Poor workmanship does more than fail to meet Regulation 7 – it puts lives at risk.

Ciara Holland, Martin Shipp and Dr David Crowder of BRE Global make the case.

Part B of Schedule 1 of the Building Regulations, along with other parts of Schedule 1, is solely concerned with the protection of life. BRE Global's investigations of real fires have demonstrated that, overall, the Building Regulations and guidance in Approved Document B (AD B) on fire safety are working in respect of safeguarding lives from fire risks in buildings.

However, for a number of years, disproportionate damage to properties by fire has regularly been attributed to failure to meet Building Regulation requirements. In many cases, these failings have resulted from poor design and/or workmanship. In the authors' opinion, failings due to poor workmanship are a breach of Approved Document Regulation 7 of the Building Regulations.

Drawing on its latest fire investigation work, BRE Global is seeking to remind the industry about the implications of poor workmanship and the impact of inadequate design and construction in real fire scenarios.

Legislative requirements of Regulation 7

Regulation 7 states:

"*Building work shall be carried out –*

- *a) with adequate and proper materials which –*
  - *i. are appropriate for the circumstances in which they are used,*
  - *ii. are adequately mixed or prepared, and*
  - *iii. are applied, used or fixed so as adequately to perform the functions for which they are designed; and*
- *b) in a workmanlike manner.*"

Approved Document Regulation 7 also stipulates that those responsible for building work *"must ensure that the work complies with all applicable requirements of the Building Regulations"*. This extends to the agent, designer, builder and/or installer, and potentially the building owner who can be served with an enforcement notice if the building does not comply.

Clearly, many of the fire protection features in a building will necessarily be concealed within the structure. Defects are generally not easy to identify and may only be highlighted after a significant event such as a fire. Even if enforcers become aware of defects, it is difficult to determine with certainty what constitutes poor workmanship.

However, fire risk assessments introduced under the Regulatory Reform (Fire Safety) Order 2005 have resulted in the identification of construction defects, especially in passive fire protection between compartments.

It is an issue that has been making headlines recently. There have been reports of schools and hospitals being temporarily or partly closed due in part to inadequate fire protection, as owners recognise that lives are being put at risk. Being public buildings subject to public scrutiny, these types of asset will tend to draw attention. But in BRE's experience, poor workmanship is an issue across all building stock and all construction managers should be mindful of this.

Case study evidence

One of the earliest reported instances of fatalities due to poor workmanship was a hotel fire in Aviemore, Scotland, in January 1995.

The incident was a primer for the fire industry to address issues concerning poor installation of passive fire protection. It led, in part, to the publication in 2003 of the first best practice guidance for passive fire protection by the Association for Specialist Fire Protection. Updated in 2014, "Ensuring best practice for passive fire protection in buildings" is now in its second edition.

Out of 69 fires attended by BRE's Fire Investigation Team over the past 10 years, the spread of fire in 21 cases was attributed, in some part, to issues with poor design and/or workmanship. Among the 21 fires were five near misses, one incident involving more than one fatality, and one resulting in a single fatality. The following case studies are typical of the investigations into the 21 fires.

Case study 1 – Block of flats, December 2008

A fire was discovered in a basement car park of a block of flats with four accommodation storeys above at around 04:00. The cause of the fire was undetermined but fully involved two cars. Smoke and flames from the fire spread to the upper floors of the building due to poor fire stopping of penetrations in the concrete slab between the car park and the upper floors (Figure 1). The fire burned through the floor above, via a poorly fire-stopped soil pipe, into a bedroom of one of the flats where the bed caught fire with the resident asleep in it. The inadequacy of the fire stopping was attributed to poor workmanship as some fire stopping around penetrations was effective. Three people suffered smoke inhalation and one sustained a broken ankle. Ten other people were rescued by the Fire and Rescue Service.

Figure 1 – Hole burned through floorboards between the car park and block of flats above

Case study 2 – Block of sheltered flats, October 2011

A fire started in a first floor flat of a two- and three-storey block due to a fault in a television. The fire spread from the flat of fire origin out of a window and entered the roof void above via the eaves. Once in the roof void, the fire spread unhindered due to inadequate cavity barriers used for compartmentation, this being attributed to poor workmanship. Figure 2 shows the extent of damage to the roof. Due to the lightweight construction of the roof timbers, collapse of the roof structure occurred early on in the incident which forced withdrawal of fire crews before they could complete rescue operations. One elderly female resident died in the bedroom of a flat located two doors along from the flat of fire origin. It is understood the woman suffered from some degree of mobility impairment, which was typical of the residents in the property. An undetermined number of other residents were understood to have become trapped in their flats and required rescue by the Fire and Rescue Service.

Figure 2 – Extent of damage to roof structure

Case study 3 – Block of flats, March 2015

A fire in a four-storey purpose-built block of flats was discovered at around 00:38. The building comprised four flats on each floor and was constructed in the 1990s from timber frame with predominantly brick cladding. The fire started in a cavity wall on the ground floor, spreading horizontally and then vertically upwards to the second and third floors and into the roof space where it burned through part of the roof. Cavity barriers were in place horizontally between floors; however, the oriel window detail at the front of the property (Figure 3) did not have any cavity barriers either vertically or horizontally. These missing cavity barriers created a route for fire spread up the building. There were no reported injuries but 33 residents were evacuated as a precaution. The cause of the fire is understood to have been due to an electrical cable arcing on a plasterboard fixing in the wall cavity.

Figure 3 – Front elevation of block of flats. The building façade was left unstable as a result of the fire

Understanding the causes, identifying solutions

BRE has recently published a series of reports highlighting issues of poor workmanship affecting fire behaviour in specific areas: roof voids, external facades and balconies. *(Links to these at end of this article.)*

These issues frequently arise where fire spread has been a factor. But while the evidence indicates the reason for the fire spread, the root cause is not always readily apparent.

For example, inadequate fire-stopping in roof voids has resulted in fire spread beyond the compartment of fire origin because, among other reasons, it has not been continued to the underside of the roof covering.

Though this constitutes poor workmanship in a broad sense, we should be asking the questions “Why?” and “What led to the poor workmanship?”. An understanding of the answers to these questions will hopefully lead to solutions and eventually an improvement once these solutions are implemented.

There are a range of commonly encountered problems and causes of disproportionate loss in building fires. Those most typically observed at fire scenes are:

- Fire-stopping at a compartment/party wall not continued to the underside of the roof covering.
- Cavity barriers moved after installation.
- Cavity barrier/fire-stopping not fit-for-purpose.
- Cavity barriers not installed.
- Inadequate fire-stopping around gaps for service penetrations.
- Fire-stopping absent.

Figure 4 summarises possible solutions to the main types and causes of these problems.

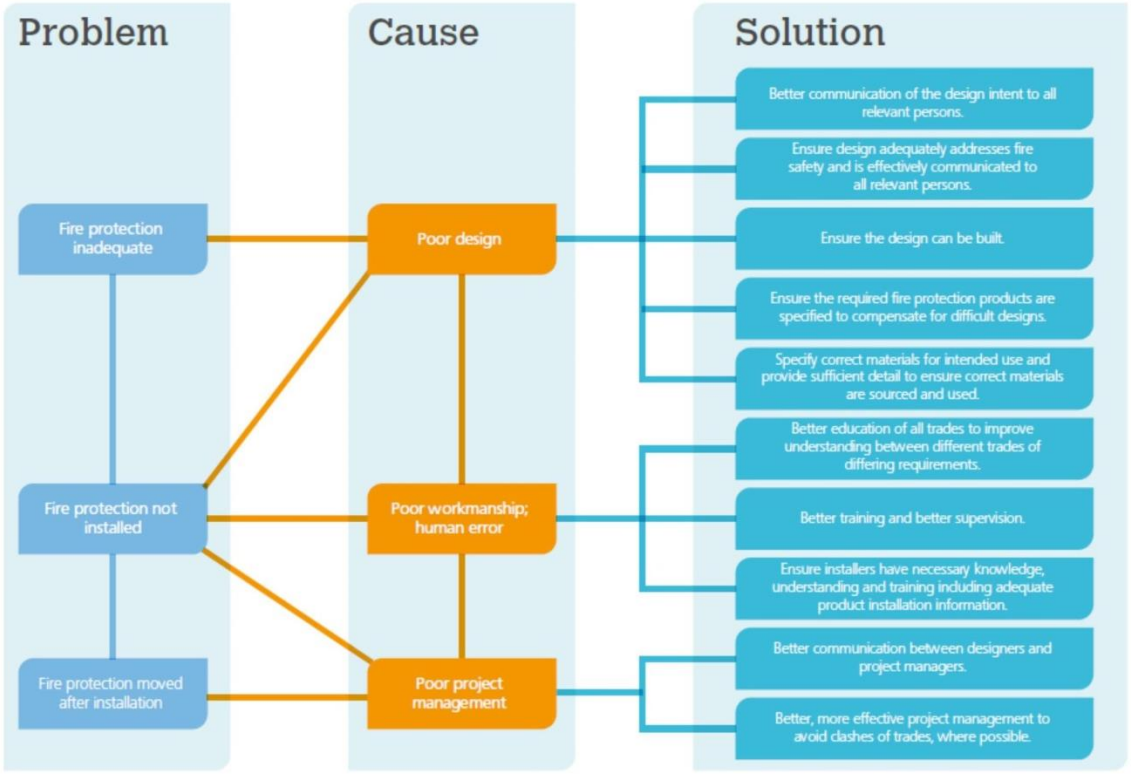

Figure 4 – Summary of possible solutions to commonly encountered problems and causes of fire spread

Approved Document Regulation 7 offers some guidance on ways to establish adequacy of workmanship:

- For CE marked products the relevant European Technical Assessment or harmonised product standard;
- Standards such as BS 8000-0: 2014 'Workmanship on construction sites. Introduction and general principles';
- Independent (ie 3rd party) certification schemes for installers;
- Management systems such as BS EN ISO 9000: 2015 'Quality management systems. Fundamentals and vocabulary';
- Past experience;
- Tests - recognising that this last point is not currently directly relevant to fire safety.

Wake-up call on workmanship

The BRE reports referenced here highlight the need for careful consideration in the design, construction, maintenance and on-going use of a building to protect lives from fire risks.

What is clear is the need for better education of, and communication between, all construction professionals, not just fire protection professionals, as well as the need for good design and management. Improvement in these areas will aid better workmanship in buildings and reduce the likelihood of fire-related deaths in the future.

ENDS

BRE reports referred to in this article are available online:

[1] https://www.bre.co.uk/filelibrary/Fire%20and%20Security/FI---Fire-compartmentation-in-roof-voids-Feb-15.pdf

[2] https://www.bre.co.uk/filelibrary/Fire%20and%20Security/FI---External-Fire-Spread-Part-1.pdf

[3] https://www.bre.co.uk/filelibrary/Fire%20and%20Security/FI---External-Fire-Spread-Part-2.pdf

[4] https://www.bre.co.uk/filelibrary/Fire%20and%20Security/FI---Fire-safety-and-balconies-July-16.pdf

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