bre news

Fire safety and sustainability – the perfect combination?

Fire safety and sustainability in buildings share common goals, but these can sometimes appear to be in conflict. Greater understanding of the issues and dialogue between the various disciplines can help make buildings safer and more sustainable. David Charters reports.

It is well known that accidental or malicious fires are bad for people but they are also bad for the environment. As well as combustion products such as carbon dioxide and sulphur oxides, there are contaminants from fire fighting activities – e.g. run-off water containing fire fighting foams – and the risk of land contamination from disposing of fire damaged materials that may contain heavy metals.

In addition, there are environmental impacts from rebuilding fire damaged structures and, in some cases, of relocating key services – such as added car travel if a local school is closed due to fire.

Clearly the fire safety and sustainable development communities have a common interest in making sure that fire safety is achieved in the most sustainable way. To do this effectively needs good scientific data, dialogue and the application of standards such as BREEAM and BS 7974 on fire safety engineering.

BREEAM

The BRE Environmental Assessment Method (BREEAM) assumes a baseline of legal compliance when starting an assessment. It awards credits for exceeding building regulations.

Currently, BREEAM does not directly award credits for the inclusion of elements limiting the impact of fire (such as sprinkler systems and added passive protection) above and beyond building regulations. We have started a number of projects that

will help establish the environmental and social benefits and impacts associated with better fire protection systems and design.

BREEAM In-Use

BREEAM In-Use already awards credits for proactive fire safety management above the minimum legal requirement.

Under the Regulatory Reform (Fire Safety) Order 2005 there is a requirement to complete a fire risk assessment for occupied buildings, which is aimed at assessing fire risks to the occupants (and other relevant persons). If the scope of the assessment is extended to include fire risks to the environment, BREEAM In-Use is able to reward that.

Enabling sustainable innovation safely

Innovative building methods developed to improve sustainability can be introduced in a way that ensures fire safety.

For example, SIPs are prefabricated lightweight units that form the principal loadbearing components used predominantly in residential and light industrial buildings. They are a sandwich construction consisting of two structural facings bonded to a lightweight insulating core.

With a number of useful qualities – they are lightweight and strong, easily adaptable and provide good thermal efficiency (and the prefabrication of panels results in reduced waste onsite and increased speed of erection) – their use in UK construction has been increasing over the last decade.

As with other forms of construction, SIPs must be tested to demonstrate their compliance with the requirements of the building regulations, but standard fire resistance tests provide little information on a building system formed of a number of interconnected building elements in a realistic fire scenario.

In view of this, the Department of Communities and Local Government (CLG) commissioned BRE to carry out an experimental programme to determine the performance of SIP systems exposed to a realistic fire scenario. The output of the

research resulted in an Information Paper entitled '*Fire performance of structural insulated panel systems'*.* The IP summarises the results of this research and provides recommendations for designers, regulators, warranty providers, manufacturers and contractors.

The experimental programme consisted of a series of laboratory tests on single panels, and four large-scale fire tests on two-storey SIP structures incorporating engineered floor joists. These studies were supported by numerical modelling.

Details of government-funded research by BRE, into the fire performance of structural insulated panels (SIPs),

[Photo caption] Large-scale fire testing of SIP system clad with masonry.

Fire-fighting and fire safety engineering

Innovative building methods can be difficult to distinguish from traditional construction and the fire fighting community is therefore concerned about choosing the safest and most effective fire fighting strategy when attending a fire. On the positive side, this is helping to raise awareness of sustainability in the Fire and Rescue Services, and guides and training courses to help building surveyors and other professionals could be readily adapted for the Fire and Rescue Services.

There are also instances where innovations to improve sustainability may seem to be stifled by the prescriptive fire safety guidance in Approved Document B.

For example, modern construction materials may conflict with the recommendations in Approved Document for Fire Safety (AD B). But there is flexibility in the building regulations and while the ADs offer one way of meeting the regulations' functional requirements, there are other options. Fire safety engineering solutions can help innovative building designs to meet the Building Regulations using an evidence-based approach rather than following AD B recommendations.

Take ventilation for example, an important sustainability issue. More ventilation options are often available when air flow through the building is unrestricted, but AD

B recommends limiting open space by including fire rated construction to reduce the spread of fire. However, through the application of BS 7974, 'The Application of fire safety engineering principles to fire safety design of buildings' and discussions early in the design process it may be possible to meet criteria for both by using performance-based fire engineering solutions.

This reflects the fact that building sustainability and fire safety can complement each other, rather than conflict with each other, if the two disciplines engage in meaningful dialogue early in the design process.

Awareness and engagement

By being aware of new developments in sustainability, fire safety professionals can flag up areas where more research would be helpful.

For example, concerns expressed by insurers over the fire performance of new building methods led to the development of LPS 1501 – Fire test and performance requirements for innovative methods of building construction. This is a new Standard that provides a means of assessing the performance of novel forms of building systems, which have no proven track record of performance in fire. It has been developed by BRE Global, in collaboration with key industry stakeholders, to enable LPCB certification of innovative building systems in different building types, such as offices, hotels and schools.

The Standard's primary objective is to provide insurers, fire services and regulatory authorities with evidence that innovative building systems can maintain acceptable levels of fire performance in the event of a fire. It covers a range of building types and applications by defining alternative nominal fire loads and floor loading depending on the intended use of the building.

LPS 1501 identifies modes of failure that might prevent specific forms of construction (such as modular or panellised systems) from achieving the presumed performance in fire, based on the regulatory compliance of structural elements with current standard testing and assessment. Potential weak links include the premature failure of connections or a breach in compartmentation due to inadequate fire stopping.

Fire test

LPS 1501 provides a performance and classification system for modern buildings based on the results of a full-scale fire test. The test is carried out in a purpose-built fire test building. It demonstrates the performance in fire of innovative building systems in relation to the interaction between floors and walls, fire stopping around openings and the correct functioning of cavity barriers.

The current standard fire test procedures for elements of construction, which are required for building regulation compliance, do not generally consider interactions between different elements or the performance of the system. To assist with regulatory compliance and to provide information in a language understood by many building professionals, the severity of the natural fire exposure is evaluated with respect to an equivalent period in a standard fire test. The equivalent period of fire resistance will be determined either by calculation or direct measurement or a combination of the two. Performance is classified with reference to grades relating to the specific purpose group(s) against which the construction system has been assessed.

The introduction of LPS 1501 provides a credible property based fire performance test for innovative methods of construction. Specification of LPS 1501 approved building systems gives fire services, regulatory authorities and insurance companies in the commercial property sector, a high degree of confidence that the buildings in question achieve satisfactory levels of fire performance – over and above that required for compliance with the minimum standards of the Building Regulations for life safety.

Engagement between professions is going to be the key to ensuring that sustainability is achieved in a safe way. Events like the one held in April 2011 organised by the Institution of Fire Engineers (IFE), the Royal Institute of British Architects (RIBA) and the Chartered Institute of Architectural Technicians (CIAT) at BRE will continue to promote inter-disciplinary consultation and joint consideration of fire and sustainability.

*‘*Fire performance of structural insulated panel systems’* (IP 21/10), by Tom Lennon of BRE, is available from www.BREBookshop.com.

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