



# RESEARCH IN SUPPORT OF THE DEVELOPMENT OF FIRE SAFETY ENGINEERING IN THE UK – A BRE PERSPECTIVE

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## INTRODUCTION

An engineering profession can be said to require four main facets to function:

1. A professional institution with a code of ethics
2. Appropriate codes and guidance
3. A critical mass of academically qualified practitioners and
4. A body of scientific research

With the Institution of Fire Engineers, the Approved Document to Part B of the Building Regulations, Fire Safety Order guides, British Standards and other fire engineering guides, such as BR187, and several hundred fire registrants of the Engineering Council, much of the first three is in place. Equally, there is a body of fire science that underpins much of the guidance and current fire safety engineering practice. However, for a professional engineering discipline to continue, all four aspects require an ongoing effort. This paper illustrates the need for continual scientific research by reviewing fire safety engineering research sponsored by the BRE Trust.

### **BRE Trust**

The BRE Trust is a research and education charity for the public benefit. All of the companies owned by BRE Trust contribute their profits to supporting the Trust's mission...

#### **to champion excellence and innovation in the built environment**

BRE Trust achieves this by funding and managing a strategic research programme and publications programme in the built environment sector. By 2004 BRE Trust was supporting about 50 research projects and nearly 20 PhD scholarships, and had committed more than £4 million in funds.

This Partnership is developing centres of excellence at five UK universities in built environment topics. For Fire Safety Engineering, the centre is based at the University of Edinburgh.

While working in different fields, each Centre and associated Research Chair will have some common objectives, including:

- Seeking and promoting new areas of research and innovation
- Fostering cross disciplinary and other programmes to benefit industry
- Providing innovative programmes of education and continuing professional education

Increasingly, the BRE Trust is seeking to fund work through collaborative projects where funding can be leveraged from additional sources to deliver more substantive outcomes. One such new project that is currently under development is focussed on the issues associated with timber-frame construction in both the construction and post construction phases.

## **RECENT FIRE SAFETY ENGINEERING RESEARCH**

There are typically two main types of research project, research projects undertaken collaboratively by BRE Global staff and research undertaken through PhD studentships at University. Some of the projects that have been funded over the last four years include;

- Fire performance of biocomposite construction products
- Spill plume analysis
- Fire safety issues related to high rise and super rise buildings
- External cladding systems
- Performance and analysis of fire protection coatings for steelwork
- Glazing in FSE design
- Water mist fire protection systems in different occupancies
- Smoke visualisation
- Evacuation of highly dependent people from buildings
- External fire spread modelling
- Real time flame spread prediction using sensor inputs
- Model assisted Fire Risk Assessment
- Assessment of fire damaged concrete structures
- Firegrid

The following are projects that are currently in progress;

- Material flammability assessment
- Super-real-time Prediction of Fire and Egress for Emergency Response
- Behaviour of damaged structures in fire
- Behaviour of a nuclear containment structure under fire
- Sensor-assisted support tools for live evacuation
- Phase change materials – real metrics
- Fire retardants – environmental impact versus fire performance

This paper will focus on the outcomes from three of these projects in more detail.

- Fire safety in high and super high-rise buildings
- Fire behaviour of glass and its implications for fire safety engineering
- Evacuation of highly dependent people from buildings

### **Fire safety in high and super high-rise buildings**

A number of high profile UK and international fires has highlighted a need gain further understanding of the nature of fire risk in high and super high-rise buildings. This project will allow fire safety engineers to make more informed decisions in the selection and performance specification of fire safety systems for new and existing high and super high-rise buildings.

## **Fire behaviour of glass and its implications for fire safety engineering**

Feedback from the building industry and fire safety engineers indicated that there was a lack of awareness about the fire behaviour of glass and its implications for fire safety engineering. This project compiled a summary of the existing research base and identified areas requiring further research. It also illustrated the types of temperature/time curve that glazing systems in atria might typically experience and how that differed from the standard fire resistance test.

## **Evacuation of highly dependent people from buildings**

There have been a number of fires where evacuation times have been extended and/or the evacuation of some occupants has been difficult if not impossible in the time available. This project collated a range of information and data to help inform fire engineering of buildings containing highly dependent people. An important by-product of the research was information on infection control and manual handling to help encourage and support the undertaking of evacuation trials by NHS and other hospitals and healthcare premises.

## **CONCLUSIONS**

To thrive, an engineering profession requires a body of scientific research. Changes in the design and use of buildings, recent fire experience and advances in other areas of research all lead to an ongoing need for research. These drivers are illustrated via a small sample of fire safety engineering research projects sponsored by the BRE Trust and undertaken by BRE Global.

More information can be found in the document "BRE Trust Review 2009" published by IHS BRE Press and freely downloadable at;  
<http://www.bre.co.uk/filelibrary/BRETrust/AP279.pdf>