

If the building is poorly designed, the engineer will struggle to arrange energy efficient and cost effective heating and cooling. If it is poorly constructed, the building will leak heat and the facilities manager will end up paying more. It will be worse if the building has not been properly commissioned and the facilities manager doesn't understand how the energy efficiency measures work.

In a recent project in which BRE was involved, the architect's design looked great but required a massive 2MW of cooling load. BRE ran a multi-disciplinary design charrette* that enabled the various specialisms to work together to reduce the load to less than 200KW, representing a 90% saving.

Another recent project involved the use of renewable energy technology. BRE helped a major landowner to assess the sustainability of competing designs. Several of the designers had realised that they could 'earn points' by including renewable energy facilities. But the problem with many of them was that these had just been bolted onto the houses, and were ugly and inefficient and not part of an integrated energy strategy.

No attempt had been made to improve the energy efficiency of the building, despite the fact that it is neither environmentally nor economically efficient to apply renewables before addressing energy efficiency. This error is typical of cross-disciplinary issues, and is one that local authorities – an increasing number of which now require that 10% of predicted energy demand come from renewable energy – need to take particular care to avoid. Without energy efficiency measures, this requirement is likely to prove expensive and may fail to reduce carbon emissions anyway. If the total building energy demand is very high, providing 10% from renewables still leaves a lot of carbon being produced from the remaining 90%.

Avoiding the mistakes of the past

Cross-cutting issues are important at every level of construction project – from individual buildings through to whole developments and communities.

This was amply demonstrated the last time we had a housing boom when serious mistakes were made, as acknowledged in the Government's Sustainable Buildings Task Group report: 'Much of the opportunity to re-plan and design our communities stems from the fact that we are currently pulling down the spectacular failures of the building boom of the 1960s. We must not make the same mistakes again.'

If we are to avoid repeating these mistakes, we can't carry on working in narrow specialisms. Someone needs to take responsibility for those issues that cut across the disciplines,

* Design charrettes typically bring the client, design team and stakeholders together at the start of a development to create the best possible plan. During intensive, facilitated discussions, opportunities are identified to reduce waste and environmental impact, improve performance and enhance the well being of communities and occupants.

because experience has shown that if they are nobody's responsibility they are everybody's problem.

Most sustainable development issues are cross cutting and so require the input of a wide range of specialist disciplines, and the wider community as well.

Crime is a good example of this – the design and layout of the housing and streets, and proper community engagement, etc are key factors in reducing crime and anti-social behaviour. If the cross-cutting crime issue is missed at the design stage, trying to rectify the resulting problems post-build is difficult if not impossible. In fact, demolition can be a cheaper option.

There are also more immediate issues that cut across stages of the construction process. One example is the forthcoming requirement for Site Waste Management Plans. In developments that exceed a yet-to-be-determined threshold, developers will be required to manage waste generated on their site.

Waste is an integrated, cross-disciplinary issue. For example, unless sufficient space has been left on the site for waste handling and sorting during the build, the developer will not be able to meet the new requirement. Good specifying and procurement will reduce the amount of waste in the first place, and careful handling reduces the amount of damaged materials that have to be disposed of.

Sustainability checklists

It can be difficult to fully grasp the range of sustainability issues that need to be considered at the development level. This is one of the reasons that BRE has been working on sustainability checklists for development for every English region and, increasingly, on bespoke checklists for larger or more significant developments – known as BREEAM: Developments.

The checklists set benchmarks to be achieved at different phases of the design and construction processes. They help decision makers to understand the cross-disciplinary issues and make sure that they are considered at the right time. There is a sliding scale of benchmarks that indicates the minimum required, but also enables developers to be recognised for doing more than the minimum.

The cross cutting themes in the checklist are climate change, community, place making, transport, ecology, resources, economy and BREAM/EcoHomes.

The bespoke checklists are usually prepared in co-operation with the planning authority. This not only allows faster decision making because the targets are agreed in advance, but also helps to speed the whole design and approval process because the teams are aware of what is required in advance and do not have to do extensive reworking at the approval stage.

Better results with community involvement

Experience has shown that better results are achieved if the community is engaged in preparing designs prior to major planning applications. They often have legitimate issues and useful ideas, many having lived with the results of previous poor developments. And community engagement in potentially contentious developments can lower temperatures and make it easier to produce 'win-win' proposals.

Planning Policy Statement 1 is very clear in its desire for community engagement: 'Local communities should be given the opportunity to participate fully in the process for drawing up specific plans or policies and to be consulted on proposals for development. . . .Community involvement in planning should not be a reactive, tick-box process. It should enable the local community to say what sort of place they want to live in at a stage when this can make a difference.'

Multi-disciplinary events involving the public and taking their ideas and opinions on board during the design phase, can provide appropriate opportunities for community involvement. Master-planning charrettes, Enquiry by Design and other similar techniques that BRE uses with clients, are useful tools for this type of activity and can be applied to developments of all sizes. Gathering community comments in this way allows them to be considered at the right stage of the development design process.

Conclusions

Based on what we know about the importance of sustainable developments – the need to address cross-cutting issues, and the social and economic costs of getting it wrong – the following conclusions can be drawn:

- performance and sustainability issues cut across specialisms and stages of the design, construction and operation of buildings and developments
- they cannot be allowed to be nobody's responsibility
- lessons from other industries show that integrated design is crucial to efficiency, effectiveness and economy (time and money)
- integrated development design teams are the logical way forward – with input from local people before decisions are made.

For more information on achieving effective communication among those involved in a new development, and with the local community, email sustainablecommunities@bre.co.uk or tel 01923 664324.

This article is based on a presentation by Lynne Ceeney at the 2006 BRE Annual Conference.

Lynne Ceeney

Lynne Ceeney, BRE's Sustainable Communities Team Leader, has had a varied career, training to be a paramedic before changing course and spending over 14 years working on 'health' of a different kind – the maintenance and creation of sustainable communities.

She and her team help local authorities to develop sustainability strategies and policies for their areas as a whole and for individual developments. Great care is taken to respond to the local context and needs – and they look for those areas which will bring the greatest overall sustainability benefit, rather than producing a standard list.

Importantly, Ceeney and her team have worked extensively with all 'sides' involved in developments – planners, developers and designers as well as local authorities and communities etc – and can therefore appreciate the sustainability issues from all points of view.

This understanding of the social and environmental aspirations on the one hand and economic and other practical factors on the other, means they can help to create developments that are humane – incorporating green spaces and good transport links for example – and yet within the required cost, timing and technical constraints.

With a full set of tools for bringing the different professional specialisms together, and for accessing the concerns and needs of wider stakeholders, Ceeney and her colleagues work to ensure that mistakes of the past are avoided. The result is a better understanding between professional teams and between professionals and the community – and better developments for all concerned.

THE CARBON MIXER – A WHOLE SYSTEM DESIGN TOOL

As Building Regulations tighten on carbon emissions and planning approval increasingly include targets for renewables, the designer's task becomes ever harder. Matt Dickinson **describes a new software design tool for low carbon and renewable strategies in new developments.**

The Carbon Mixer software programme allows users to compare the carbon emissions for different combinations of buildings and energy systems.

Developed by Bobby Gilbert and Associates (BG&A) in partnership with BRE, the Carbon Mixer provides a consistent, reliable and robust approach to designing energy strategies for new developments. It uses an energy and carbon accounting method to mix and match building forms, renewable technologies and micro-generation systems to give the optimal solution for a given local climate. The process enables users to follow the lean, clean, green hierarchy and allow the building and its energy systems to be considered as a whole.

Graphs and pie charts instantly show users how the mix is working and where the strengths and weaknesses lie. This is particularly useful in discussions with clients and other professionals who do not have the relevant technical knowledge.

The user first calculates the energy demands for each building type using standard benchmark figures, Part L SAP calculations, Part L SBEM calculations and/or thermal modelling. At this stage insulation, draught proofing and lighting levels can be investigated to minimise energy demands. Usually, several versions of the same design are modelled and the version that is nearest to Building Regulations requirements is loaded into the Carbon Mixer, along with a benchmark set. The user then gets a visual snapshot of the heat, power and cooling requirements of the development. Those wanting reduced energy use and carbon emissions can enter increasingly efficient low carbon and renewable energy systems to see how much CO_2 can be reduced in comparison to the benchmark.

Building characteristic graphs such as that in Figure 1, show how the thermal energy is managed in the building to maintain comfort levels for occupants. Blocks above the zero line are thermal gains to the building and those below are thermal losses. In this case the solar gains through the windows in summer are being balanced by ventilation losses. If ventilation were difficult to achieve in practice, this graph suggests that improved shading should be considered in order to prevent overheating.

In many cases the next most important thing is to have a low carbon heating system using efficient boilers supplying heat to community or district heating systems. This might initially be powered by a high efficiency gas heating system, but could be upgraded to biomass heating, or gas or biomass combined heat and power (CHP) systems, fulfilling the 'clean approach'. The advantage of CHP is that local generation of electricity does not have the transmission losses (typically up to 70%), with associated CO_2 emissions, of grid generation as heat produced can be used locally.

BRE and BG&A worked recently with developers Terrace Hill and architects Jestico and Whiles on the River Thames Platts Eyot development. This comprises apartments, maisonettes, detached and terraced houses, offices, light industry and a restaurant. A biomass lead boiler was used on a heat main to the apartment buildings. It was estimated that this would meet 35% of the energy demand, the rest being met by gas boilers. The Carbon Mixer was used to show, for example, how increasing the percentage of the demand met by the biomass boiler impacts on CO_2 emissions.

At each stage a snapshot of the scenario can be saved to see what the effects of various changes are. Figure 2 shows the scenarios considered for Platts Eyot – solar hot water systems on the roofs of the maisonettes and terraces, the biomass boiler, and combining the two – resulting in a 15% drop in emissions from the already lean designed buildings. These emissions reductions are in the areas of heating and hot water – the emissions associated with electrical appliances can also be reduced by experimenting with the mix of renewable technologies available.

Characteristic graphs show a standardised measure of each particular renewable technology's ability to produce energy in a particular climate. For photovoltaic and solar collector panels this is per square meter of panel, for wind turbines it is per square meter of blade-swept area.

The Carbon Mixer will also calculate the costs of the various measures, giving the user the technical information and the business case on which to base the final decision. The savings associated with each scenario are also summarised and broken down into savings in fuel and power bills, and savings in annual service and maintenance costs, giving a total annual saving.

As a result of interest from building designers wishing to purchase this software, BRE and BG&A are currently considering releasing a trial version.

Any companies wanting to be added to the list of those who would like to receive the trial version, or needing help in assessing the most cost effective low carbon/renewable energy strategy for their development, can call 01923 664500 or email environment@bre.co.uk.

A demonstration video of the software is available at www.bre.co.uk/md.jsp

Matt Dickinson is an energy consultant at BRE

Figure 1. Building characteristic / P-Eyot Maisonette – u0.27 100% LE, nat vent, Sap/Bredem, London

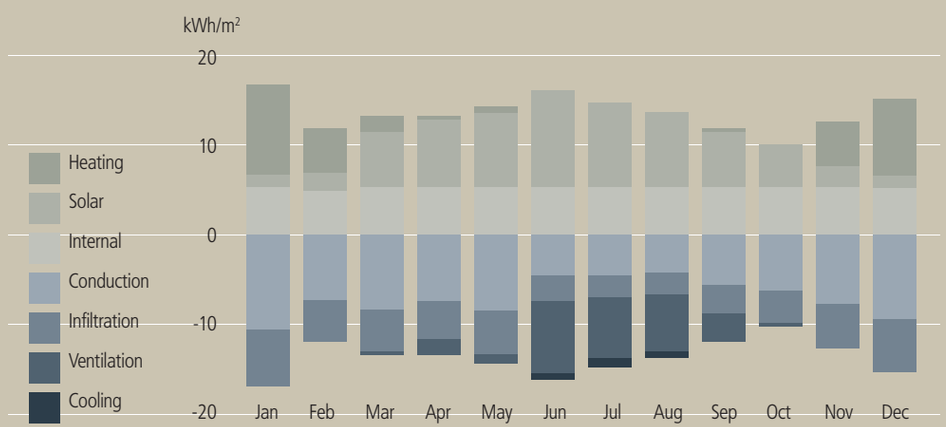
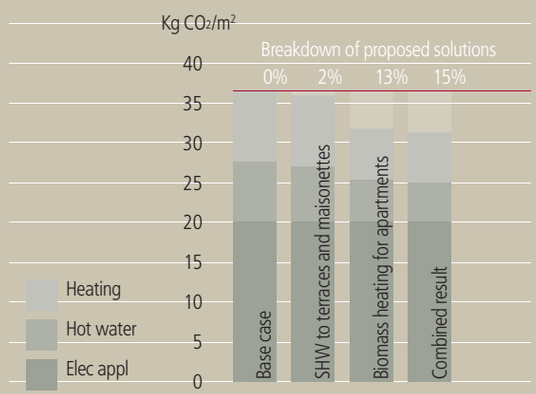
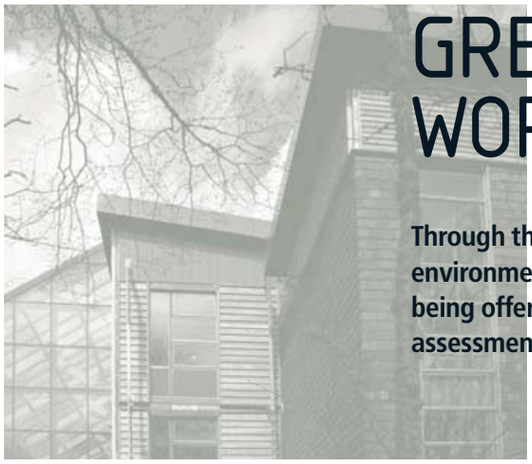


Figure 2. Carbon Dioxide Reductions





GREEN BUILDINGS WORLDWIDE

Through the BREEAM scheme the UK has taken a strong lead in assessing the environmental performance of buildings. This experience and knowledge is now being offered to those in other countries wishing either to develop their own assessment schemes, or to develop an accredited BREEAM-based system.

Scottish Natural Heritage HQ.
Winner of the 2006 BREEAM
Award for office buildings
Architect: Keppie Design

A growing international move to improve the sustainability of buildings is reflected, not only in the forthcoming launch of the UK Green Building Council (see page 3), but also in the fact that 23 other countries are in the process of establishing Green Building Councils and a further nine already have them.

The market demand for green buildings is increasing rapidly, principally driven by construction clients, funders, developers and owner-occupiers who want to 'future-proof' their buildings. They recognise that the future asset value of a building is likely to be directly linked to its environmental credentials – particularly its energy performance as many countries are introducing mandatory building energy labelling.

Along with the demand for green buildings and construction products, the other key elements in achieving sustainable construction are the ability of the supply-side to deliver them, and the establishment of credible methods of assessing environmental performance to ensure that these buildings are in fact green.

The environmental assessment of buildings is an area in which the UK has taken a lead, and in the process gained the sort of experience and expertise that other countries may find useful when developing their own assessment methods.

Tried and tested

The UK's BREEAM assessment method is the world's longest established and most widely used environmental assessment for buildings. Created by BRE in 1988, BREEAM is a tried and tested system, both in terms of its robust technical standards and its commercial delivery – especially the independence of its licensing, quality assurance and certification procedures.

BREEAM assesses buildings against a range of environmental issues and gives a score (on a scale of PASS, GOOD, VERY GOOD and EXCELLENT) depending on performance. 73,000 buildings have been certified to date and a further 285,000 are currently registered for assessment.

Under continual development, BREEAM now has versions that cover offices, housing, court buildings, light industrial units, prisons, shops, schools, nursing homes and other building types. In addition there is a bespoke version of BREEAM that can be used to assess any building type – from opera houses to pharmaceutical laboratories.

BREEAM has been readily adopted by the UK construction industry because it strikes a realistic balance between being technically rigorous and commercially practical. It uses a straightforward scoring system that is transparent and easy to understand, and it enables developers and designers to prove the environmental credentials of their buildings to planners and clients.

There is a wide spectrum of assistance that BRE can offer to organisations – such as Green Building Councils – wanting to develop environmental performance assessment methods for buildings in their regions. This ranges from advising those wanting to develop their own assessment methods, to helping them develop an accredited BREEAM-based system, tailored to their specific needs, under the recently developed BREEAM International scheme.

BREEAM International

BRE already has an established track record in tailoring BREEAM for buildings or developments outside of the UK. Those recently assessed in this way include the European Investment Bank in Luxembourg and the Van de Kamp Bakery Building at Los Angeles City College.

Under BREEAM International an environmental assessment method can be tailored for the circumstance in any country or region in the world. For example, the method is adapted to meet local codes and conditions either by replacing the UK code material with local codes or guidance, by providing a standard or measurement method where none exists locally, or with a mixture these where local codes and practices partly meet the need. All key environmental issues are covered, but the weightings they are given when calculating the assessment score can be adjusted to reflect their importance in a particular area.

The assessment's technical framework, the process for developing a method, the business model, the quality assurance process and the training and licensing model, are not UK specific and readily translate to a system in any country in the world. The upshot is that BREEAM International enables the assessment of buildings wherever they are, be it Norway or Uganda.

A system developed under BREEAM International can achieve the same credibility and authority as the original scheme through a process of accreditation in which it is certified as having met the required standard for environmental assessment methods for buildings.

A brief summary of these steps is given in the right-hand column of this page. This is not to suggest that in approaching BRE for advice on developing an assessment method, the outcome must be an accredited scheme under the BREEAM system. Advice is available for developing other national or regional schemes, and at any or all stages of the development process.

For more information – 01923 664462, email lowec@bre.co.uk
A BREEAM FactFile giving information on frequently answered questions is now also available at www.breeam.co.uk/factfile

Key steps in the process

Advice is available for all or any of the following steps, either in the development of a local scheme or a fully accredited scheme under the BREEAM system.

1. Advisory panel
Set up an advisory panel representing all interested parties to oversee the development of the methodology and ensure that it meets the objectives.

2. Initial evaluation
Review issues – their relevance to the region, the need for information, alternative means of compliance, etc.

3. Weightings exercise
Examine the relative importance of each of the key environmental issues in the particular region (can be done at the same time as 2).

4. Initial review by advisory group
Review information obtained in 2 and identify further issues for consideration.

5. Technical research
Research and collate the information identified as needed in 4.

6. Response from advisory group
Review information obtained in 5.

7. Technical documentation
Draft technical assessment documentation following review and final agreement on the technical content of the scheme by the advisory group.

8. Assessment tool
Produce electronic assessment scoring tool.

9. Pilot assessments
Carry out a number of pilot assessments on real buildings using the technical documentation and scoring tool.

10. Assessor training, examination system and licensing
Training information production can be started at the same time as the pilot assessments but not completed until the pilots are complete and the experience gained built in.

11. Release of final assessment methodology
Release final methodology once the above steps are completed.

12. Quality control and certification
Develop procedures for quality control and certification.

13. Official recognition/accreditation
Scheme certified as having met the standard for Environmental Assessment Methods for Buildings.

14. Ongoing management and updating
Regularly review the technical methods to ensure that they are kept up to date.

Recent publications

Books

Designing quality buildings: a BRE guide (BR 487)
A new guide on the design of domestic and low-rise buildings covers site investigation and preparation, foundations, walls, windows and doors, roofs, floors and ceilings, basements, building services, and much more. Fully in line with UK regulations and standards, the guide is based on sustainable design requirements, in particular, how to achieve a long life, limit maintenance requirements, reduce defects and design for the future. £67.50 (£47.50 for Connect members).

Schools Design Forum (SDF) workshop report (BR492)
SDF is a new initiative that brings together leading practitioners committed to changing the way sustainability is understood, delivered and shared in schools. A recently published report (BR492) outlines the responses from an SDF workshop on the sustainable design of schools, and provides a stimulating and wide-ranging insight into how the built environment can play its part in making the learning environment more sustainable – see page 2. A detailed record (BR491) of the workshop is available in a companion publication. BR492 is £15 (£10 for Connect members). BR491 is £25 (£17.50 for Connect members).

Reuse of Foundations for Urban Sites
Two publications have been produced as part of the Reuse of Foundations for Urban Sites (RuFUS) research project:
- A best practice handbook (EP 75) draws together experience of reusing foundations across Europe and analyses existing knowledge and the latest research. £75 (£52.50 for Connect members).
- A set of proceedings (EP 73) presents papers by the RuFUS project partners and authors from Europe and further afield. It provides valuable technical information and case studies on successful reuse of foundations, and extends the guidance presented in the handbook. £95 (£67.50 for Connect members).

Green roofs and façades (EP 74)
Green roofs and building façades offer wide ranging benefits, including reduced rainwater run-off, better thermal stability and energy conservation, enhanced air quality, wildlife habitat and open space. This fully illustrated guide identifies the key aspects to consider when designing, building and maintaining them, and gives numerous examples of successful applications from around the world. £22.50 (£15 for Connect members).

Good Building Guides

Practical guidance on building design and construction

GG 69 Loft conversion
This two-part package provides a concise introduction to the structural considerations, safety requirements, insulation and installation of services when converting loft space to habitable accommodation. £20 (£15 for Connect members).

GG 70 Plasterboard Part 1: Types and their applications
To achieve satisfactory performance of a completed construction, it is crucial that the correct type, thickness or mass of plasterboard is selected. Part 1 of this Good Building Guide describes the range of boards available and when they can be used. Parts 2 and 3 will provide practical guidance for operatives on fixing and finishing plasterboard. Part 1 is £15 (£10 for Connect members).

Information Papers

The latest BRE research information and how to apply it.

IP 9/06 Refurbishing Victorian housing
This paper outlines a method of assessing the refurbishment of traditionally built houses dating from the period 1840 to 1919, which is similar to that used in BREEAM EcoHomes. It is based on the report *Sustainable refurbishment of Victorian housing* (FB14), which deals with the topic in much greater detail and includes several case studies. £9 (£7.50 for Connect members).

To obtain any of the publications listed above or to subscribe to BRE Connect:
– www.BREBookshop.com
– Email brepress@ihsatp.com
– Tel 01344 328038
– Fax 01344 328005

Events and training

Various dates in England, Scotland and N. Ireland
SBEM training
SBEM is a computer program that provides an analysis of a building's energy consumption. This course is aimed at building designers and consultants with a basic understanding of energy use and building services, and Building Control practitioners wanting to specialise in energy calculation and Part L compliance. See www.bre.co.uk/events for dates.

16 February at BRE Watford
Energy efficient buildings
Workshop that is part of a project to encourage the use of energy efficient construction products and a greater awareness of environmental labelling.

20 February at BRE Watford
Let's discuss the future of fire investigation and research!
Will provide an opportunity for the exchange of information and a forum for discussion between fire investigators and research scientists. It will include a report on the implications to fire investigators of the recent revisions to Approved Document B and much more.

21 February, 22 February and 18 April 2007 at BRE Watford
Home Condition Report (HCR) and Energy Performance Certificate Training (RdSAP)
Three-day course to help Inspectors survey dwellings in a consistent way and complete the Home Condition Report to a standard format.

22 February and 7 March at BRE Watford
Understanding safety risk management
One-day course providing a pragmatic framework approach to risk management (encompassing structural risk and occupational health and safety risk) as it relates to the practising engineer.

26 February–2 March and 26–30 March at BRE, Watford
Building services integration with KNX/EIB
Allows delegates to effectively deliver the benefits of EIB, and provide value-added service to clients.

28 February at Earl's Court 2, London
Launch of UK GBC at EcoBuild
The UK Green Building Council will be launched at EcoBuild (27 February – 1 March). See page 3.

27 February-2 March at BRE, Watford
Fire Risk Assessment training
A four-day comprehensive course that includes carrying out a Fire Risk Assessment.

6–7 March at BRE Watford
BREEAM Industrial assessor training course
Two-day course – day one provides a foundation for all non-domestic BREEAM schemes, the second day focuses on BREEAM Industrial. Contact: 01923 664462, breeam@bre.co.uk

13–14 March at BRE Watford
BREEAM Schools assessor training course
Two-day course – day one provides a foundation for all non-domestic BREEAM schemes, the second day focuses on BREEAM Schools. Contact: 01923 664462, breeam@bre.co.uk

14 March at BRE Watford
MMC: Made in Britain
The future of MMC manufacturing in the UK will be discussed at this special one-day conference.

21–22 March and 18-19 April at BRE Watford
EcoHomes (BREEAM for Homes) Assessor training course
Covers the technical content of EcoHomes and the details of the assessment process.

26 March and 16 April at BRE Watford
The Code for Sustainable Homes explained
Free seminar providing and overview of the code, its principle technical aspects, compliance and how to get a home assessed.

27 March at BRE Watford
Low carbon technology briefing: small scale wind
One of the series of briefings giving an insight into what low carbon technologies are available, the output that can be expected and how they can be incorporated into building developments.

29 March at BRE Scotland
Understanding safety risk management
One-day course providing a pragmatic framework approach to risk management as it relates to the practising engineer.

17 April at BRE Watford
Low carbon technology briefing: low carbon cooling
One of a series of briefings giving an insight into what low carbon technologies are available, the output that can be expected and how they can be incorporated into building developments.

11–14 June at BRE Watford
OFFSITE2007
With full-scale exhibits and demonstrations and a case study based conference programme, OFFSITE2007 will explore how innovative construction methods and advanced technologies for buildings are coming together to deliver higher performing, more sustainable and smarter buildings.

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

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Constructing the future is circulated in association with *Contract Journal*.