

Guide to the use of fire engineered designs in building projects

Technical guidance for building control surveyors, designers and architects



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Introduction

Fire engineered designs – designs that do not adhere to standard guidance such as Approved Document B or specialist codes such as the Department of Health’s Firecode or the Department of Children, Schools and Families’ Building Bulletin 100 – are becoming more common. Whilst

fire engineering can give designers freedom to select the most efficient design, there are many potential pitfalls and risks if the design process is not well managed. It could be that inadequacies in the fire-engineered approach are not uncovered until late in the design or during construction when remediation is costly.

Key to the successful and efficient execution of a development project involving fire engineering is detailed consultation between the design team and the approvals authorities. Design teams will often look for building control to become an active member of the design team. The appraisal of such designs requires a greater involvement and higher level of skills from building control than for schemes that simply rely on a standard design code.

Discussion

All fire-engineered design solutions commence with the selection of an appropriate fire scenario that could realistically occur. Likely fire growth rates are then calculated or estimated, smoke spread rates determined and heat transfer to structural elements calculated. Evacuation times are then calculated and compared with the time that conditions remain tenable in the building. The final stage is to establish the period of fire resistance needed to structural elements.

Calculations can range from spreadsheet calculations based on BS 7974, Eurocodes and other relevant literature, to detailed computer simulations of fire growth and heat transfer, together with real time simulations of people movement. Good fire-engineered design will take the needs of fire safety into account at every step of the design process. It does not rely on simply adding fire protection measures to a design that does not, of itself, provide adequate levels of fire safety.

In practice it is rare for all aspects of a design to be “fire-engineered”. It takes significant effort to assemble a safety case from basic principles. Design teams will often decide this is only justified where standard codes are felt to be particularly inflexible, restrictive or inappropriate. The design team should be put together at an early stage in the design process, and will look to involve all stakeholders in the consultation process. Depending on the nature of the project, any or all of the following could be involved:

- Developer
- Future owner(s) and tenant(s)
- Architecture and engineering team

- Building control
- Fire and rescue authority
- Other approvals bodies such as English Heritage or the HSE, and trades union representatives for the staff who will work in the building when it is completed.

The main guidance on fire engineering in the UK can be found in the BS 7974 suite of documents. PD 7974-0:2002 recommends that a design process involving fire engineering should follow a structured process with the following four stages:

- Qualitative Design Review (QDR)
During this stage the design team and approvals authorities agree the design approach and the criteria against which the design should be assessed.
- Quantitative Analysis
The actual calculations are carried out.
- Assessment of the design against the agreed objectives
The results of the calculations are compared with the agreed success and failure criteria.
- Reporting of the results
Building control will normally be involved in the first stage and in the appraisal of the final report.



Include building control as an active member of your design team

The QDR has crucial importance for the efficient conveyance of the design process. It is at this point that stakeholders will agree the calculation methods that are to be used and the criteria against which the design should be assessed. They will identify the input data and ascertain whether the design should be reviewed by an independent third party.

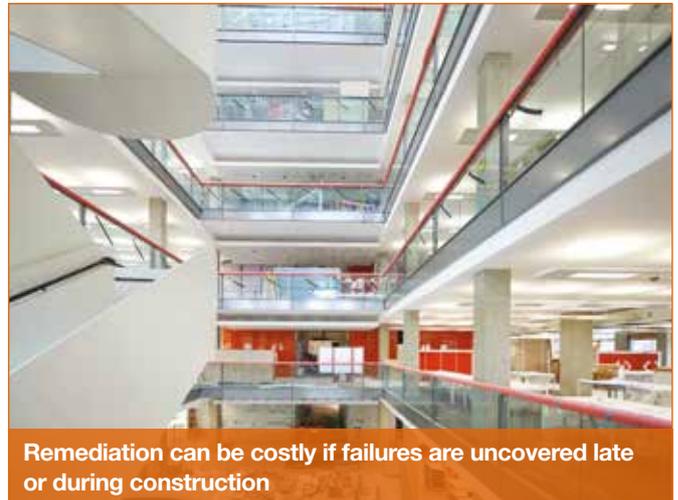
It is advisable for the design team to ensure that all stakeholders are satisfied with the design plan at the outset, as in all likelihood different stakeholders will have different requirements that have to be met before the scheme is acceptable.

The QDR will normally address:

- locations of fires that should be assumed, fuel loads, fire growth rates, etc;
- assumptions that will be made about the occupants of the building and the building's management. What analysis methods will be used to determine fire growth, smoke spread, behaviour of structural elements and behaviour of people (e.g. calculations based on BS 7974 or more complex computer simulations);
- safety factors and margins that should be included in the analyses; and
- the exact criteria against which it will be decided if the design should be accepted (e.g. the definition of what conditions are

considered tenable for escaping occupants or the point at which structural elements are assumed to fail).

If the four-stage process outlined above is followed and building control is invited to take an active role as a partner to the design team, then the project risks can be minimised. This will enable the project to be efficiently executed through to completion, and the required levels of fire safety can be built into the design from the outset.



Key points to consider

- Whilst fire engineering can give designers freedom to select the most efficient design, design teams should include building control as an active member of the team
- The design process should follow these stages - Qualitative Design Review; Quantitative Analysis; Assessment of the design against agreed objectives; Reporting of the results
- Ensure that all stakeholders are included in the design team and that they are satisfied with the design plan at the outset

Further guidance

- BS 7974:2001 Application of fire safety engineering principles to the design of buildings. Code of practice
- PD 7974-0:2002 - Application of fire safety engineering principles to the design of buildings. Guide to design framework and fire safety engineering procedures
- Approved Document B http://www.planningportal.gov.uk/uploads/br/BR_PDF_ADB1_2006.pdf

LABC is a membership organisation representing all local authority building control teams in England and Wales who work with industry and building professionals to ensure compliance with Building Regulations. We are a not-for-profit organisation dedicated to promoting public sector expertise.

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