bafsa

Information File

Retrofitting Sprinkler Systems

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Introduction

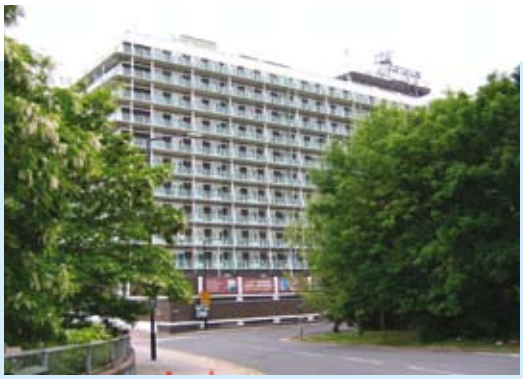
An increasing number of automatic fire suppression systems are being installed into a wide range of buildings. They are being installed for a number of reasons:

- In the conversion and refurbishment of buildings to a new use (ie offices to residential flats)
- To permit relaxation of building regulations requirements (ie open plan flats, loft conversions, care homes)
- To enhance the protection of residents in care facilities, sheltered housing and flats
- To address shortcomings in other fire protection measures
- To provide protection for the heritage buildings and their contents
- To reduce cost of the impact of fire to occupiers and building owners
- To provide protection for fire and rescue personnel
- As a business continuity or resilience measure

The wider use of sprinklers and water mist systems is due in part to an increased awareness of the benefits in protecting buildings and occupants and also the life-long cost effectiveness of these systems in comparison with other fire protection measures.
Advances in technology have also assisted. For example, the availability of modern materials such as CPVC piping and other lightweight materials that do not require hot working, help in minimising the equipment required for installation and the disruption to occupants. These materials are also easier to handle and reduce the installation time over more traditional materials.
This document addresses the benefits of retrofitting sprinklers and references issues to be considered. It also provides evidence in the form of case studies.

Northampton House

Whilst retrofitting is more common, an early example from 2000 is the conversion of Northampton House, a former office block converted to residential flats. Northampton Borough Council Building Control Department and the Fire and Rescue Service agreed to the installation of a sprinkler system because there was a difficulty in complying with the requirement for two fire-fighting shafts. The main shaft could not be ventilated due to the lack of windows, and the



developer considered the cost of a roof mounted smoke extract system was too prohibitive since installing this would have led to the loss of one flat per floor.

The solution was to install a residential system designed to US standard NFPA 13R (this project predated the establishment of a British Standard). The installation has since proved its value following a fire in an occupied flat in July 2007 that was successfully extinguished and, it is believed saved three lives.

Considerations when undertaking retrofit of automatic fire suppression

There are a number of factors to take into account when considering the benefits and potential to retrofit a suppression system in to an existing structure or occupied building.
If the project is a refurbishment or conversion to a new use, the use of a suppression system can provide greater flexibility in the design and layout and possible reductions in the requirement for other fire safety measures.
Guidance is provided in part in Approved Document B of the Building Regulations and Scottish Building Standards' Technical Handbooks. As outlined below, further guidance is provided in *both BS9991:2011, Code of Practice for Fire Safety in the design management and use of residential buildings* and *BS9999:2008, Code of Practice for fire safety in the design, management and use of buildings*.

It is important that where such flexibilities are being considered that the authority having jurisdiction should be consulted.

Where consideration is being given to the installation of fire suppression systems it is important that those responsible for the building understand both the potential benefits and costs of the measures. At the same time, due weight must be given to both the initial and whole life costs of all the methods of complying with building regulations and fire regulations.

In addition to the enhanced protection of occupants (and firefighters) the direct and indirect cost of fire can be used as part of the business case for suppression systems. In most cases the fire is contained to the area or room of fire limiting the financial and indeed social impact of fire. Evidence from fires in an unsprinklered building suggests that the impact can be significant both in direct financial cost but also have significant consequences for occupants in residential premises and business in commercial premises.

Housing and social care organisations are installing suppression systems into a range of high and low rise social housing, including general purpose housing, sheltered housing and care homes. These systems are being installed to enhance the protection of residents and to address short comings in other fire protection measures. It is important that where a system is being installed that residents are consulted fully to understand how sprinklers work, how they will enhance the quality of fire protection and that the system is relatively easy to install with minimal impact whilst they are still in residence. Evidence from Callow Mount and a number of other projects can be used.

The use of automatic fire suppression systems is no longer novel and is detailed in BIF 3: *Fire Suppression Systems in Heritage Buildings*. Their use is often dependant on the ability to satisfy the requirements of fire safety legislation. In many cases the introduction of certain passive measures such as fire compartmentation or the upgrading of fire resistance of doors may not acceptable due to its visual impact nd irreversible damage to heritage fabric. Suppressions systems can be installed in such a way to be unobtrusive and without affecting the historic fabric or nature of the building. In addition to the life safety benefits they also ensure that the historic fabric and in many cases irreplaceable artefacts are protected from the effects of fire.

Standards for Installation

Sprinklers can be installed using any one of a number of accepted standards. In the UK, for non-residential buildings this is BS EN 12845 (2009). BS 9251: 2005 may be used for smaller residential and domestic buildings. Watermist systems should be designed and installed to BS DD 8458 (2011) for residential properties and BS DD 8489 (2011) for other properties.

Types of Systems

While there are a range of different types of sprinkler systems used in a range of premises it is considered that only wet systems should be specified in heritage buildings. These systems are the simplest, easiest to maintain and are also the most cost effective. Pipework can be in copper, steel, stainless steel or in CPVC (chlorinated polyvinyl chloride) which is approved for the purpose.

For more information on sprinkler systems refer to BIF 15, *Types of Sprinkler Systems*.

For information on watermist systems see BIF 9 *Water Mist* .

System Design and Installation

The high reliability and effectiveness of these systems has come about over the years by strict adherence to design standards. It would be wise to select a contractor who is not only capable and competent but who also has an established track record and who can offer proof of compliance with an established quality assurance system.

Full information on the various third party certification schemes can be found in BIF 20, *Third Party Certification*.

Water Supplies for residential and domestic systems

It is important to assess the pressure/flow requirements for the specific system and the appropriate sources of water supply. Where the pressure and flow available through the town water main is adequate this is the preferred method of supply. Alternatively it may be necessary to use booster pumps or tank and pump supply.

Full information on the water supplies can be found in BIF 13 *Water supplies to firefighting systems* and Appendix 1 to BAFSA Technical Guidance Note No 1 *The Design and Installation of Residential Sprinkler Systems*.

Conversion, Refurbishment and Relaxation of Building Regulations Requirements

Automatic water suppression systems have been specified in a number of refurbishment and conversion projects. Their use permits relaxation of the requirements for fire resistance, compartmentation, means of escape, travel distance, fire detection and alarm systems, separation distances between buildings and fire service access.

Approved Document B identifies some specific examples where relaxation will be approved if sprinklers are fitted. More detailed guidance on the level of relaxation can be found in two British Standard documents:

BS9991:2011, Code of Practice for Fire Safety in the design management and use of residential buildings

BS9999:2008, Code of Practice for fire safety in the design, management and use of buildings

These standards usefully provide alternatives to the technical solutions proposed in Approved Document B to the Building Regulations. They offer middle ground in terms of flexibility as they sit between Approved Document B (and the fully engineered approach of BS PD

7974:2001, *Application of fire safety engineering principles in the design of buildings, Code of Practice*).

Developers who have utilised sprinklers in the design of refurbishment projects have identified that they provide design freedoms, cost savings and as in the case of the example below ensure the project is more cost effective.

Information from developers and organisations such as housing associations suggests that the cost of installing sprinklers in refurbishment and conversion projects is in the region of 1 – 2 % of the total project costs.

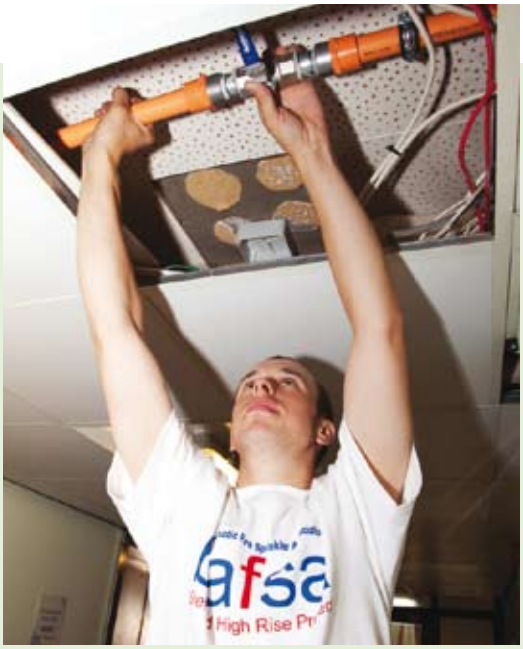
FM Office Refurbishment

When undertaking a refurbishment of their offices in the UK Factory Mutual retrofitted sprinklers at a cost of £10k per floor

Enhancement of fire protection in existing buildings

Since the introduction in October 2006 of the Regulatory Reform (Fire Safety) Order 2005, owners of residential premises including flats, care homes and sheltered housing have been required to undertake fire risk assessments of their properties. The outcome of many of these has been to identify shortcomings in the fire protection measures such as compartmental fire resistance, condition of fire doors and fire alarms. This and emerging evidence from a number of fire incidents supports the view that fire can spread within buildings where passive fire measures have not performed as expected either as a result of improper installation or to their having been damaged by the installation of building services.

In considering the outcome of fire risk assessments, building owners, fire risk assessors and the fire and rescue service should consider the effectiveness of fire protection measures to ensure they are 'fit for purpose' and assess the full life-costs of maintaining them. Any assessment of these measures should then be compared with the full life-cost of retrofitting sprinkler systems. Evidence from the BAFSA sponsored retrofit project to a high rise social housing block and a number of sheltered housing projects has provided both practical experience and identified potential costs.



The Callow Mount Sprinkler Retrofit Project

In recent years there have been a number of serious fires in high rise blocks that have resulted in occupant and firefighter fatalities. Following a major fire resulting in six deaths in 2009 in a social housing block, Lakanal House questions were asked about the potential benefits in protecting residents in such properties. In response, a Department for Communities and Local Government (CLG) report suggested that retrofitting sprinklers to such buildings would not be cost effective or practicable.

Members of the UK Sprinkler Coordination Group (SCG) had long held the view that retrofitting fire sprinkler systems in existing high-rise buildings would indeed be cost- effective. In 2011 BAFSA agreed to lead and manage a project to retrofit a system into an existing occupied high rise block to determine the real costs, both financial and societal, of retrofitting an automatic sprinkler system into an unprotected, older, high-rise social housing block while determining the problems of doing so and developing guidance which can be used elsewhere. Whilst sprinkler systems had been previously retrofitted to existing high-rise flats most notably in Ayr, the Callow Mount project would be the first to be conducted without decanting the residents.

The project sponsored by BAFSA undertaken in September 2011 retrofitted a sprinkler system in a 1960s high-rise block, 13 storeys high with 47 flats. The installation was completed in exactly four weeks without the need to decant the residents. Feedback from the residents was very positive indicating a high level of satisfaction with the quality of workmanship and the increased level of protection provided by the installation sprinklers.

The Callow Mount project also provided definitive evidence of the initial and full life-costs of installing sprinklers into this type of property. At 2011 prices the total installation cost was £55134 at an average of just under £1150 per flat. The full life-cost was estimated as being approximately £62000 resulting in an annualised cost of £2065 per year for the whole building.

Evidence from subsequent installations has confirmed that the costs attributed to Callow Mount are accurate.

Full details of the project can be found in the BAFSA publication 'Safer High-rise Living. The Callow Mount Sprinkler Retrofit Project.

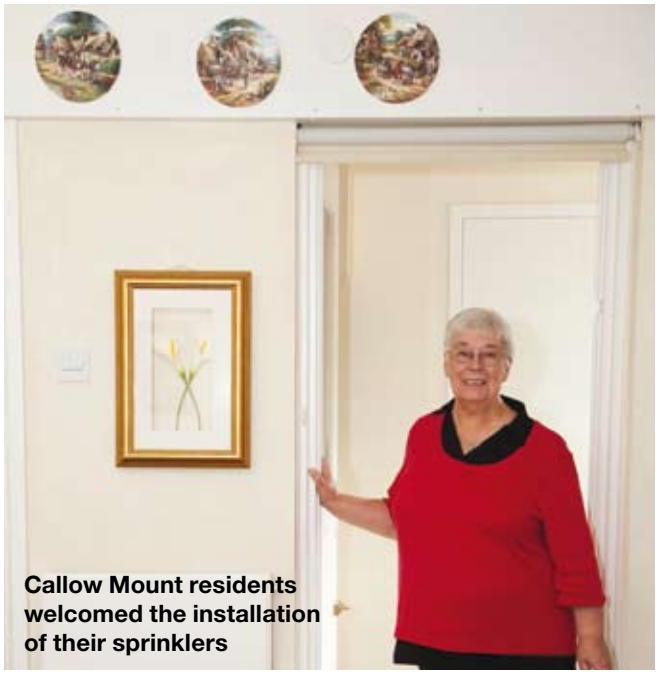
Since the publication of the Callow Mount project report a number of private and public sector social housing landlords have initiated projects to retrofit sprinkler systems in some of their high rise and low rise blocks such as the case study from Lewisham Homes below.

Lewisham Homes

Built in the 1970s the two storey block contains 26 flats and is utilised as extra care sheltered housing. In 2012 arisk assessment and full structural survey was carried out which raised a number of concerns with regard to the effectiveness of the fire protection arrangements. These included a common roof void, limited fire resistance at ceiling level and a significant number of breaches in the compartmentation following internal modifications and improvements.

In considering the possible remedial actions a cost/risk benefit was carried out which compared the cost of upgrading and reinstating the passive fire protection with the cost of retrofitting sprinklers.

Although the initial investment required indicated a lower cost for upgrading the passive measures, Lewisham Homes determined that in view of the full life- costs and enhanced safety provisions that they would install sprinklers to the property.



Callow Mount residents welcomed the installation of their sprinklers

Conclusions

A number of organisations have identified the potential benefits of retrofitting sprinklers and other suppression systems to their property portfolio. These include the protection of life for residents and visitors and reducing the risk to contents and the fabric of the building.

In addition they permit relaxation of the legislative requirements for other fire protection measures which in many older buildings are difficult to guarantee or would impact on the historic nature of the structure.

Installations can be carried out with minimum impact on and without the need to decant residents.
The initial and whole life costs of retrofitting of sprinklers can be cost effective in comparison with other fire protection measures.

Presented by

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