Never again: Sprinklers as the next step for safer homes
Call for evidence responses

Contents

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About Certsure

Certsure LLP is the largest UKAS-accredited certification body in the UK for electrical contractors. Over 36,000 registrants display our market leading brands; NICEIC or ELECSA and approximately 90% of the domestic electrical work in the UK is undertaken by a contractor registered with Certsure.

Launched in 2013, Certsure is a young organisation but our heritage and expertise date back to 1956. As a not-for-profit organisation, any surplus that we make goes back to supporting consumer awareness and understanding of electrical safety. We also promote the need for high standards of skill, training, assessment and competence across the industry.

Many of our contractors are involved in the installation of fire detection and fire alarm systems in domestic, commercial and industrial buildings. Because of this, Certsure welcomes the opportunity to respond to this call to evidence focusing on the areas where we feel we can add value.

Benefits of Sprinklers

1. In general, what advantages do buildings with AFSS installed, particularly residential buildings, have over buildings without these systems?

Certsure Response –

It is a preventative measure so that people can get out of their homes in the event of a fire occurring. It will also reduce the risk to fire fighters that are called to deal with domestic fires.

Evidence from the Welsh Government suggests that there has been no lives have been lost in the UK due to fire in buildings fitted with domestic sprinkler systems.

2. Which groups of people are more likely to benefit from the cost of installing AFSS than others?

Certsure Response –

The most like group to benefit would be the vulnerable, elderly and infirm who are less able to evacuate in the event of such an emergency. Additionally those with young and dependent children will derive benefit from the potential extended evacuation times.

Feasibility

3. What are the typical costs of installing a sprinkler system in a new-build flat or block of flats, and how much is this as a proportion of development cost? Are there mechanisms available to reduce these costs?

Certsure Response –

We are unable to comment as we have no experience in this sector.

4. How far is it feasible to extend the existing Building Regulations to mandate AFSS in new residential buildings with a height lower than 30 metres?

Certsure Response –

We are unable to comment as we have no experience in this sector.

Retrofitting

5. What factors do you consider necessary to justify installing AFSS in existing residential buildings?

Certsure Response –

Any such proposals may need to be considered where the building structure did not meet enhanced or current fire safety standards as well as looking at the cost benefit analysis.

Consideration would need to be taken as to whether the building would be sub-divided such that sprinklers were fitted in either common areas only or flats only or all areas.

6. What is the typical cost of retrofitting an existing residential flat with sprinkler systems? Are there differences between the private and public sectors?

Certsure Response –

We are unable to comment as we have no experience in this sector.

Technical issues

8. What are the main technical issues with installing AFSS in new residential buildings? Which issues are most likely to make AFSS unviable?

Certsure Response –

Consideration needs to be given to –

- Water supplies if using a wet system
    - Direct connection to the water mains
    - Boosted connection
    - Storage tank with legionella protection
    - Pressure tank
    - Separate unmetered supply
- Allowing sufficient space for the installation of an AFSS controls, pumps and the like to allow for operation and maintenance etc….

9. What is the general level of public perception and knowledge of sprinkler systems? How can these issues be addressed?

Certsure Response –

We feel that public perception is -

- Generally only used in commercial and industrial fire suppression systems
- Easy to set it off the sprinkler system by accident
- Aesthetics – ugly looking sprinkler heads in the home

This can be addressed by Government information via websites etc….. via FAQ's

10. How much power do local authorities and the Mayor have to impose more localised fire safety standards, including AFSS? Would more localised standards be desirable?

Certsure Response –

We are unable to comment as we have no experience in this sector.

EUROPEAN FIRE SPRINKLER NETWORK

A European Fire Safety Coalition

Response to London Assembly Planning Review
Installing Sprinklers in London's Buildings

December 2017

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European Fire Sprinkler Network

The European Fire Sprinkler Network (EFSN) is a membership organisation, with almost 100 members from 18 countries. They include fire services, local authorities, insurers, consultancies, laboratories, approval bodies, sprinkler manufacturers and installers. They share a desire to see an improvement in fire safety across Europe through the widespread use of fire sprinkler systems.

Benefits of sprinklers

1. **In general, what advantages do buildings with AFSS installed, particularly residential buildings, have over buildings without these systems?**

   AFSS activate when the ceiling temperature passes a threshold level, typically about 70°C. They operate while the fire is small and so relatively little water is needed to deal with it. As a result, far less damage is caused by the fire and by the water needed to extinguish it. Less smoke is produced and the water from the sprinkler system cools it, causing it to contract so that it no longer pumps through keyholes and around doors.

   As a result, people in other flats are much less likely to be at risk from smoke and fire spread. In addition, people in the room or flat where the fire starts have a much better chance of survival. In most cases, a sprinkler system will maintain survivable, albeit unpleasant, conditions even in the room where the fire starts.

2. **Which groups of people are more likely to benefit from the cost of installing AFSS than others?**

   Statistics show that the very young, the very old and people with disabilities are far more likely to die in a fire. These groups are more likely to benefit from sprinklers.

Feasibility

3. **What are the typical costs of installing a sprinkler system in a new-build block of flats, and how much is this as a proportion of development cost? Are there mechanisms available to reduce these costs?**

   Installers claim that the cost is about £150 per sprinkler, plus £300-500 for the water supply to the flat. In a one-bedroom flat there would typically be 5-6 sprinklers, 6-7 in a two-bedroom flat and 7-8 in a three-bedroom flat. With costs for monitoring of the system, the total is about £1,200-£2,000 per flat. According to a 2015 report for the Federation for Small Businesses[1], the average size of a flat is 75 m^2 and the typical build cost is about £1,200/m^2, or £90,000 per flat. Thus on average the sprinkler system costs about 1.8% of the development cost. Much of this cost can be offset against savings in other measures, such as reduced fire resistance and reduced compartmentation within the flat, allowing for open-plan layouts.

[1] Housing development: the economics of small sites – the effect of project size on the cost of construction. Report for the Federation of Small Businesses, BCIS, August 2015

4. **How far is it feasible to extend the existing Building Regulations to mandate AFSS in new residential buildings with a height lower than 30 m?**

   Given that this is being done in Wales, where all new blocks of flats are being sprinklered, the feasibility is proven. In Scotland since 2005 new residential buildings above 18 m have had to be sprinklered. There has not been any difficulty in doing so. For decades sprinklers have been required in all new blocks of flats in many jurisdictions in North America. Technically, there is no issue.

   In England, the Building Act and Building Regulations currently do not allow for any measures to be prescribed other than to ensure the safety of people in and around buildings. A cost-benefit analysis has shown that there is an economic case, based on lives saved, injuries prevented and reduced property losses, for fitting sprinklers in all new blocks of flats[2]. The only regulatory barrier is the regulatory impact assessment, which does not take a long-term view but solely looks at the impact on initial development costs. That said, if it is possible to have a height threshold at 30 m, it is also possible to have one at a lower height. The evidence is that all new flats and care homes should be fitted with sprinklers.

Retrofitting

5. **What factors do you consider necessary to justify installing AFSS in existing residential buildings?**

   I believe we should first show that it is technically feasible to install AFSS in existing buildings. This is now proven in the UK, where hundreds of existing buildings have been fitted with AFSS. Systems can be installed without the need to rehouse occupants: a flat can be fitted with sprinklers in a day. Moreover the system can be installed using special, fire-resistant plastic pipe that can be quietly and cleanly cut to the required lengths. Given that:

   - it is technically feasible to fit AFSS (sprinklers) in existing residential buildings
   - the occupants need not suffer much inconvenience
   - it has been proven that sprinklers are highly reliable and reduce the risk of death or injury from fire by over 80%,

   the only remaining objection to fitting them is the cost. There is an economic justification for installing AFSS in new flats and care homes. The increased cost to fit sprinklers in existing flats and care homes is modest, typically 20%, and would not change the results of the cost-benefit analysis.

6. **What is the typical cost of retrofitting an existing residential flat with sprinkler systems?**

   Installers are fitting sprinklers in existing residential flats for £1,500-£2,500 per flat, depending on the number of bedrooms.

[2] Cost Benefit Analysis of residential sprinklers – prepared for the Chief Fire Officer's Association, BRE Global, report 264227, 1st March 2012.

7. **What are the main factors affecting the feasibility of retrofitting existing residential buildings with AFSS? Are there differences between the private and public sectors?**

   It is always feasible to retrofit sprinklers. The main factors to consider are:

   - whether the mains water supply can deliver sufficient pressure and flow, or whether a pump must be installed to provide the necessary pressure, or a tank as well to provide enough water. Space must then be found for the pump, and if also needed, the tank. A route must be found for the sprinkler riser;
   - whether the pipe can be hidden above a false ceiling in the public areas and the flats or must be boxed in;
   - whether to fit a flow switch to every flat or just to each floor (the flow switch gives an alarm to let the fire brigade know where water is flowing – one per floor is the usual recommendation)

   It is easier to secure access to public sector flats than to private flats but with good communication, access to private flats can also be arranged.

Technical issues

8. **What are the main technical issues with installing AFSS in new residential buildings? Which issues are most likely to make AFSS unviable?**

   In new residential buildings the main technical issues to consider are:

   - whether the mains water supply can deliver sufficient pressure and flow, or whether a pump must be installed to provide the necessary pressure, or a tank as well to provide enough water. Space must then be found for the pump, and if also needed, the tank. A route must be found for the sprinkler riser;
   - whether the pipe can be hidden above a false ceiling in the public areas and the flats or must be boxed in;
   - whether to fit a flow switch to every flat or just to each floor (the flow switch gives an alarm to let the fire brigade know where water is flowing – one per floor is the usual recommendation);
   - what to monitor in the system

   There are no issues which would make AFSS unviable in new care homes and flats. In new houses if a pump and tank are required it can be difficult to find space for them, and the cost can more than double the total cost of the system. However, in most cases the water main supply will be adequate for the sprinkler system in a house, as long as the connection is at least 32mm in diameter and the water meter is either of a design that causes little reduction in pressure, or is waived for the sprinkler system. In larger buildings such as blocks of flats a pump and tank do not add significantly to the overall cost of the sprinkler system. Water mist systems cannot be supplied from the water main and will always need a dedicated tank and pump, although the tank is smaller and takes less floor space than a sprinkler system tank, if one is needed.

9. **What is the general level of public perception and knowledge of sprinkler systems? How can these issues be addressed?**

Everyone has heard of sprinklers but because of misportrayals in films and on television almost everyone has the wrong idea about how they work. It is widely assumed that they react to smoke and that when one operates, they all operate. Instead each sprinkler responds mechanically to heat. They are not linked. Only the sprinkler that gets hot will operate and fire brigade statistics show that in 65% of fires only one sprinkler operated. Smoke, dust or water vapour, which can cause smoke alarms to operate, do not cause sprinklers to operate. For each retrofit project it would be very helpful to communicate beforehand with the residents and organise an information session to explain how sprinklers operate. The fire brigade is usually happy to assist by providing a speaker. Residents should also be given literature to take home. Councillors should also attend a session, since they are making decisions and too many still hold these misperceptions.

10. **How much power do local authorities and the Mayor have to impose more localised fire safety standards, including AFSS? Would more localised standards be desirable?**

    We are unsure how much power the Mayor and local authorities have in this matter but suggest that the Mayor and local authorities have considerable power over planning and may be able to exert influence there when it comes to new, private buildings. They also are responsible for many care homes and social housing, so can take decisions for those buildings. When it comes to new and existing private housing, the Mayor and local authorities, working with the fire brigades, can exert pressure by having a policy to fit sprinklers in their buildings and publicly shaming private housing providers who only provide the legal minimum in fire safety. They could also publicise lists of private blocks of flats in their areas which have sprinklers, the implication being that any building not on the list is inadequately protected from fire. Journalists can help to publicise the failings.

Essex County Fire & Rescue Service Response to - London Assembly Planning Committee review - Installing sprinklers in London's buildings

Benefits of Sprinklers

1. In general, what advantages do buildings with AFSS installed, particularly residential buildings, have over buildings without these systems?

- Control and suppress fire size/development
- Restrict fire spread to one compartment/room
- Additional protection to the most vulnerable
- Give additional reassurance to occupiers

2. Which groups of people are more likely to benefit from installing AFSS than others?

- The most vulnerable i.e.
    - Young and elderly
    - People with mobility or sensory impairment
    - People with addictions
    - Learning difficulties

Feasibility

3. What are the typical costs of installing a sprinkler system in a new-build flat or block of flats, and how much is this as a proportion of development cost?

- Unsure would be best asking Sprinkler companies. Referencing BAFSA guidance it states between 2 - 4%

Are there mechanisms available to reduce these costs?

- Yes with better close positive working between water authorities.
- The utilising of existing pipe work i.e. dry/wet risers
- Joint working/design between sprinkler manufacturers
- Early consideration for installing sprinklers at the design stage.

4. How far is it feasible to extend the existing Building Regulations to mandate AFSS in new residential buildings with a height lower than 30 metres?

- I believe this is the case in Wales & Scotland to buildings > 18m therefore very feasible.

Retrofitting

5. What factors do you consider necessary to justify installing AFSS in existing residential buildings?

- Used to house vulnerable persons (for examples see Q2)
- History of fires at the premises

- Used to house residents with limited mobility
- High-rise premises
- Existing problems in achieving fire safety
- Potential risk to firefighter safety

6. What is the typical cost of retrofitting an existing residential flat with sprinkler systems?

- Referencing the BAFSA "Safer High-rise Living – The Callow Mount Sprinkler Retrofit Project", £1,150 per flat.
- Projects within Essex have shown a variation of costs dependant on size/number of flats, water supplies, type of finish. Cost has ranged from £2,260 to £3,500 per flat, included common areas, rubbish storage and redecorating.

7. What are the main factors affecting the feasibility of retrofitting existing residential buildings with AFSS?

- Disruption to occupiers
- Securing water supplies
- Getting agreement & cooperation from occupiers and owners/tenants.
- Funding

Are there differences between the private and public sectors?

- The private sector is generally profit driven whereas the public sector is generally service led.
- The public sector once agreement reached are easier to work with and will consider installation in a wider portfolio of properties.
- Individual private owners/tenants in a development are more difficult as there are far more opinions and beliefs to win over.

Technical issues

8. What are the main technical issues with installing AFSS in new residential buildings?

- I believe there are no technical issues, in a new build, if the suppression is built into design from the start, in fact savings could be achieved due to relaxations once Sprinklers are fitted and more flexibility for the designer.
- Water suppliers need to be engaged early in design to ensure correct; pipe sizing, pressure, flow rate, etc.

Which issues are most likely to make AFSS unviable?

- Cost reducing Profit.
- Perception of how the systems operate and aesthetic concerns.
- Inadequate water supplies.

9. What is the general level of public perception and knowledge of sprinkler systems?

- Very limited
- Often led by television/cinema showing incorrect operation and use of suppression.

How can these issues be addressed?

- Fire Services across the world are already trying to educate the public
- Government investment in the form of media coverage would assist

10. How much power do local authorities and the Mayor have to impose more localised fire safety standards, including AFSS? Would more localised standards be desirable?

- Changes in legislation which affect Fire Safety Standards should be nationally introduced not localised, a move which was imposed by Government and cemented by the introduction of "The Regulatory Reform (Fire Safety) Order 2005" bringing about the replacement of local acts.

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The Effectiveness and Economic Viability of Requiring Automatic Fire Suppression Systems (sprinklers) in all London Buildings

Benefits of Sprinklers

1. **In general, what advantages do buildings with AFSS installed, particularly residential buildings, have over buildings without these systems?**
   An initial examination of the frequency of fires in listed buildings showed that there is an increased risk of having a fire.
   The study shows that the risk is nearly 3 times greater in a listed building than in a non-listed building.
   The provision of AFSS in listed residential buildings will not only help to save lives, but has the added benefit of protecting the heritage asset for the enjoyment of future generations.
2. **Which groups of people are more likely to benefit from the cost of installing AFSS than others?**
   The highest risk of death from fire was identified by the FSEC toolkit as single old persons and rented accommodation. These groups of people are most likely to benefit from AFSS

Feasibility

3. **What are the typical costs of installing a sprinkler system in a new-build flat or block of flats, and how much is this as a proportion of development cost? Are there mechanisms available to reduce these costs?**
   One of the most unpredictable costs on the installation of AFSS in buildings appears to be the charges made by water undertakings. Costs of between £1500 and £3000 per dwelling are typically quoted by installers of domestic/residential sprinkler systems. In a recent conversion of a Maltings into 36 flats in Bury St Edmunds, the sprinkler system cost £32000 (without connection to the water mains) out of a build cost in excess of £3million. Fixing the cost of joining the sprinklers to the water mains could reduce the overall cost by giving certainty
4. **How far is it feasible to extend the existing Building Regulations to mandate AFSS in new residential buildings with a height lower than 30 metres?**
   It is considered a good idea to require sprinklers to BS 9251 in all residential buildings

Retrofitting

5. **What factors do you consider necessary to justify installing AFSS in existing residential buildings?**
   See 1 and 3 above.
   Listed buildings could benefit from the sympathetic installation of automatic water suppression systems for the protection of the fabric and contents of the building, as well as being used as compensatory features permitting more sympathetic adaption of listed buildings for alternative uses.
   The activation of a AFSS in a dwelling as a cause of fire is likely to lead to more rapid repair to the dwelling and in many cases, the dwelling remains habitable post fire.
6. **What is the typical cost of retrofitting an existing residential flat with sprinkler systems?**
   Cost quoted by BAFSA as £1500-£3000 per unit.

7. **What are the main factors affecting the feasibility of retrofitting existing residential buildings with AFSS? Are there differences between the private and public sectors?**
   No comment

Technical issues

8. **What are the main technical issues with installing AFSS in new residential buildings? Which issues are most likely to make AFSS unviable?**
   The perception by designers, commissioners and occasionally even insurers of buildings of the danger of the risk of water damage. In fact, the accidental activation of AFSS systems is very rare. This needs to be balanced against the risk of fire and the damage caused by fire (environmental as well as to the building and contents.)
   Also that there is currently no legal requirement for AFSS in most residential buildings
9. **What is the general level of public perception and knowledge of sprinkler systems? How can these issues be addressed?**
   There is the widespread perception (mostly as a result of Hollywood blockbuster films) that once a sprinkler head operates, that all other heads in the building will also operate. Even a recent advert by an insurance company had a sprinkler system operating because of the use of a joss stick! This perception is held by many architects and designers of buildings too.
10. **How much power do local authorities and the Mayor have to impose more localised fire safety standards, including AFSS? Would more localised standards be desirable?**
    No comment

London Assembly Planning Committee AFSS Consultation response

Benefits of Sprinklers

1. In general, what advantages do buildings with AFSS (Automatic Fire Suppression Systems) installed, particularly residential buildings have over buildings without these systems?

1.1 An Automatic Fire Suppression System, such as a sprinkler system, is designed to control and extinguish fire, without human intervention, at an early stage following the start of a fire. AFSS plays no role in fire prevention and should not be seen as a panacea in terms of fire safety. AFSS should be considered alongside other systems and processes of fire control and building evacuation. The causes of fires especially faulty electrical appliances and power surges, increasingly common, require further research and prevention measures.

1.2 AFSS form part of the overall fire safety strategy along with other suppression systems and structural/finishing material measures. Sprinklers are designed to extinguish small Class A fires by preventing them from escalating, thus protecting the building structure but not the contents. They should NOT be used in cases of electrical fires, or oil fires, such as those that could occur in kitchens.

1.3 If the building has been designed and maintained correctly, the fire resistance is normally 30 minutes, which would allow enough time for the sprinklers to keep the fire restricted to its source. However, it should be appreciated that once a sprinkler head has been activated and extinguished the fire, it will continue to discharge water until it has been manually turned off. This is likely to result in water damage to the contents, and tenants often do not have contents insurance. The same will occur if the sprinkler head is activated by misuse or vandalism.

1.4 There is anecdotal evidence from the Fire & Rescue Service and from RICS members who have inspected buildings after a fire, that sprinklers fitted within individual apartments can contain fires within those apartments and prevent fire spread to the rest of the building. There is a need for a thorough assessment of all available data and, if necessary, to conduct new research.

1.5 Sprinklers within an apartment will not stop fire spread via the outside of a building fitted with combustible cladding, and combustible window frames; the latter potentially compromising compartmentation and fire-separation of flats as much as combustible cladding.

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1.6 Sprinklers could be effective at stopping a fire, which starts internally from spreading to the outside.

1.7 There may be little advantage in terms of life safety other than reducing the risk, which due to other factors may already be very low, although by limiting smoke there could be an effective life safety element, and there is an advantage in terms of preserving the building.

1.8 There may be an advantage in terms of lower insurance premiums, as buildings' insurers are likely to rate the fire risk of a building fitted with AFSS as lower and reduce insurance rates accordingly.

1.9 According to the National Fire Chiefs' Council (NFCC), when sprinkler systems have been in operation:

1.9.1 Fire deaths (including firefighter deaths) have been almost eliminated;
1.9.2 Fire injuries have been reduced by 80%;
1.9.3 Significant improvement in firefighter safety has been achieved;
1.9.4 Property damage has reduced by over 80%;
1.9.5 The effect of arson has been reduced, particularly in empty buildings overnight such as schools.
1.9.6 There has been a reduction in the environmental impact of fire;
1.9.7 There has been a reduction in the economic cost of fire.

1.10 There is also the perception amongst the public, including building occupiers and investors, particularly post-Grenfell, that a building fitted with AFSS is safer and therefore more likely to be acceptable to residents, owners and investors. There is anecdotal evidence that some banks are already looking at whether or not to lend on high rise and higher risk buildings without AFSS.

2. Which groups of people are more likely to benefit from the cost of installing AFSS than others?

2.1 In general, people with reduced mobility who would not be able to exit a building quickly in the event of a fire (where a simultaneous evacuation policy exists) are the most likely to benefit. This would include care homes and hospitals, but in general, in residential premises, it is assumed that the majority of occupiers are not of impaired mobility.

2.2 Investors and owners of buildings and apartments with AFSS fitted may benefit from a more sustainable valuation of their assets, as buildings without AFSS, particularly high rise, higher risk buildings, may in time suffer lower valuations due to lower market demand.

2.3 Sprinklers are mandatory in many multi-storey commercial buildings, which are arguably a lower-risk category because occupants are generally awake.

Feasibility

3. What are the typical costs of installing a sprinkler system in a new-build flat or block of flats, and how much is this as a proportion of development cost? Are there mechanisms available to reduce these costs?

3.1 The cost of providing AFSS in a residential building will vary considerably, and is dependent upon the design, layout, height and construction of the building. There is usually a general cost for the infrastructure (tanks etc) plus a cost per sprinkler head which is dependent on the number of apartments and the number of rooms in each apartment. Other factors impacting upon the cost are:

- Size of building
- Compartmentalisation
- Sprinkler zones
- Area of coverage [ie do Landlord areas have sprinkler protection? Basements?]
- Type of system [ie many residential buildings use the Boosted cold water system, however some still specify a Standalone sprinkler system]

3.2 The cost efficiency of AFSS generally increases with the size of the building. The Business Sprinkler Association produces guidance on costs generally.

3.3 The RICS has provided an indicative range of benchmark costs below, for the purposes of which it has been assumed that the entire building will have sprinkler protection via a dedicated sprinkler system and that individual Apartments will be

fitted to a sprinkler head density of 1:10m2. It has also been assumed that the building will be larger than 10,000m². For smaller buildings, the cost per m² will increase.

Shell & Core - £30-40 per IPMS-2/GIA (Gross Internal Area) m2
Fit Out - £25-31 per IPMS-3 /NIA (Net Internal Area) m2

[Note: the above costs are net of VAT but inclusive of main contractor prelims, OH&P and installation. These costs are indicative only, and must not be relied upon for individual buildings which will require a full survey and a cost plan produced].

3.4 Installed AFSS include both sprinkler systems and misting systems. Misting systems are (at present) more expensive, but use less water and so require less storage space, and cause less damage, so there could be distinction on costs depending upon system type.

3.5 Sprinklers (and to a lesser degree, misting systems) pose a potential cost problem to other residents if activated in an unoccupied property.

4. How far is it feasible to extend the existing Building Regulations to mandate AFSS in new residential buildings with a height lower than 30 metres?

4.1 There is a separate Review of Building Regulations and Fire Safety being conducted by Dame Judith Hackitt. It will not be helpful or viable to extend or alter the existing Building Regulations in England (or to create separate regulations in London) in advance of the Hackitt Review recommendations being published and acted upon by the Department of Communities and Local Government.

4.2 The Review of Building Regulations and Fire Safety, currently being carried out by Dame Judith Hackitt, may not review the AFSS Standards currently in use.

4.3 In view of the Grenfell tragedy, the current British Standards should be reviewed for similar new and existing tower block developments.

Retrofitting

5. What factors do you consider necessary to justify installing AFSS in existing residential buildings?

5.1 We generally would only consider retrofitting to be necessary in higher risk residential buildings where the fire risk assessment has identified poor compartmentation; poor availability of other fire engineered solutions [eg automatic smoke vents, multiple means of escape, etc]; and behavioural problems associated with the occupation of the block which indicates that other fire measures such as fire alarms and/or fire doors may have been tampered with.

5.2 We do support the recommended action of retrofitting of sprinkler systems to all existing higher risk residential buildings (inc student accommodation, care homes and hospitals) over 18m in height; there are issues about whether this could be reinforced by a requirement for sprinkler systems as a "consequential improvement" where "material alterations" are made to existing high rise residential buildings.

5.3 We generally do not consider retrofitting of AFSS to low rise, lower risk residential buildings (eg bungalows) to be necessary or desirable, unless circumstances determine otherwise following a survey or fire risk assessment.

5.4 We draw attention to the BAFSA Report of retrofit sprinkler installation: www.bafsa.org.uk/wp-content/uploads/bsk-pdf-manager/2017/09/CALLOWMOUNT_web0407LR_lowres.pdf

5.5 And to the BRE Report on the Cost Benefit of Sprinklers across a range of building types: BRE Report Number 204505 - *Effectiveness of sprinklers in residential premises:* https://www.be.co.uk/page.jsp?id=723

6. What is the typical cost of retrofitting an existing residential flat with sprinkler systems?

6.1 This will depend greatly on the building design, layout, number of rooms, type of construction, height, availability of adequate water pressure, and availability of water storage space. Each building will have a different cost and so there is no typical cost available. We recommend that generalisations on costs are not assumed and that every building is assessed individually. [See answer to Q3, above].

6.2 The BASFA report (above) provides case-study costs for retrofit of sprinklers to an existing residential apartment.

7. What are the main factors affecting the feasibility of retrofitting existing residential buildings with AFSS? Are there differences between the private and public sectors?

7.1 The main factors are:

- The desire of owners and occupiers;
- The level of risk determined by a survey;
- political desire by local and central politicians;
- cost of installation;
- cost of maintenance and consequent service charges;
- water supply connection issues – the incoming supply may not be large enough, or the water supply pipe in the road may not be sufficient
- ease of installation dependent upon type of construction including ease of access to each apartment – privately owned leasehold apartments may not be accessed if the leaseholder is not in agreement with installation and/or costs; and
- payment in the private sector – AFSS is not a repair/ maintenance item generally recoverable under the leasehold service charges (a S.20 Notice – see below), so would have to be funded by the owners as a capital improvement, which many private landlords would not be willing to fund.

7.2 Leases / Improvements

There may be a restriction within leases that prevent improvements, although some leases do provide for costs incurred where notice has been issued by a statutory or authority body enforcing works to be completed by the Lessor/Lessees. If this sort of clause is included then costs could be passed on, although if in excess of statutory limitations (S20 consultation for costs above £250) this would need to be followed, or if the works are urgent, dispensation could be sought through the First Tier Tribunal. This could have time implications, or could mean the Tribunal are inundated with Lessors trying to circumvent the consultation process.

Such a matter could also be dealt with by an amendment to legislation, the Service Charge definition in the Landlord and Tenant Act 1985 was amended by the CLRA 2002 to incorporate the word “improvement”, although this does not supersede the terms of the lease. An amendment could be made to incorporate along the lines of “or any works required to comply with statutory notice”, or other such means as it is determined. This would override the Lease, but it should not remove the obligation to carry out consultation if statutory thresholds are exceeded, and lessees should still have the same rights to challenge any Service Charge as they would ordinarily have.

7.3 Ongoing Management

If systems were to be extended into flats it does bring with it a maintenance issue in terms of accessing and maintaining equipment. In terms of private long leasehold flats the confines of the demised premises are usually the lessees responsibility, although shared/communal systems would be the lessors responsibility. It works for communal systems such as heating, tv etc., as any problem results in a loss to the lessee, leading to a level of co-operation. In terms of a fire/sprinkler system Lessees/tenants may not see the issue in the same way and providing access may prove problematic. Although Leases provide for the Lessor to access, actually gaining access is a different matter.

7.4 In terms of any retrospective install, there would likely be an issue with surface run pipework or cabling within properties, damage to any fixtures or fittings, décor etc.

Technical issues

8. What are the main technical issues with installing AFSS in new residential buildings? Which issues are most likely to make AFSS unviable?

8.1 AFSS can be installed much easier in a new building than by retrofitting existing buildings.

8.2 The biggest issue likely to make AFSS unviable in new residential buildings is if a developer calculates that the additional cost would make a development unprofitable.

8.3 We are aware of water supply and pressure issues, and recommend that further consultation is undertaken with Thames Water on the supply side issues.

8.4 We need more information on the effectiveness of sprinklers in controlling fires that are started by faulty domestic appliances. We also recommend that greater research on fires started by faulty appliances is undertaken, as these seem to be an increasing source of fires.

8.5 All sprinkler installations are required to have an annual inspection and test by a competent person with the building log book recording the details of the inspection. In order to comply with this requirement, access to all protected areas including

both privately owned and rented dwellings will be necessary. This access can be difficult to enforce or may prove impractical at a reasonable cost.

8.6 If there is a surge in demand for AFSS then more will need to be done to ensure that there are sufficient competent persons to design, specify and install them.

9. What is the general level of public perception and knowledge of sprinkler systems? How can these issues be addressed?

9.1 As a result of Grenfell, media attention has been drawn to the advantages of AFSS and is likely to be demanded by tenants even though, on the whole, they have very little knowledge of such systems, the cost of installation or maintenance requirements, and who will pay.

10. How much power do local authorities and the Mayor have to impose more localised fire safety standards, including AFSS? Would more localised standards be desirable?

10.1 We strongly argue against a fragmented regulatory approach by the local authorities or Mayor in London. The Hackitt Review is likely to bring systemic "root and branch" changes to the Building Regulations regime, and we are firmly against any implementation of additional layers of confusion in differing regulations, standards or guidance as between different boroughs or across London as a whole in relation to surrounding areas. This would lead to the undesirable outcome of blocks of flats on differing sides of the same street, on the fringes of London boroughs, potentially having different standards applied, something which happened in the past with the old London Building Acts.

10.2 Localised standards are to be discouraged unless there are very good environmental or geographical reasons for them. National regulations which apply across the whole of England are necessary for consistency.

10.3 AFSS play an important role in helping to save lives and protect buildings, but there is a general perception that they could be a panacea. AFSS should always be considered in the context of an overall fire safety plan for each building.

10.4 A major consideration is to avoid mitigating one risk (fire) by increasing another risk (for example, tenants costs) and therefore all work should be undertaken by professionally qualified persons who are competent in the disciplines required.

On behalf of the Royal Institution of Chartered Surveyors

Gary Strong BSc(Hons) FRICS FCIArb FCABE CBuildE FCILA FUEDI-ELAE
Global Building Standards Director
RICS
[redacted]

13 December 2017

London Assembly Planning Committee consultation

Benefits of Sprinklers

1. In general, what advantages do buildings with AFSS (Automatic Fire Suppression Systems) installed, particularly residential buildings have over buildings without these systems?

1.1 An Automatic Fire Suppression System, such as a sprinkler system, is designed to control and extinguish fire, without human intervention, at an early stage following the start of a fire. AFSS plays no role in fire prevention and should not be seen as a panacea in terms of fire safety. AFSS should be considered alongside other systems and processes of fire control and building evacuation.

1.2 AFSS form part of the overall fire safety strategy along with other suppression systems and structural/finishing material measures. Sprinklers are designed to extinguish small Class A fires by preventing them from escalating, thus protecting the building structure but not the contents.

1.3 As sprinklers dispense water, which is not recommended for suppressing electrical or oil/grease fires, they should not normally be fitted in kitchens, where such fires are likely to occur.

1.4 One approach in kitchens is to install an ansul type system in the extract hood above the commercial cooking area, as the hood blocks the sprinklers. In dwellings, sprinklers should not be placed above cookers as the heat may trigger them. Sprinklers are often installed in electrical rooms.

1.5 If the building has been designed and maintained correctly, the fire resistance is normally 30 minutes, which would allow enough time for the sprinklers to keep the fire restricted to its source. However, it should be appreciated that once a sprinkler head has been activated and extinguished the fire, it will continue to discharge water until it has been manually turned off. This is likely to result in water damage to the contents and tenants often do not have appropriate insurance. The same will occur if the sprinkler head is activated by misuse or vandalism. Following NFPA 5000 would allow smoke retarding construction where sprinklers are provided. Without sprinklers, water damage from fire fighters may be much worse than with them.

1.6 There is anecdotal evidence from the Fire & Rescue Service and from RICS members who have inspected buildings after a fire, that sprinklers fitted within individual apartments can contain fires within those apartments and prevent fire spread to the rest of the building. There is a need for a thorough assessment of all available data and, if necessary, to conduct new research.

1.7 Sprinklers within an apartment will not stop fire spread via the outside of a building fitted with combustible cladding, and combustible window frames; the latter potentially compromising compartmentation and fire-separation of flats as much as combustible cladding.

1.8 Sprinklers could be effective at stopping a fire that starts internally from spreading to the outside.

1.9 There may be little advantage in terms of life safety other than reducing the risk to lives, which due to other factors may already be very low, although by limiting smoke there could be an effective life safety element, and there is an advantage in terms of preserving the building.

1.10 BS9999 and US codes allow large "relaxations" to the requirements for egress, it has huge potential implications for design. A current UK school design is fully sprinklered and by applying BS9999:2017 has resolved all the design non compliances. BS9999 is aligning more with NFPA codes. Had this design followed ADB (or BB100) the design team would have had to have added another stair.

1.11 There are anecdotal suggestions that there may be an advantage in terms of lower insurance premiums, as buildings' insurers are likely to rate the fire risk of a building fitted with AFSS as lower and reduce insurance rates accordingly.

1.12 According to the National Fire Chiefs' Council (NFCC), when sprinkler systems have been in operation:

- Fire deaths (including firefighter deaths) have been almost eliminated;
- Fire injuries have been reduced by 80%;
- Significant improvement in firefighter safety has been achieved;
- Property damage has reduced by over 80%;
- The effect of arson has been reduced, particularly in buildings left empty overnight (such as schools)
- There has been a reduction in the environmental impact of fire;
- There has been a reduction in the economic cost of fire

1.13 There is also the perception amongst the public, including building occupiers and investors, particularly post-Grenfell, that a building fitted with AFSS is safer and therefore more likely to be acceptable to residents, owners and investors. There is anecdotal evidence that some banks are already looking at whether or not to lend on high rise and high risk buildings without AFSS.

1.14 The RIBA has called for sprinklers/automatic fire suppression systems to be mandated in all new and newly converted residential buildings, as is the requirement under the Building Regulations in Wales.

1.15 The CIAT calls for an emphasis on a fire strategy to determine sprinkler provision as part of a multi-disciplinary and multi-stakeholder process. The industry should move away from 'design only' fire strategy reports, which need to cover design, installation, maintenance, documentation requirements and use. The CIAT argues that there ought to be a national standard for what a fire strategy contains, similar to PAS79 for fire risk assessments.

2. Which groups of people are more likely to benefit from the cost of installing AFSS than others?

2.1 In general, people with reduced mobility who would not be able to exit a building quickly in the event of a fire (where a simultaneous evacuation policy exists) are the most likely to benefit. This would include care homes and hospitals, but in general, in residential premises, it is assumed that the majority of occupiers are not of impaired mobility. Sprinklers allow significant design flexibility in the US codes for people with disabilities.

2.2 Investors and owners of buildings and apartments with AFSS fitted may benefit from a more sustainable valuation of their assets, as buildings without AFSS, particularly high rise, higher risk buildings, may in time suffer lower valuations due to lower market demand.

2.3 Sprinklers are mandatory in many multi-storey commercial buildings, which are arguably a lower-risk category than multi-storey residential buildings because occupants are generally awake and they are likely to have better fire safety management systems.

Feasibility

3. What are the typical costs of installing a sprinkler system in a new-build flat or block of flats, and how much is this as a proportion of development cost? Are there mechanisms available to reduce these costs?

3.1 The cost of providing AFSS in a residential building will vary considerably, and is dependent upon the design, layout, height and construction of the building. There is usually a general cost for the infrastructure (tanks etc) and this is a big cost if tanks and pumps are required and a room to house them, plus a cost per sprinkler head which is dependent on the number of apartments and the number of rooms in each apartment. Other factors impacting upon the cost are:

- Size of building
- Compartmentation, which may be reduced where sprinklers are provided
- Sprinkler zones
- Area of coverage [ie do Landlord areas have sprinkler protection? Basements? etc]
- Type of system [ie many residential buildings use the Boosted cold water system, however some still specify a Standalone sprinkler system]

3.2 CIBSE suggest that we should allow sprinklers to be installed to NFPA 13D It is a lower standard than for a commercial office tower but they argue that it is reasonable.

3.3 The CIPHE has advised that sprinkler systems taken from the boosted cold water system will reduce the spread of Class A fires; but may increase the risk of Legionella and other water-borne pathogens occurring in the domestic water supply. Standalone systems are preferred.

The risk is associated with the introduction of a deadleg where the sprinkler system connects to the domestic water supply. A standalone system may reduce the risk (there will still be a possible dead leg as the sprinkler tank will have a mains water supply which will also be a deadleg). If sprinklers are supplied from a domestic supply system then concerns relating to lack of maintenance may be reduced: if the booster cold water system fails then this will be immediately observed by the residents, but if a stand-alone sprinkler system is not maintained/fails then it may not be evident until required to operate during a fire condition.

3.4 The cost efficiency of AFSS generally increases with the size of the building. The British Sprinkler Association produces guidance on costs generally, and is regarded as an excellent reference document.

3.5 The RICS has provided an indicative range of benchmark costs below, for the purposes of which it has been assumed that the entire building will have sprinkler protection via a dedicated sprinkler system and that individual Apartments will be fitted to a sprinkler head density of 1:10m². It has also been assumed that the building will be larger than 10,000m². For smaller buildings, the cost per m² will increase. CIBSE has noted that 1 head per 10m² is very dense, more appropriate to have 1 head for 20m² for light hazard (see CIBSE Guide E).

Shell & Core - £30-40 per IPMS-2/GIA (Gross Internal Area) m2
Fit Out - £25-31 per IPMS-3 /NIA (Net Internal Area) m2

[Note: the above costs are net of VAT but inclusive of main contractor prelims, OH&P and installation. These costs are indicative only, and must not be relied upon for individual buildings which will require a full survey and a cost plan produced].

3.6 Installed AFSS include both sprinkler systems and misting systems. Misting systems are (at present) more expensive, but use less water and so require less storage space, and cause less damage, so there could be distinction on costs depending upon system type. The current standards only allow misting for buildings up to 30m in height (BS9991) or 45m in height (the installation BS that BS9991 references). This is a contradiction that needs to be resolved. CIBSE has noted that Marriott Hotels allow mist to NFPA standards in all buildings.

3.7 Sprinklers (and to a lesser degree, misting systems) pose a potential cost problem through water damage to other residents if activated in an unoccupied property.

4. How far is it feasible to extend the existing Building Regulations to mandate AFSS in new residential buildings with a height lower than 30 metres?

4.1 There is a separate Review of Building Regulations and Fire Safety being conducted by Dame Judith Hackitt. It will not be helpful or viable to extend or alter the existing Building Regulations in England (or to create separate regulations in London) in advance of the Hackitt Review recommendations being published and acted upon by the Department of Communities and Local Government.

4.2 The Review of Building Regulations and Fire Safety, currently being carried out by Dame Judith Hackitt, may not review the AFSS Standards currently in use. In the UK, the current standards for sprinklers are BS EN12845 for industrial and commercial buildings; BS 9251 for domestic and residential occupancies (currently undergoing a European Harmonised process prEN 16925); and in some cases to the US Standard NFPA 13 or 13D. CIBSE has noted that NFPA sets a limit of 23m not 30m and single storey dwellings require sprinklers in some instances.

4.3 In view of the Grenfell tragedy, the current British Standards should be reviewed for similar new and existing tower block developments.

Retrofitting

5. What factors do you consider necessary to justify installing AFSS in existing residential buildings?

5.1 CIC members generally would only consider retrofitting to be necessary in higher risk residential buildings where the fire risk assessment has identified poor compartmentation; poor availability of other fire engineered solutions [eg automatic smoke vents, multiple means of escape, etc]; and behavioural problems associated with the occupation of the block which indicate that other fire measures such as fire alarms and/or fire doors may have been tampered with.

5.2 However, the RIBA has recommended the retrofitting of sprinkler systems to all existing residential buildings over 18m in height; the RIBA argues that this could be reinforced by a requirement for sprinkler systems as a "consequential improvement" where "material alterations" are made to existing high rise residential buildings.

5.3 CIC members generally do not consider retrofitting of AFSS to low rise, lower risk residential buildings to be necessary or desirable, unless circumstances determine otherwise following a survey or fire risk assessment.

5.4 We draw attention to the BAFSA Report of retrofit sprinkler installation: www.bafsa.org.uk/wp-content/uploads/bsk-pdf-manager/2017/09/CALLOWMOUNT_web0407LR_lowres.pdf

5.5 And to the BRE Report on the Cost Benefit of Sprinklers across a range of building types: BRE Report Number 204505 - Effectiveness of sprinklers in residential premises: https://www.be.co.uk/page.jsp?id=723

6. What is the typical cost of retrofitting an existing residential flat with sprinkler systems?

6.1 This will depend greatly on the building design, layout, number of rooms, type of construction, height, availability of adequate water pressure, and availability of water storage space. Each building will have a different cost and so there is no typical cost available. We recommend that generalisations on costs are not assumed and that every building is assessed individually. [See answer to Q3, above].

6.2 The BASFA report (above) provides case-study costs for retrofit of sprinklers to an existing residential apartment.

7. What are the main factors affecting the feasibility of retrofitting existing residential buildings with AFSS? Are there differences between the private and public sectors?

7.1 The main factors are:

- The desire of owners and occupiers;
- The level of risk determined by a survey;
- political desire by local and central politicians;
- cost of installation;
- cost of maintenance and consequent service charges;
- ease of installation dependent upon type of construction including ease of access to each apartment – privately owned leasehold apartments may not be accessed if the leaseholder is not in agreement with installation and/or costs; and
- payment in the private sector – AFSS is not a repair/ maintenance item recoverable under the leasehold service charges (a S.20 Notice), so would have to be funded by the owners as a capital improvement, which many private landlords would not be willing to fund.

Technical issues

8. What are the main technical issues with installing AFSS in new residential buildings? Which issues are most likely to make AFSS unviable?

8.1 AFSS can be installed much more easily in a new building than by retrofitting existing buildings.

8.2 The biggest issue likely to make AFSS unviable in new residential buildings is if a developer calculates that the additional cost would make a development unprofitable.

8.3 All sprinkler installations are required to have an annual inspection and test by a competent person with the building log book recording the details of the inspection. In order to comply with this requirement, access to all protected areas including both privately owned and rented dwellings will be necessary. This access can be difficult to enforce or may prove impractical at a reasonable cost.

8.5 If there is a surge in demand for AFSS then more will need to be done to ensure that there are sufficient competent persons to design, specify, install and maintain them.

9. What is the general level of public perception and knowledge of sprinkler systems? How can these issues be addressed?

9.1 As a result of Grenfell, media attention has been drawn to the advantages of AFSS and they are likely to be demanded by tenants even though, on the whole, they have very little knowledge of such systems, the cost of installation or maintenance requirements, and who will pay.

10. How much power do local authorities and the Mayor have to impose more localised fire safety standards, including AFSS? Would more localised standards be desirable?

10.1 It is premature to address this issue ahead of the fundamental review of Building Regulations and Fire Safety, being undertaken by Dame Judith Hackitt and commissioned by the DCLG.

10.2 We strongly argue against a fragmented regulatory approach by the local authorities or Mayor in London. The Hackitt Review is likely to bring systemic "root and branch" changes to the Building Regulations regime, and we are firmly against any implementation of additional layers of confusion in differing regulations, standards or guidance as between different boroughs or across London as a whole in relation to surrounding areas. This would lead to the undesirable outcome of blocks of flats on differing sides of the same street, on the fringes of London boroughs, potentially having different standards applied, something which happened in the past with the old London Building Acts.

10.3 Localised standards are to be discouraged unless there are very good environmental or geographical reasons for them. National regulations which apply across the whole of England are necessary for consistency.

10.4 A proliferation of local standards will lead to confusion in the marketplace and may undermine the enhancement of public safety that they are intended to deliver.

10.5 AFSS play an important role in helping to save lives and protect buildings, but there is a general perception that they could be a panacea. AFSS should always be considered in the context of an overall fire safety plan.

10.6 A major consideration is to avoid mitigating one risk (fire) by increasing another risk (for example, legionella) and therefore all work should be undertaken by professionally qualified persons who are competent in the disciplines required. The legionella risk may increase as there will be deadleg(s) introduced into the domestic water system, but good design and system management can minimise the risk.

11. About us

11.1 The Construction Industry Council brings the Built Environment Professions together.

11.2 The Council represents the following organisations on whose collective behalf this response is made:

CIC Members

ACA	Association of Consultant Architects
ACAI	Association of Consultant Approved Inspectors
ACE	Association for Consultancy and Engineering
APM	Association for Project Management
APS	Association for Project Safety
BCS	British Computing Society
BIID	British Institute of Interior Design
BIFM	British Institute of Facilities Management
BSRIA	Building Services Research and Information Association
CABE	Chartered Association of Building Engineers
CIAT	Chartered Institute of Architectural Technologists
CIBSE	Chartered Institution of Building Services Engineers
CICES	Chartered Institution of Civil Engineering Surveyors
CIH	Chartered Institute of Housing
CIHT	Chartered Institution of Highways & Transportation
CIOB	Chartered Institute of Building
CIPHE	Chartered Institute of Plumbing and Heating Engineering
CIRIA	Construction Industry Research and Information Association
GF	Ground Forum
ICE	Institution of Civil Engineers
ICWCI	Institute of Clerks of Works and Construction Inspectorate
IET-BES	Institution of Engineering and Technology - Built Environment Sector
IIRSM	International Institute of Risk & Safety Management
ISSE	Institute of Specialist Surveyors and Engineers
IStructE	Institution of Structural Engineers
LABC	Local Authority Building Control
LI	Landscape Institute
NHBC	National House-Building Council
RIBA	Royal Institute of British Architects
RICS	Royal Institution of Chartered Surveyors
RTPI	Royal Town Planning Institute
SAFed	The Safety Assessment Federation

CIC Associate Members

ADJ SOC	Adjudication Society
BACH	British Association of Construction Heads
BBA	British Board of Agrément
BSI	British Standards Institute
CCS	Considerate Constructors Scheme
CIMCIG	Chartered Institute of Marketing (Construction Industry Group)
CIPR	Chartered Institute of Public Relations
KCL	King's College London Centre of Construction Law and Dispute Resolution
LCI-UK	Lean Construction Institute
SCL	Society of Construction Law
UCEM	University College of Estate Management

On behalf of the Construction Industry Council

Graham Watts OBE
Chief Executive **13 December 2017**

Dear The London Assembly Planning Committee,

I think a review of fire safety is required across the board, and i am particularly concerned about the safety of my current block of flats, [redacted].

We do not have sprinkler systems fitted; this is despite the majority of flats being sold at full price on the open market (mine is one of the few offered for Shared Ownership) in a prime location in London. the building itself is less than 10 years old.

Also we have only one staircase, in the centre of the building (right next to the lifts) and no additional fire escapes.
The majority of flats have no balcony and the only other means of escape is a roof garden on the 4th floor.

On a different note we had a situation where our block flooded - a burst pipe on one of the upper levels - and the maintenance companies response was not fantastic, however their communication during the whole event was pitiful - and has left me with little confidence.

They are extremely hard to communicate with in general, and while I don't want to sound like an alarmist, it would have been nice for them to confirm after Grenfell that the cladding on our building has been inspected and is safe. Though I do not think anything has been stated to that effect yet.

Thank you for your time,

Yours sincerely,

[redacted]

British Automatic Fire Sprinkler Association

bafsa

Response to the London Assembly Planning Review

Installing Sprinklers in London's Buildings

12th December 2017

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Benefits of Sprinklers

1. **In general, what advantages do buildings with AFSS installed; particularly residential buildings have over buildings without these systems?**

   Automatic fire sprinklers detect and actuate when a fire is in its incipient stages, by doing so they control or extinguish the fire.

   Because they operate at relatively low pressure and use a small flow of water produced as a spray the water damage is considerably less than if the Fire and Rescue Service were called to extinguish the fire usually some ten to twenty minutes later or even longer if it is in the upper floors of a hi rise building.

   Because sprinklers actuate so quickly and control the fire, this allows the occupant of the house to escape, sprinklers also control the deadly smoke that is produced by a fire and is so lethal to the old and the very young.

   Protecting the building from fire makes it far more sustainable and protects the housing stock; it also prevents the gases and contaminated water from fire from damaging the environment. But most of all sprinklers protect lives, both residents of the houses and Firefighters.

2. **What groups of people are more likely to benefit from the cost of installing AFSS than others?**

   Those that benefit most are the most vulnerable in our society, the elderly, the young, those on medication or with disabilities or those who may have a drug or alcohol problem and are unable to act for themselves.

Feasibility

3. **What are the typical costs of installing a sprinkler system in a new build block of flats and how much is this as a proportion of the development cost? Are there mechanisms available to reduce these costs?**

   Typically installing automatic fire sprinklers in a new build block of flats will be between 1.8% & 2% of the development cost.
   Dependent on the layout of the flats and common areas, number of rooms, water supplies in the area and the local building costs.
   Typical costs for new build flats would be between £1100 & £2000 per flat. Ensuring that the sprinkler system is specified at the planning stage will help to reduce costs as it can be planned along with all the other series in the building. Other savings can be achieved by requiring less fire

resistance in the compartments and the ability to have open plan living such as is allowed under the Scottish Building Standards.

4. **How far is it possible to mandate AFSS in new residential buildings with a height lower than 30m?**

   At present in Scotland under their building regulations, all residential blocks above 18 metres require AFSS, similarly if you wish blocks of flats to have open plan living they require sprinklers. In Wales the same applies together with all other forms of housing no matter the height. Therefore it is perfectly feasible to have similar standards in England Recent Cost Benefit Analysis studies in Scotland have shown that there is a case for automatic fire sprinklers to be installed in all social housing flats and student halls of residence.

Retrofitting

5. **What factors do you consider necessary to justify installing AFSS in existing residential buildings?**

   Firstly, we believe it is a cost effective means of protecting the residents from the danger of fire, secondly it makes your existing housing stock more sustainable by prolonging the life of the building by providing additional fire protection. Lastly it provides a means to protect Firefighters when they have to tackle fires in ageing residential buildings whose fire protection has been compromised by lack of investment or maintenance.
   BAFSA has proven in two case studies that it is perfectly feasible to fit automatic fire sprinklers into existing hi rise blocks with the residents in situ. What is required to do this is good planning and excellent communication with the residents before during and after the installation.
   The actual installation need not be intrusive and typically should take no more then 1-2 days for a typical flat.

6. **What is the typical cost of retrofitting and existing residential flat with a sprinkler system?**

   Dependent on the layout, number of bedrooms, water supplies and access, typically the cost should be between £1500 & £2500 per flat. However the use of an external Project manager and inclusion of other works in the contract can increase the costs, however these should not be confused with the true cost of installations of a sprinkler system.

7. **What are the main factors affecting the feasibility of retrofitting existing residential buildings with AFSS? Are there differences between the private and public sectors?**

There is no reason that sprinklers cannot be fitted to existing buildings. With good planning and communication and using Third Party Accredited Installers and specifying a system that complies with the British Standard this can be achieved very easily.
A full fire risk assessment should be carried out for the building prior to the decision to install the system, this will support the need for what you are trying to achieve and the areas the system should cover.
A survey of the building and its water supplies will tell you what are the requirements for your system, do you need just a pump or do you require a tank also? The physical survey of the structure should indicate how you would run the water supply pipes to each floor.
There is very little difference between installation of sprinklers in publicly owned or privately owned flats, however there maybe some legal requirements to ensure you can gain access on an annual basis for maintenance and inspection.

Technical Issues

8. **What are the main technical issues with installing AFSS in new residential buildings? Which issues are most likely to make AFSS unviable?**

   The technical issues with installing AFSS in new build are typically less than retrofitting systems into existing properties.
   As previously stated, the earlier a decision is taken to install sprinklers the easier it will be. Making the decision at the planning stage allows you to plan where the pump and if necessary water tank can be situated, in some cases with larger developments of houses a communal pump and tank can be specified centrally to the development, however this can usually only be achieved at the planning stage.
   Early decisions about pipe runs to make them unobtrusive or hidden completely is beneficial and whether you wish an flow switch and alarm for each flat or for each floor?
   In our view with new build there are no technical aspects that make a system unviable, provided you specify the system early enough in the project.

9. **What is the general level of public perception and knowledge of sprinkler systems? How can these issues be addressed?**

   The public's level of knowledge regarding automatic fire sprinkler systems is relatively low. Sadly the portrayal of all sprinkler heads going off at once makes good film and TV moments but is very far from reality. Accidental actuation of sprinklers is extremely rare and the possibility of getting legionella is non-existent as there have been no known cases worldwide.

We have produced a lot of information to educate the public and we also believe we should start with young children as they can educate the parents in many cases. When you install sprinklers in your housing stock you must communicate and educate your residents about sprinklers throughout the whole installation process.

10. **How much power do local authorities and the Mayor have to impose more localised fire safety standards, including AFSS? Would more localised standards be desirable?**

    We are unsure what powers the Assembly or Mayor have to proscribe sprinklers into buildings. However, it is an option for every council to include sprinklers in building projects or refurbishments that they are the client in. There has been discussion previously with councils that sprinklers could be required as a condition of planning, particularly if the council were also selling the land.

15 December 2017

Navin Shah AM
London Assembly Member for Brent and Harrow
London Assembly Labour Group
City Hall
London
SE1 2AA

Dear Mr Shah AM

London Assembly Planning Committee review into installing sprinklers in London's buildings

By way of a response to your consultation on the effectiveness and use of sprinklers in London's buildings, please find enclosed a copy of the National Housing Federation's submission to the recent call for evidence from the Independent Review into Building Regulations and Fire Safety.

The National Housing Federation is the voice of housing associations in England. Our sector is united by a common purpose – to make sure that everyone can live in a quality home that they can afford. We are the trade association to all the housing associations currently working to ensure their residents' safety following the Government's ACM cladding testing programme. Together with our members, we are working closely with government and other stakeholders to deliver the necessary remedial works as quickly and as safely as possible and to make sure that a tragedy such as the fire at Grenfell Tower never happens again.

As you will know, the interim report of Dame Judith Hackitt's Review of Building Regulations and Fire Safety is due before the end of the year. We therefore believe that the most appropriate and relevant information we can provide to your consultation is included in the views we submitted to this review. In our submission, we have offered our support for transformative change across the construction and built environment industries, so that in the future those who commission, construct, own, manage and live in a residential building can have confidence in its safety and the regulatory regime underpinning it.

I would particularly like to draw your attention to the following points, as I believe that these will have the most relevance to your own consultation:

- Our members have direct experience of building new homes, refurbishing existing properties and managing significant property portfolios and, as such, often oversee the end to end process of developing and managing properties
- Because of their involvement in housing construction and management, our members have highlighted a lack of a clear and co-ordinated relationship between the building regulations (their application and sign off) and fire safety regulation, making any assessment of the need for sprinklers currently open to interpretation
- Our members and other stakeholders have highlighted the lack of standardisation and consistency in terms of Fire Risk Assessment reporting and risk allocation, meaning under the current regulatory regime, different assessors could interpret risk, and the potential need for sprinklers to reduce it, very differently
- When ascertaining the requirement for retrofitting sprinklers, our members would support clear guidance based on ensuring residents feel safe in their homes, as well as on risk to residents and users of the building, the building height and means of escape
- Should housing providers be required to retrofit sprinklers, the Government should set up a Building Safety Fund to support organisations with the cost of this work and ensure that all works are VAT free

- There are a number of pressures which are beginning to challenge the ongoing viability of high rise blocks as affordable housing assets, which must be recognised in the context of any changes required to these buildings as a result of new regulation.

The National Housing Federation and our members are committed to working with all relevant stakeholders to ensure the safety of our residents now and in the future. We would very much welcome an opportunity to discuss this submission with you, as well as the work London-based housing associations employ to ensure residents' safety. I hope you won't mind if I follow up with your office to see if there is a mutually convenient date in the coming weeks.

Yours sincerely

Lucy Grove
Grenfell Programme Lead
National Housing Federation
[redacted]

NATIONAL HOUSING FEDERATION

Submission:

Independent Review of Building Regulations and Fire Safety

National Housing Federation

13 October 2017

Summary of key points:

The National Housing Federation is the voice of housing associations in England. Our members have contributed enormously to this evidence submission and are committed to supporting the important work of the Review. In collating this evidence we have focused on the areas where we best add value. Key proposals include:

- Strategic review and reform of the purpose, form and operation of Building Control
- A more robust Primary Authority Scheme between housing providers and Fire Authorities
- Standardised and higher quality Fire Risk Assessments
- A government convened permanent Building Safety Group
- Periodic review of key safety legislation and regulation
- Explicit consideration of how recommendations will influence the capacity and resources of relevant sectors

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1. Introduction

The National Housing Federation (the Federation) is the voice of housing associations in England. Our members own and manage more than 2.5 million homes across the nation, as well as providing vital care, support and community services. Housing associations are a prime example of what is possible through public and private sector partnership and innovation; they exist for public benefit and support public bodies in discharging their statutory duties, and maximise their impact by leveraging in private finance and reinvesting all surpluses into the communities that they serve.

The housing association sector is united by a common purpose and ambition – to ensure everyone in the country has the opportunity to live in a quality home that they can afford.

This underpins our bold vision for the future, a future where housing associations have increased their output of new homes from 40,000 in 2016/17 to 120,000 in 2034/35, and where it is common knowledge that if you want a great place to live, you go to a housing association.

The quality of places, spaces and homes runs throughout this vision, and the foundation of any discussion on quality must be safety. The tragic events at Grenfell Tower have called into question the suitability and effectiveness of the legislative and regulatory regime for buildings, and in particular high rise, multi-occupancy residential buildings.

It is imperative that everyone involved in the design, commissioning, construction and management of such buildings does everything they can to ensure such a tragedy never happens again. Similarly, government must ensure that the regulatory environment provides the necessary support and information to those striving for good practice, while also ensuring oversight and enforcement where standards are not being met.

The Federation's overriding motivation for contributing to the call for evidence is to ensure that in the future those who commission, construct, own, manage and live in residential buildings can have confidence in the safety of the building and trust in the regulatory regime which applies to it. In order to achieve this, we believe the Independent Review of Building Regulations and Fire Safety (the Review) must be a catalyst for transformative change across the construction and built environment industries, and we offer our support for making this a reality.

2. Purpose and content of our evidence

The Federation recognises that the Review is likely to receive wide-ranging and in-depth evidence from the significant number of organisations and individuals who have relevant interests or expertise. It is therefore important for our submission and input to focus on those areas where we add most value to the Review's terms of reference, and can best represent the views and experiences of our members.

We believe we can best contribute to the success of the Review by sharing the insight and experience of hundreds of organisations who commission, procure, construct, own and manage millions of residential buildings collectively. Our members have direct experience of building new homes, refurbishing existing properties and managing significant property portfolios. Our evidence will focus on their experience of the legal and regulatory regime, their identification of its failings, and their ideas for making it fit for purpose in the future.

As large-scale property developers and managers, our members have been significantly affected by the recent developments and uncertainties surrounding building safety. As organisations who have an unshakeable commitment to resident safety and security, and a long term stake in the buildings they construct and manage, housing associations have been at the forefront of pressing government for greater clarity on building safety and key participants in the cladding testing process and the Industry Response Group. Nonetheless, it is of the greatest importance that the current vital focus on safety is not limited to the social housing sector. We urge government to recognise that the cladding testing programme has unearthed systemic and widespread regulatory failure, and to reflect this in its approach by taking into account all relevant buildings, including those in the private sector.

As described above, our evidence focuses on those areas where we believe we can best add value to the Review. As well as on-going member engagement we have convened a cross-sector Expert Panel to inform our wider policy work, and they have been involved in the production of this submission. It is our hope that the Review will receive comprehensive and wide-ranging evidence if each organisation focuses on its particular area of experience and expertise.

Understandably the Review is being carried out to a very tight timescale. We recognise and support the importance of assessing the suitability of the existing regime and making timely recommendations for its improvement. In order to contribute to the Review in a coherent and consistent way our evidence at this stage focuses on priority issues and key principles. We would encourage the Review to see this initial submission as the start of our constructive and ongoing engagement in this vital area of work. Similarly, the Review will be aware that there are a number of other related pieces of work currently underway or due to commence, namely:

- The Grenfell Tower Inquiry
- Social Housing Green Paper
- Labour Party's review of social housing

The Federation is committed to providing support and assistance as appropriate to these work areas as well.

2.1 Key issues with the existing regime

The key issues with the existing building regulations and fire safety regime we have identified are:

- The legal and regulatory regime is complex, unclear and disjointed
- A lack of accountability
- Insufficient oversight and enforcement
- Insufficient requirements surrounding expertise, skills and resources
- Specific challenges for housing associations

2.2 Key principles for a future regime

The key principles we are advocating for a future regime are:

- Clarity – roles, responsibilities, requirements and compliance
- Accountability – responsible individuals and organisations
- Expertise and resourcing – improved assurance through skills and resourcing requirements

- Holistic and comprehensive – explicit consideration of how the entire legal, regulatory and policy environment affects new and existing buildings
- Trust and assurance – the overall regime must provide assurance and engender trust for key stakeholders

Our submission explores each of these areas in turn, and is supported by 'Technical Annex A: potential changes to current regulations and guidance' (Annex A), which provides more detail on specific options for future reform.

Our proposals include:

- Strategic review and reform of the purpose, form and operation of Building Control
- A more robust Primary Authority Scheme between housing providers and Fire Authorities
- Standardised and higher quality Fire Risk Assessments
- A government convened permanent Building Safety Group
- Periodic review of key safety legislation and regulation

3. Conclusions and next steps

We hope the Review finds our evidence useful, relevant and informative. We welcome the opportunity to contribute to this vital debate and reiterate our desire to constructively engage with the work of the Review as it progresses over the coming months. It is essential that the views of housing associations are taken into account, given their central role in the delivery of new and existing affordable housing in England. The Federation is well placed to coordinate a representative group of housing associations for further engagement with the Review as proposals and recommendations emerge, should that be beneficial and appropriate. The sector is determined to deliver great homes in great places and the future legal and regulatory regime will play an important role in supporting this to happen.

For further information please contact:

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4. Evidence

The following sections set out key issues with the existing regime, followed by principles for a future regime, supported by Annex A.

5. Key issues with the existing regime

5.1 The legal and regulatory regime is complex, unclear and disjointed

Legislation

It is recognised that legislation has been shaped, developed and implemented over time but member feedback and evidence indicates that use of the current regime of legislation, regulation and guidance is complex, unclear and disjointed.

We welcome the ambition to map the current regulatory system as it applies to both new and existing buildings through planning, design, construction, maintenance, refurbishment and change management to identify areas of inconsistency. This is of particular relevant to our members who in many cases are responsible for buildings throughout their lifecycle.

Building regulations (fire)

Following the tragic fire at Grenfell, in depth engagement with members has supported the view that current approved documents covering fire safety are complicated and difficult to follow.

Specific issues have been identified for high rise homes where guidance changes depending on the nature of the physical design of the building and its height. For example, the height at which sprinkler provision is mandated or restrictions on cladding specification. Where buildings are close to the boundary definition on either side, the risks could be seen to be broadly similar and give rise to unintended consequences.

Conversely in some parts of the regulations, too much freedom has led to inconsistency of approach in terms of routes to achieving compliance, (for example, desktop review of cladding testing) with out-sourcing of services exacerbating these inconsistencies.

Overall, the fire approved documentation is seen as being slow to adapt to technological, material and other changes within the construction industry, leaving gaps in guidance. This is particularly important in terms of building specifications which are classed as non-traditional, and in light of other sector wide drivers such as the uptake of Off Site Manufacturing techniques, to improve housing supply and quality.

Fire safety

In some locations our members have reported good working relationships with local fire services to ensure trust and assurance for customers living in high rise blocks. However, others have reported inconsistency in service, advice and approach depending on location.

A further issue is the lack of a clear and co-ordinated relationship between building regulations (their application and sign off) and fire safety regulation, and how this then interacts with landlord / housing management responsibilities. Housing associations are particularly aware of this issue as they can be involved in the design, commissioning, construction and management of residential buildings.

Many stakeholders have highlighted the lack of standardisation and consistency in terms of Fire Risk Assessment (FRA) reporting and approaches to risk allocation. For example, we know of reports produced for two different clients with homes in the same building following non-standard reporting formats and highlighting different risks and subsequent recommendations. There is also confusion regarding the type or level of Fire Risk Assessment (FRA) that is required and how this is determined.

In practice, there is potential conflict and inconsistency between the Regulatory Fire Safety Order and the Housing Health and Safety Rating System (HHSRS), particularly in terms of oversight and enforcement. This is illustrated in the example below.

Example

Two flats owned by a housing association on a council estate of approximately 400 units. The housing association was served with an enforcement notice under the HHSRS and instructed to install a full alarm system in both flats. This followed an internal inspection by the Environmental Health Inspector. The local authority landlord also present on the estate was not required to carry out the same works to their identical flats because their stock had been inspected by the local Fire Authority under the Fire Safety Order, and had therefore only been subject to a Type One inspection. The outcome being inconsistency in enforcement and safety measures for identical properties on the same estate.

Supporting guidance

Current guidance sites issues with the complex nature of legislation and regulation, in itself an indication of the need for overarching review and reform. Supporting guidance is not easily sourced and it is difficult to accurately contextualise it within the wider legislative and regulatory regime.

While the guidance itself is detailed and comprehensive, it is clear that it has been added to and amended over time, and therefore struggles to clearly identify key roles and relationships. In striving to manage the interplay between different areas of legislation, it has grown unwieldy and unclear, and is therefore of limited use to the individuals for whom it is intended.

Contractual relationships

We believe it is important for the Review to consider the role of construction contracts and contraction management as a key part of the wider picture of achieving legislative and regulatory compliance. While legal theory is clear in respect of liability (definite breach of contractual requirements) and defects (either due to design or workmanship), often in practice there are areas of uncertainty which may blur legal responsibility. Throughout this evidence, we will also make reference to the behaviours and priorities incentivised by current dominant approaches to procurement and contract management.

To support our members to respond effectively to the building safety concerns that have emerged in the wake of the Grenfell Tower fire, we commissioned a briefing from legal advisers on possible areas of liability and recourse. This is attached to our submission for the Review's information.

5.2 A lack of accountability

Through dialogue with our members we have identified a lack of accountability as a key problem with the existing legal and regulatory regime. In part this is linked to the overlapping and disjointed legislation that applies to building and fire safety and the complexity of the accompanying guidance. However, it is also a function of specific developments over time and wider legal and contractual issues.

Under the current regime it is difficult to ascertain with certainty and clarity which organisation or individual is accountable for building and fire safety at key stages of the property lifecycle. This has been illustrated by the challenges faced by those organisations who own buildings affected by the fire

safety issues that emerged in the wake of the tragic fire at Grenfell Tower. These organisations have faced a number of currently unanswerable questions:

- If a building is signed off by Building Control as being compliant with building regulations and is later found not to be so, who is responsible for this error and what recourse does the building owner have?
- If materials used by a contractor were thought to be compliant with building regulations and are subsequently found not to be, who is responsible for this error and what recourse does the building owner have?
- What legal, regulatory and practical mechanisms are in place to ensure contractors undertaking works on a building ensure their staff and sub-contractors have the skills, knowledge and expertise necessary to carry out the works in a way which is consistent with the intended design and operation of the building, and in a way which is compliant with the wider regulatory regime?

We have discussed legislation and guidance in the section above; therefore here we will focus on specific issues relating to Building Control and the effective operation and maintenance of residential buildings.

Building Control

Certification by Building Control is currently a legal requirement for new buildings and alterations or extensions made to existing buildings. In theory, this vital stage should determine whether the building is compliant with building regulations. In practice however, this mechanism is failing to provide sufficient assurance and those responsible for administering it are not suitably accountable for their actions.

Under the current regulatory regime it is near impossible for building control bodies to gain a full and complete understanding of the works undertaken and therefore sufficient assurance that the final product is compliant with regulations. Day to day oversight of the project rests with those present on site (potentially employed by building clients such as Clerk of Works), with building inspectors only reviewing plans and progress at key junctures. This means that significant factors when assessing compliance – such as workmanship and materials – are very difficult to inspect and are essentially left to the discretion of the contractor carrying out the works. The problematic nature of procurement and contract management in this regard will be discussed further below.

Linked to the lack of assurance, and highlighted by the current concerns about fire safety, is the lack of accountability for building control bodies. Under the current regime it is possible for a building control body to sign off a building/works as compliant, for the building/works to subsequently be found non-compliant, and for there to be no recourse for the building owner or consequences for the building control body. We would argue that this is a significant gap in the current regulatory regime as it dilutes the assurance provided by Building Control certification and fails to incentivise robust and meaningful inspection by building control bodies.

Operation and maintenance of residential buildings

The successful operation and management of residential buildings by housing associations involves a number of parties, each with their own responsibilities. Vital to the ongoing safety and use of the building are the contractors responsible for construction, refurbishment, repairs, maintenance and

major works. These are organisations that do not have a long term interest in the building, but are contracted with for a specific purpose and agree to certain specifications.

A consistent challenge faced by housing associations is the divergence in priorities that exists between them and their contractors. Housing associations are long term property owners and managers and therefore prioritise quality, safety and long term value, whereas contractors are transactional and prioritise reduced costs and improved margins. This dynamic poses significant challenges to effective procurement and contract management, particularly within a context where housing associations have been encouraged to improve their own efficiency and value for money. The chief concern being that quality of works and therefore safety is compromised as a result.

At the heart of this challenge are the priorities and motivations of the contractor. Under the status quo they can adopt a value-engineering approach whereby they focus on an agreed price of works, and then seek to improve their own margins by reducing time spent on site, substituting materials for cheaper alternatives and reducing staff costs through the use of less skilled labour. This is all permissible as long as the specification in the contract is met, and the building/works are ultimately signed off by Building Control.

Furthermore, common approaches to procuring new properties, either through Section 106 or Design and Build Contracts, severely limit the influence housing associations have over specification, materials and the quality of works. This lack of supply chain control, combined with an understandable desire to increase the supply of new homes, has contributed to a culture in which cost is often prioritised over quality.

Given the current approach to procuring such works, this is rational behaviour by contractors operating within an environment where they are not specifically and independently responsible for the quality of the works and the expertise of the staff undertaking them. Currently they are accountable to the client (contract) and building regulations (issues discussed above), but as independent organisations involved in the delivery and upkeep of residential buildings, they do not have specific requirements or accountabilities within the regulatory regime. This is a further gap which we believe should be addressed.

5.3 Insufficient oversight and enforcement

The lack of oversight and enforcement is intrinsically linked to the accountability issues we have identified above. True accountability can only be achieved if compliance is rigorously assessed and appropriate enforcement action taken against those who have failed to fulfil their responsibilities. We discuss the existing issues with Building Control at length elsewhere in this evidence, so will here focus on fire safety and site/works inspections.

Fire safety

The fundamental problem with the existing approach to fire safety regulation in residential buildings is that there is no identifiable organisation or body with ultimate responsibility for oversight and compliance. We have discussed elsewhere the fractured nature of the legislation in this area, and unfortunately oversight and enforcement is similarly disjointed.

What this means in practice is:

- Understanding of legal and regulatory requirements is mixed, and it is not easy to seek consistent and reliable clarification from a trusted source
- The quality, consistency and volume of inspection and enforcement is constrained as it rests with different organisations operating under different legislation
- The profile of fire safety, and the resources allocated to compliance, are less than other areas of compliance

It is also important to recognise that fire safety in residential buildings, and particularly multi-occupancy high rise buildings, comes with specific risks, challenges and good practice. These do not exist solely in the realm of building regulations, fire safety or housing management, but at the intersection of all three. This is not currently reflected in the regulatory regime and cannot therefore form part of the current oversight and enforcement process.

Site and works inspections

We have noted the challenges faced by Building Control inspectors seeking sufficient on-site access to make an informed and reliable assessment of the quality and compliance of works. Dialogue with members has suggested that this is also a challenge faced by the Clerks of Works they employ.

In many ways this issue is another result of the endemic cultural focus on minimising cost and maximising speed. Thorough inspection and sign off at key stages in the project, or of key safety measures, requires the presence on site of an appropriate number of sufficiently trained inspectors/Clerks of Works. This cost would be borne or passed on to the client, meaning that minimising it can become a point of competitive advantage. In addition, in some cases effective inspection requires works to stop until specific features can be signed off (rather than being covered up), and this has the potential to cause delays and increase costs. If the contractor has already agreed a price with the client, any delay affects their margins, meaning there are clear incentives to prioritise speed over robust inspection.

5.4 Insufficient requirements surrounding expertise, skills and resources

Essential to the integrity of any regulatory regime, and the assurance it therefore provides, are the skills and expertise of the individuals who have responsibilities within it and those who are involved in the activities it regulates. Our engagement with members and other stakeholders has found that regarding both building and fire safety there is currently insufficient specification for the skills and expertise of key personnel. Not only does this reduce the likelihood of effective compliance, it also undermines the assurance provided by the regime.

The Regulatory Reform (Fire Safety) Order 2005 requires the Responsible Person to undertake a Fire Risk Assessment (FRA) for the premises they are responsible for. However, it does not specify who should undertake the FRA, and indeed the use of a ‘competent person’ is an option rather than a requirement. While we understand that this approach was likely taken to ensure the regulatory burden on some organisations/individuals was not excessive, we believe it is insufficient for ensuring a key part of the fire safety regulatory framework is completed to the necessary standard. It should be noted that while room for interpretation, and an outcome-based approach, allows different organisations to apply the Order in a way which is relevant to their operations, it also creates uncertainty and can actually add to the regulatory burden as Responsible Persons are unsure whether their legal obligations have been fully met. Similarly, public and stakeholder trust in FRAs has been undermined

by the knowledge that there is no clear specification regarding the skills and expertise of the individual carrying out the assessment.

Regarding building safety more generally, our members have expressed concern that the framework surrounding the skills and expertise of contractors and sub-contractors completing works on site is not suitably robust. Not only does this apply to individuals carrying out works on behalf of the landlord, such as repairs, maintenance and refurbishment, but also other trades people in the home – such as those installing cable for television and other domestic works. As things stand it is very difficult for those with overall responsibility for the safety of the building to gain assurance that individuals undertaking works within the building have sufficient skills and expertise to complete the work to a high standard and in a way which is consistent with the intended design and operation of the building – including fire safety measures. In short, legislation, regulation and guidance can be as comprehensive as possible, but if a trades person damages, alters or removes an integral part of the building's fire safety design through a lack of skills or expertise, the fire safety strategy of the building will be undermined. There is therefore a strong case for more robust training and certification requirements for anyone who undertakes works within residential property that could have an impact on the building's safety performance.

Adopting a more robust approach would not only improve the skills and expertise of the individuals on site, it would also provide a mechanism for effective oversight and assurance for those who own and manage buildings and commission works. It would provide an additional specification to be included within the procurement process, and in doing so, ensure client and contractor had a shared understanding of the expected skills and expertise present on site.

We believe more specific requirements regarding the skills and expertise for relevant persons carrying out works in residential buildings is a key area for the Review to consider. A well understood and robust approach in this regard has the potential to underpin a far more effective regulatory regime going forward.

Although potentially outside the scope of the Review, it must be noted at this point that skills and expertise in the construction industry is a fundamental challenge for the sector and the nation as a whole, and will have a significant impact on the success of any future regime. We have heard from members and other stakeholders that attracting and retaining suitably qualified construction personnel is proving increasingly difficult, with implications for the capacity of the sector and the quality of work undertaken. This dynamic is expected to be worsened by the UK leaving the European Union, due to the number of skilled EU migrants working in construction. The Review will therefore want to consider how any recommendations for future building regulations will actually be implemented on the ground, and by whom.

5.5 Specific challenges for housing associations

As discussed, housing associations occupy a unique position within the residential property market, as large scale developers, owners and managers of residential property. This means that the current regime poses significant challenges to them, and also that future changes will impact on the sector in nuanced and potentially unintended ways.

Management of mixed tenure buildings

Increasingly, housing association schemes contain a mixture of tenants and leaseholders, due to both mixed-tenure new build developments and the historical and on-going impact of the Right to Buy. This mix presents particular challenges because it does not fit easily with the legal and regulatory regime, particularly in high rise multi-occupancy buildings.

The legislation regarding building and fire safety has been discussed in detail above. Notwithstanding the inconsistencies identified, a fundamental challenge arises from the interaction between legal responsibility and tenure. As landlords/freeholders, housing associations are responsible for the common parts of the building, and as Registered Providers of social housing they are responsible for maintaining the quality of their social rented properties and providing for the health and safety of their tenants. But such responsibilities, and therefore powers, do not extend to leaseholders in their buildings. This is a significant gap in the current regime and can present barriers to housing associations seeking to improve and safeguard the safety of their buildings.

Our members have provided some illustrative examples of the challenges they may face in reconciling fire safety for the building and individual leaseholder behaviour:

- The removal or alteration of fire doors undermining the fire safety strategy for the building. Unless specified in the lease, housing associations have no powers to compel leaseholders to replace or maintain fire doors.
- The installation and testing of fire alarms if these are deemed integral to the overall fire safety strategy for the building. Housing associations cannot compel leaseholders to install and/or test alarms, and yet their absence could significantly increase the fire risk to the entire building.
- Annual gas servicing. Housing associations must ensure all of their properties have up to date gas safety certificates, but there is no comparable responsibility for leaseholders in housing association blocks.

Provision for diverse needs

Housing associations are at the forefront of providing specialist accommodation for older people, people with disabilities, support needs and other vulnerabilities. It is also important to note that social housing tenants in general needs stock are on average older and more likely to have a disability or support need, than the general population. This has clear implications for housing management and service delivery, but crucially also affects health and safety policies and procedures – including fire safety. For example, regular fire alarm tests and evacuations could be traumatic and counter-productive, or may not be possible, for certain client groups, and communicating fire safety information effectively to hard to reach groups is a particular challenge.

In making proposals and recommendations, and as part of any impact assessment carried out, we would be keen for the Review and government to engage with us and our members to ensure the complexities and sensitivities surrounding older and vulnerable tenants are fully understood and taken into consideration.

Viability of existing housing stock

Housing associations are integral to the provision of quality, affordable homes in England. In certain locations across the country many of these homes take the form of multi-occupancy high rise buildings, often as a result of large scale stock transfers from Local Authorities. The housing crisis

affecting the nation means that these high rise buildings remain essential to meeting current and future need. There are however a number of financial and operational pressures which are beginning to challenge their ongoing viability as affordable housing assets. This must be recognised as it is these buildings which are most likely to be affected by future changes to building regulations and safety requirements.

In low value markets our members can often find themselves competing directly with a poor quality private rented sector (PRS) for tenants, due to very low private sector rents.

Landlords in the PRS are not subject to the level of regulation our members are, nor do they provide homes and services to the high quality that our members do, meaning they are able to minimise their costs and undercut housing associations on price. In reality this means more people living in poor quality and potentially unsafe accommodation.

Welfare reform is also having a significant impact on the future viability of these assets. The planned introduction of the Local Housing Allowance to social housing in 2019 will have a disproportionate effect on high rise buildings in low value areas in the midlands and north of England. The combination of rents and service charges for properties in these buildings is often greater than the very low LHA (which is determined by the low PRS rents discussed above). For welfare-dependent tenants this means that their benefits will no longer cover the combined cost of their rent and service charge, requiring them to find the difference or fall into rent arrears.

These two issues are illustrative of the challenges faced by housing associations operating high rise buildings in low value markets in England. We feel it is important for the Review to be aware of these factors as it is these organisations that will be required to meet future building and fire safety requirements for their high rise buildings, as well as continuing to provide much needed affordable housing for those in need. If the outcome of the Review requires relevant existing buildings to undergo significant retrofitting in order to meet higher new standards, it will be vital for government to introduce a mechanism for funding this programme in order to protect and maintain the provision and new supply of affordable housing. Elsewhere we have called for government to create a single Building Safety Fund to provide upfront funding for social landlords who need to carry out significant works in order to make their buildings safe. We have also suggested that costs could be contained by exempting such works from VAT. Under no circumstances should resident safety be dependent on landlords' ability to pay.

6. Key principles for a new regime

6.1 Clarity

Key questions:

- *What are our responsibilities?*
- *How do we know we have met them?*
- *How can we demonstrate this to others?*

We believe the overarching aim of a future regime should be to engender trust through clarity, consistency and ease of understanding. This will support compliance for all those involved with residential homes within their lifecycle, including residents and tenants.

Considering examples of previous transformational and culture change within the construction industry, the implementation and subsequent amendments to the Construction Design and Management Regulations (CDM) since 1994 provides a notable example of the introduction of a sector wide regime focused on the achievement of increased health and safety. A number of transferrable lessons regarding accountability, clarity of roles and responsibilities, planning, resources, transfer of information, consideration of potential impacts during the life of the building, training and scale of change are relevant.

The ambition of government to achieve a proportionate regulatory regime is understood but recommendations resulting from this review should not preclude the need for legislative review and regulatory change to achieve fitness for purpose now and into the future.

Consideration should be given to the relationship between building regulations and fire safety guidance; the first is focused on the design and construction of homes, the second on management. Compliance with both regimes is influenced by a wide range of factors of which some are easier to control and mange than others (including the difference between theory and practice).

Taking this into account we would support consideration of the need to ensure that compliance with future regulation achieves a sufficient margin of redundancy, to ensure buildings and their residents remain safe during the daily demands of occupancy. In addition, that compliance with regulation is achieved through a holistic approach, not placing disproportionate pressure on the performance of one technical design feature. Such an approach will provide a level of assurance for those who are accountable that they are in a position to meet their responsibilities and ensure residents are safe in their homes now and in the future.

A number of more specific suggestions to revise and improve existing regulatory regimes are set out in Annex A.

6.2 Accountability

Key questions:

- *Who are we accountable to and who is accountable to us?*
- *What happens if requirements are not demonstrably met?*

First and foremost housing associations are legally and morally accountable to their tenants. The wider regulatory regime must therefore provide a framework which empowers housing associations and other buildings owners/managers to meet their obligations and safeguard the safety of their tenants.

Housing associations are committed to tenant involvement and engagement, and must ensure it is carried out effectively in order to fulfil their obligations under social housing regulation. Our members are well placed to describe the structures and approaches they use to deliver this commitment in practice, and we are aware that this will form a significant part of the evidence that they submit to the Review individually. At a strategic level we are undertaking work to review and understand tenant involvement and engagement and would welcome the opportunity to share our findings with the Review as they emerge.

Genuine and robust accountability is a key requirement of the new regulatory regime. It will be central to driving up quality and performance and re-establishing trust in the concept and operation of regulation in this area. Our proposals focus on:

- Building Control
- Fire Authorities
- Building owners and managers
- Contractors

Building Control

The purpose, form and operation of Building Control requires fundamental review and reform. Within the regulatory landscape it is building control bodies that play the crucial role of actually certifying that buildings/works are compliant with building regulations. For this to be done effectively we believe building control bodies must be independent, well qualified and accountable.

Independent – responsibility for Building Control should sit with adequately resourced Local Authorities. This would improve consistency and transparency, and remove the possibility of stakeholders questioning building control bodies' expertise and priorities. The current mix of public and private providers is unclear and inconsistent, and it is not apparent that the introduction of market forces into this area of regulation improves service provision or safety.

Well qualified – individuals inspecting buildings for compliance with building regulations must be adequately trained and resourced. Expectations regarding qualifications, training and performance review should be clearly communicated to building control bodies. Similarly, performance monitoring and quality assurance must be overseen from a central body in order to determine whether good practice is actually happening on the ground. The integrity of the building regulations framework is undermined if the quality of inspection and certification is called into question.

Accountable – the inspection and certification of works/buildings should be thorough and robust. In part, this relies on other changes to regulatory environment – namely the need for contractors and those on site to take responsibility for the quality and safety of their work. It is also a question of resourcing, to ensure inspectors are able to gain a full understanding of the project and dedicate sufficient time to ensuring its compliance. Ultimately, we must arrive at a position where those responsible for certifying compliance have had sufficient access, information and assurance in support of the certification that it is appropriate for them to be accountable for the decisions they have reached. For Building Control to play an effective regulatory role it must be accountable, and this means that mistakes and erroneous certifications must have consequences.

Fire Authorities

Legislation regarding fire safety makes clear who the Responsible Person is, however the question of accountability here is more complex, focusing instead on how the Responsible Person can be confident that they are meeting their obligations effectively. There is a further challenge around improving the consistency, quality and relevance of the advice provided to housing providers by Fire Authorities.

We believe a potential solution to both of these challenges is to build on the established Primary Authority Scheme (PAS) to develop a deeper and more meaningful relationship between relevant landlords and Fire Authorities.

A renewed and focused PAS for fire safety in housing would offer the dual benefit of ensuring housing providers have access to high quality, consistent support and advice regarding fire safety in their stock, while encouraging Fire Authorities to improve their understanding of different types of housing provision and the specific risks and challenges they might entail.

If this could be successfully developed and tested with the support of both sectors, future regulations could require landlords of a certain size to enter into a PAS for fire safety.

It is important to note that the interaction and relationship between building and fire safety regulations must be improved in practice. Our members have suggested a number of ways that this could be achieved for new build and existing properties, which are included in Annex A. We would be happy to facilitate further engagement between the Review and our members to explore and test these ideas.

Building owners and managers

Owners and managers of residential property, such as our members, are responsible and therefore must be accountable for meeting legal and regulatory requirements and ensuring as much as possible the safety of those who live in the buildings. Housing associations take this responsibility very seriously. As discussed elsewhere in our submission, the ability for boards and staff to effectively monitor and evaluate compliance can be constrained by more systemic legal and contractual issues. In recognition of this, the Federation has begun a project focusing on more effective procurement and contract management, with the aim of positioning housing associations as informed and appropriately demanding clients. It should be noted that the wider commercial and legal environment does not incentivise such an approach at this stage in time. This cultural atmosphere is something that the Industry Response Group is alive to, and we believe the Review should be aware of and factor into its recommendations and proposals for implementation.

Contractors

Contractors and sub-contractors play an enormous role in constructing, maintaining, repairing and refurbishing housing association properties. They are therefore integral to a properly functioning building and fire safety regulatory regime. However, their primary motivations are to meet contractual specifications and secure Building Control certification. This incentivises a process and cost driven approach, as opposed to one motivated by outcomes and quality. This is particularly pronounced where contractors take the lead on aspects of design, as per a Design and Build Contract.

In addition to the work we are leading on procurement and contract management, we believe the Review should consider how those who actually undertake the majority of works on new and existing buildings could be brought more formally within the regulatory regime. The intention of such a move would not be to add additional layers of bureaucracy or cost, but to encourage culture change across the sector by better aligning priorities and incentivising and rewarding desirable behaviours and outcomes. It would also seek to improve the accountability chain as it cascades down from building owner to resident.

This could be achieved through a more robust and demonstrably independent Building Control function, specific requirements for the skills and expertise of individuals carrying out and managing

works, named individuals responsible for coordinating and evaluating compliance with stated safety regimes, and specific legal and regulatory responsibilities for those who are contracted to undertake works on residential buildings. A more collaborative and outcome-based system would also be more likely if construction frameworks, partnerships and Joint Ventures were encouraged and supported.

We believe that taken together, the proposals above provide a comprehensive approach to improving accountability throughout the property lifecycle.

6.3 Expertise and resourcing

Key question:

- *How do we know that the individuals with day to day, management and oversight responsibilities have the skills, expertise and resources to fulfil their roles effectively?*

Fundamental to the operation of an effective regulatory regime are the skills and expertise of those who have responsibilities within it, and those whose activities it regulates. Our proposals here focus on fire safety and wider building safety.

Fire safety

We believe fire safety legislation should be clearer in stating what a Fire Risk Assessment (FRA) must involve, who should undertake it and how regularly it should be carried out. We recognise the need to ensure this is proportionate and relevant to the building in question, and are open to the idea of more prescriptive requirements only applying to buildings where the fire risk presents a greater risk to life (such as multi-occupancy high rise residential buildings, hospitals, and other buildings in which people sleep).

In particular, it should be a requirement for FRAs to be carried out by an appropriately qualified person, as evidenced by their qualifications and certification. We see no reason why the assessment of fire risk should be subject to less stringent expectations regarding expertise than gas safety testing for example.

We also note that our recommendation regarding a PAS for fire safety in housing should facilitate greater knowledge exchange between the two sectors and generally improve fire safety awareness and understanding for those who are responsible for housing and property management.

The knowledge, understanding and behaviour of those who occupy high rise buildings in particular, has a significant impact on the overall fire risk profile of the building. Building owners and managers must take the lead in developing resources which effectively engage and inform tenants, but we also believe there is scope for national guidance and resources to support good practice. A national campaign on fire safety in the home, and easily accessible information resources for occupants on managing domestic fire risk, could play an important role in increasing awareness and understanding.

Building safety

It is well recognised that effective fire strategies encompass a whole building/system approach, whereby the design, fabric, operation, maintenance and management of the building all have a role to play in ensuring fire risk is effectively managed. In keeping with this approach we believe more should be done to ensure that those carrying out works within residential buildings have the appropriate skills

and expertise fulfil their tasks to a high standard, and in a way which is in keeping with the wider safety of the building.

In order to achieve this we would support a requirement for contractors undertaking major works or refurbishments to be able to demonstrate robust understanding of the building's fire safety strategy and other relevant documentation, and to be responsible for certifying that the works they have undertaken are consistent with them. Not only would this improve contractor accountability, it would also provide strong incentives for them to ensure their work force is appropriately skilled.

Another option would be to require the presence of someone with appropriate training in fire safety to be involved in certain types of work being carried out in residential buildings. This could be demonstrated through certification and would improve the likelihood of fire safety being considered throughout the project.

Our members have identified the fire safety risks presented by external contractors carrying out works within individual properties. Routine tasks such as the installation of cables for television have the potential to undermine fire safety measures by tampering with or removing important fire stopping or containment materials. This presents unique challenges as the building owner or manager has little control over works carried out in individual properties. A potential solution would therefore be to require a form of training or certification for all contractors/engineers who carry out works likely to impact on fire safety in the home.

We feel it is important to reiterate the importance of an appropriately skilled workforce, and for the skills and expertise of relevant individuals to be evidenced by qualifications, certificates and registers. This improves the effectiveness of the regulatory regime and provides greater assurance to those with overall responsibility for safety in residential buildings. However, we are aware of broader challenges in the construction and property maintenance industries regarding the attraction and retention of staff. This is an issue faced by the nation as a whole and can be seen across the construction and built environment industry. It therefore requires a strategic response from government, and we would encourage the Review to consider the workforce implications of its recommendations. It may be that in the long term, the kind of transformation necessary to improve safety across the board can only be delivered alongside a bold new approach to increasing the capacity within the construction and property maintenance workforce.

6.4 Holistic and comprehensive

Key question:

- *How is government maintaining its consideration of how legal, regulatory and policy developments impact on the safety and operation of new and existing buildings?*

The new building and fire safety regime must be holistic and comprehensive, and it is welcome that the Review is considering the two areas together, as well as wider factors which affect successful operation of the regime. We recognise that 'joined up' policy making can be challenging due to the complexity of the issues involved, the inter-relationship between many areas and competing priorities and resources. However, we believe now is the time to devise an approach to building and fire safety which is joined up, and which ensure this will remain the case going forward. If this is not achieved it is possible that in five, ten or fifteen years in the future we are again talking about a disjointed and ineffective system of regulation.

Improving the energy efficiency of residential buildings is an example of this dynamic in action. Previous governments rightly encouraged housing associations and other developers of residential property to improve the energy performance of new and existing properties beyond that required by building regulations. This was often achieved through the use of new materials, without explicit consideration of how this would impact on compliance with other parts of the current approved documents which set out building regulations. This, and broader misunderstanding of the Regulations, contributed to the situation we are in now whereby non-compliant materials, such as ACM cladding, have been found to be in use and must now be removed and replaced. Similarly, the focus on improved energy performance through higher levels of insulation and reduced loss of heat through the building fabric (air tightness), has led to overheating and ventilation issues in a number of cases.

The coordinated response from government and industry has been crucial to responding to the challenges emerging from the fire at Grenfell Tower, and we believe could provide a blueprint for an effective approach going forward. Government should convene a permanent 'Building Safety Group,' encompassing civil servants from all relevant government departments and bodies, and representatives from industry. The role of this group would be to assess the performance of the building safety regulatory regime, monitor developments in construction practices, inform government policy and pre-empt potential issues and risks.

In the short term our members would welcome a comprehensive overhaul of the way the industry interacts with building regulations and Building Control. There are opportunities for government to embrace modern technology and communication techniques by:

- introducing digital versions of all key documentation with links to further information and resources
- supporting online applications and more user-friendly interfaces
- developing a live online tool which pulls together all relevant policy, regulation and legislation in one place and ensure it can be almost instantly updated

Exploring these kinds of options is important, as the way people engage with and understand a regulatory regime, is just as important as its content.

In keeping with the need to be comprehensive, we feel it is important to recognise that the majority of domestic fires begin in individual properties. To date, the discussion has rightly focused on the overall safety of the building, fire safety measures and systemic failings in the regulatory environment. However, at some point consideration must also be given to how domestic fires start, and in particular the quality and safety of household goods and appliances such as electric heaters and white goods. This is a particular issue for housing associations as their tenants tend to have lower incomes, which often means access to poorer quality household appliances and white goods.

Similarly, effective housing management strategies for multi-occupancy high rise buildings, with regards to fire safety, should be developed further and shared across the sector. There is certainly a role for the Federation and our members to play here.

6.5 Trust and assurance

Key question:

- *How do we, and our stakeholders, know that the legal and regulatory regime we are operating within is effective and fit for purpose?*

The shocking events at Grenfell Tower, and the subsequent discovery of unsafe materials in use across the country, has shaken confidence in the nation's approach to building safety and regulation. We have seen first-hand that regulatory failure has the potential to contribute to catastrophic loss of life, as well long term trauma for survivors, family members the local community. Similarly, occupants of similar buildings are now deeply concerned about their own safety, building owners are seeking assurance that their assets are safe and compliant, and financial stakeholders such as funders and valuers are questioning the ongoing financial viability of affected assets.

All of these factors demonstrate the overriding need for a future regime to inspire confidence and trust amongst all parties. In many ways, the proposals and ideas for improvement submitted to the Review will go some way to achieving this, if they are implemented by government. From our perspective the wider construction and residential property sector is united in its desire for transformative change in order to prevent such tragedy from happening again. In addition, the outcome of the Grenfell Inquiry and the proposals included within the Social Housing Green Paper will have an enormous influence on public perceptions.

However, given the scale of the regulatory failure unearthed through this process we believe there is more that can be done to provide greater assurance to residents, landlords and other stakeholders in the future. Our proposal is for government to commit to structured, regular and independent reviews of the regulatory regimes in key areas of public safety and interest, including building and fire safety. On a rolling basis these reviews could consider key questions such as:

- How is the current regime performing against key criteria?
- Have there been any major changes or developments in the industry/sector (e.g. technological) which require further investigation?
- Does the regime remain fit for purpose?

The reviews would offer an opportunity for government to bring together the full range of experts and stakeholders in order to gain a comprehensive and informed understanding of the issues, challenges, successes, failures and risks. (Our 'Building Safety Group' idea above could have a role to play here.) They would also demonstrate that government is committed to proactive and proportionate regulation in order to safeguard the health and wellbeing of the nation. Such an approach is preferable to the status quo whereby a tragedy or accident must occur before fundamental review and change takes place.

7. What can be learnt from other countries?

It is our expectation that others respondents will be in a position to provide more detailed learning from other sectors and countries. However, engagement with members and our expert advisors did highlight potential considerations for further review. Specifically feedback, actions and learning identified in the oil and gas and transport (aviation and rail) industries following major incidents.

In respect of building regulations and codes adopted by other countries, the approach to sprinklers within new build homes adopted by Scotland and Wales were highlighted.

Further afield, changes to regulation following high rise fires in buildings in UAE (Dubai) were cited, including approaches to fire protection, sprinklers and evacuation policies. In addition, it would be worth reviewing approaches to site working practices in the USA (permit to work in relation to skills and training).

8. Conclusions and next steps

We hope the Review finds our evidence useful, relevant and informative. We welcome the opportunity to contribute to this vital debate and reiterate our desire to constructively engage with the work of the Review as it progresses over the coming months. This is a unique opportunity to bring about transformative change in an ambitious, proactive and collaborative way. The final result must be a comprehensive approach to building and fire safety which inspires trust in key stakeholders and supports the delivery and management of high quality, safe residential buildings.

It must be recognised that delivering a step change in residential building quality and safety will come with resourcing implications. When implementing the Review's recommendations government will have a number of options for adequately resourcing new structures, systems or requirements. While this will be part of wider fiscal considerations, we feel it is essential that sufficient public funding and investment is committed to this vital task, in order to prevent sector capacity – manifested in ability to invest in new and existing affordable homes – from being depleted.

It is essential that the views of housing associations are taken into account, given their central role in the delivery of new and existing affordable housing in England. The Federation is well placed to coordinate a representative group of housing associations for further engagement with the Review as proposals and recommendations emerge, should that be beneficial and appropriate. The sector is determined to deliver great homes in great places and the future legal and regulatory regime will play an important role in supporting this to happen.

For further information please contact:

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Annex A: Potential changes to current regulations and guidance

This section covers suggestions for potential changes to revise and improve existing regulation as it stands. Our members are keen to support further discussions and exploration of potential changes to ensure that proposals are practical and fit for purpose.

Building regulations

To improve clarity of use there is potential to consider the current split of building regulations in Approved Document (AD) Part B (Fire) into part B1 (dwelling houses) and B2 (buildings other than dwelling houses). Aside from the confusion caused by this split and its nomenclature, recent years have seen a huge increase in the level of detail contained within the building regulation approved documents. It may be prudent to separate any housing requirements for ease of use and reference. This would have the benefit of improving compliance across design and sign off processes, recognising that there is a significant number of organisations, professionals and contractors who specialise in housing.

Building on this approach and examples earlier in this submission, a general review of all housing requirements would be welcome, to ensure that unintended consequences of differing areas of regulation do not impact on fire safety. Members have indicated that current requirements for energy efficiency (Approved Document Part L) have an impact on the choice of fuel used in homes which in high rise buildings could add to fire safety risk.

Subsequent versions of AD Part B (Fire) should seek to take account of the research and recommendations already co-ordinated in respect of usability by DCLG. Future documentation should be reviewed to remove reference to ambiguous or outdated terminology and be flexible enough to be able to deal with emerging or new materials and technologies to achieve compliance. This in turn will inform the approach to risk adopted by lenders and insurers.

The inclusion of crucial safety information in footnotes and appendices should be avoided and cross referenced to EN/BS standards. There is potential for dedicated paragraphs in the body of the document with bold headings that should clarify combustibility and spread of flame information.

Paramount to the success of a future regulatory regime is the need to recognise the differing requirements for existing buildings (including any subsequent work required to them) and new build homes and how this information is conveyed and supported. Further considerations have been set out in this respect in a number of the sections below.

New build homes

Members agree further work is required to support the implementation of regulations regarding provision of sprinklers and their ability to work as part of an overall approach towards fire safety. Similarly, the need for higher standards to be considered for all new residential building projects in relation to cladding.

Cladding

Following earlier references to a holistic approach to risk and unintended consequences of current requirements, learning from member experience post-Grenfell, buildings had the potential to be placed in different risk categories purely as a result of their height falling just above or below the 18 metre definition within regulation in respect of cladding specification. In practice the difference in building design could be marginal. The Review should seek to provide greater clarity of approach in such instances.

There are examples of practice already used within other parts of the building regulations approved documents which could be used as precedents for reviewing requirements for achieving compliance with parts of Part B (Fire). Members have cited the use of “robust details” to meet requirements for transfer of sound within dwellings, providing clarity in terms of compliant solutions but less flexibility and room for alternatives without further testing.

One suggestion is that manufacturers of cladding have their product checked as part of a complete external wall structure, with variations tested for different façade build ups in terms of background construction, insulation type and thickness etc. Building on recent government test information this would support a library of approved and tested cladding systems for use under licence. Nominal fees paid for use would cover the cost of maintaining the system but cladding and insulation manufacturers would pay for the initial test. Use of a system under licence would be deemed to satisfy building regulations. Any variation or alternative would need to be fully tested as part of achieving regulatory approval limiting the routes for sign off to two and removing the need for reliance on desk top reviews.

Where cladding and fire stopping are specified (not just fire stopping for cladding), this should only be carried out by registered contractors and site operatives. A system of certification could follow the precedent of Gas Safety, with operatives having to be trained and tested regularly and the need for specific certification for different categories of work.

Sprinklers

Regulatory regimes adopted in Scotland and Wales have been cited as worthy of review and it is important to understand how examples from other countries work in practice.

Specific technical considerations raised in regard to the wider provision of sprinkler systems in homes include:

- The need for further clarity as to how misting systems meet UK regulations and their adoption and use
- The potential impact of differing local levels of water pressure and the operational impact this might have on systems. For example, the ability to get water to top floors of high rise homes when water pressure drops as this leads to the need for tanks which can be expensive.
- Consideration of the impact of regulation change in respect of risks from exposure to Legionella in man-made water systems (see above).
- The need for greater communication to understand the realities of modern sprinkler systems, how they work in practice; including how they are triggered, length of response, appropriate use, maintenance and installation with other systems.

From a regulatory compliance point of view, if sprinklers are mandated with a wider scope than current regulation, concerns were raised that designers will try to further “fire engineer” designs using sprinkler provision as a backstop to allow longer means of escape travel distances.

Existing homes

There is support for separate guidance on both cladding (replacement) and sprinklers (retrofit) that is based on risk to residents and users of the building, referencing height, means of escape and specification. This should clearly guide building owners and landlords as to whether cladding will need to be replaced or sprinklers need to be retrofitted to ensure that residents feel safe in their homes.

For existing schemes, if cladding needs to be replaced or sprinklers need to be retrofitted under the criteria set out, government should set up a Building Safety Fund to provide grant support to help building owners with the cost of this work and ensure that eligible works are VAT free.

Other

Members have specifically highlighted the use of the BBA certificate system, citing the need for work to make it fit for purpose in terms of clarity and use including following potential changes to regulations. Currently many certificates are heavily caveated and do not provide sufficient clarity as to the range of uses that products can be used safely.

Fire safety regulation

- Additional commentary has picked up the need for the Fire Brigade or enforcement officers to mirror the demands of Fire Risk Assessments (FRAs), and in turn the scope of FRAs should be reviewed in light of any changes to AD Part B (Fire). This would ensure that all those with an interest in the building have a common goal – that building regulations are in place, have been followed, risks have been mitigated and residents are safe in their homes.
- There is potential for greater collaboration between sign off of building regulations by the building inspector and subsequent points of clarification regarding fire safety.
- To support clarity, consistency and confidence, a Fire Risk Assessment Body should be established, with approved inspectors qualified to a recognised standard. FRAs should be completed following an approved format for scope and content, then submitted to the Assessment Body for quality assurance purposes.
- Focusing on the adoption of greater levels of technology there was support for a legal requirement for buildings to come with Safety Handbooks, electronic asset registers, details of maintenance and servicing requirements, including suppliers and sub-contractors.
- Linked to this, there is potential for the use of more remote monitoring technologies which will allow responsible parties to ensure systems are working and identify and potential breaches. For example, there should be a Fire Strategy document together with an FRA completed on day of occupation. Formats could include putting this information in Premises Information Boxes, or information could be available in the cloud (other than clear block plans) and available through QR codes. These codes could also be fitted to items such as smoke detectors, fire doors etc.

London Assembly Planning Committee Call for Evidence

Installing sprinklers in London's buildings

Croydon Council's Submission to the London Assembly Planning Committee

December 2017

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CONTENTS

Preliminary Comments

As a precautionary note to all comments below the use of sprinklers should never be seen as a standalone solution or as a remedy where existing passive fire precautions have been breached or altered.

Over the years buildings are altered and the primary reason of the fire precaution measures and means of escape are not always understood or taken into account leaving the structure in a condition where the building would no longer meet the regulations that existed when it was constructed e.g. fire doors are replaced with substandard substitutes or door closers are removed compromising means of escape and spread of fire, additionally common is where services are replaced or altered and they breach fire compartments with no thought of fire spread or use of fire stopping to remedy the situation.

Benefits of Sprinklers

1. In general, what advantages do buildings with AFSS installed, particularly residential buildings, have over buildings without these systems?

- *Potential ability to control spread and growth of fire thereby reducing fatalities, injuries and property damage caused by fires*

Design freedom allowing more innovative use of space. Approved Document B of the Building Regulations provides the following significant benefits should a sprinkler system be installed:

- *A reduction can be achieved of other passive fire safety measures. The requirements for fire retardant materials, the number of escape routes may reduce with increased travel distances.*
- *Allowing buildings to be used for purposes other than which they were designed for.*
- *Allowing buildings to be built or converted to other uses which planning restrictions would otherwise prevent.*
- *Under building regulations you may double the size of a fire compartment if sprinkled in some circumstances*
- *May provide compensatory benefits where FB access to fight the fire is limited*

Arson is a factor in many fires, although fire sprinklers cannot prevent arson as such they can minimise the damage caused.

Insurance companies may give discounts for sprinkled properties.

Environmental benefits may be achieved due to carbon emission reductions and reduced quantity of water used to fight fire.

Less fire damage from smoke and water means the affected area can be put back into normal use quicker and the rest of the building may be unaffected

Reduce the risks to life and injury experienced by firefighters working in high rise blocks.

2. Which groups of people are more likely to benefit from the cost of installing AFSS than others?

All groups will benefit but popular thinking attributes the greater benefits to social housing and the lower end of the social economic scale.

Feasibility

3. What are the typical costs of installing a sprinkler system in a new-build flat or block of flats, and how much is this as a proportion of development cost? Are there mechanisms available to reduce these costs?

The earlier fire protections including sprinklers are introduced into the design process the cheaper the end cost will be without costly redesigning or value engineering being applied where sprinklers are an afterthought.

4. How far is it feasible to extend the existing Building Regulations to mandate AFSS in new residential buildings with a height lower than 30 metres?

- *This would require a process similar to that which has been undertaken in Wales with Consultation, Regulatory Impact Assessments and Cost Benefit Analysis also taken into consideration (Implementing the Domestic Fire Safety (Wales) Measure 2011)*
- *The DCLG commissioned NERA Economic Consulting (NERA) in 2010 to carry out a cost benefit analysis of options for addressing the fire and community safety needs of areas of new build housing, with special reference to the Thames Gateway. Of particular interest is the issue of installing sprinklers in domestic properties, and whether or not the present costs of installing and maintaining sprinkler systems might be justified by the risk reduction that they would provide (A Cost Benefit Analysis of Options to Reduce the Risk of Fire and Rescue in Areas of New Build Homes Fire Research Series 1/2010)*

  It concluded "The limited and uncertain evidence for installing domestic sprinklers in new social housing suggests that sprinklers may be cost-effective in some cases. It may therefore be appropriate for providers of new social housing to consider sprinklers on a case-by-case basis. However, the cost benefit evidence from this study does not support the mandatory installation of sprinklers in all housing or social housing in the Thames Gateway. The benefits from installing sprinklers in social housing would be reduced in particular by the current government planning policy of mixing social and private housing, as the scope for FRS savings would be reduced where both housing types share the same FRS resources."

Retrofitting

5. What factors do you consider necessary to justify installing AFSS in existing residential buildings?

- *A Cost Benefit Analysis would need to be carried out taking into account the technical and constructional difficulties, ease of fitting, water supply etc. As well as the social problems, resistance, ownership etc.*

- *"Safer High Rise Living... the Callow Mount Sprinkler Retrofit Project" is a major report, published by the British Automatic Fire Sprinkler Association (BAFSA) in 2012, which demonstrated that it is cost effective and practical to retrofit automatic fire sprinklers in existing high-rise tower blocks in particular in those constructed between 1950 & 1970.*
- *Age and structural composition of the buildings; number of stair cores, external escape routes, Comprehensive FRA's;*

6. What is the typical cost of retrofitting an existing residential flat with sprinkler systems?

- *Price for core works, tanks, pumps alarms systems, core drilling, fire stopping, surveys, technical design and making good is between on average £4000-£5500 per flat.*

7. What are the main factors affecting the feasibility of retrofitting existing residential buildings with AFSS? Demographic and political factors. Structural and services capacities of the building. Resident buy-in. Are there differences between the private and public sectors?

- *There will be both technical and financial difficulties for retrofitting sprinkler systems in residential buildings, problems such as structural loading for the water tanks if required, water pressures, variation in the occupancy, cosmetic appearance of pipework or boxing in, allocating spaces for the sprinkler system components such as water tank, pumps and pipes compound the complexity of retrofitting sprinkler systems*
- *Another factor is the number of leaseholders in any block. Croydon has a relatively low number of leaseholders in the blocks we are retrofitting sprinklers within (46 leaseholders within over 1000 properties in scope). However, the leases we have do not provide the right of access to carry out these works. We have used behavioural science approaches in our letters to leaseholders as well as offering the works for free in order to encourage leaseholders to voluntarily agree to having sprinklers fitted. This has achieved an over 50% success rate to date.*
- *When considering the private sector similar considerations above apply. However, whereas in the public sector there is the opportunity to limit charges to leaseholders, the private sector these tend to be passed on in full. This applies not only to AFSS, but also to removal of cladding and waking watch for example. Early indications from Croydon are that this is placing significant burden upon leaseholders, where income is low in comparison to mortgages.*

Technical issues

8. What are the main technical issues with installing AFSS in new residential buildings? Age, Structural and services capacities of the building. Which issues are most likely to make AFSS unviable?

- *All of the factors listed above but also critical is to take into account any breaching of existing fire compartments and structural elements and how these can be resolved*

9. What is the general level of public perception and knowledge of sprinkler systems? Knowledge is generally vague but positive. How can these issues be addressed?

- *Misconception by the public due to misinformation such as heads are easy to activate and all heads will activate simultaneously in the event of a fire, many of these myths are based on the general perception of commercial sprinklers seen by the general public such as in large retail sheds.*
- *Increased communication on the back of the Grenfell tragedy is vital not only to the public but also to decision makers such as councillors and board members etc. who may also hold these false beliefs never actually having seen a residential sprinkler system and how few actual heads it supports.*
- *We have found that public perception is generally positive. Comments from our own residents suggest that on the whole residents feel that sprinklers are important for their safety and welcomed. Some residents in lower rise properties have asked why the council is not installing sprinklers in these properties, despite this not being the recommendation of the LFB or other bodies, or indeed a requirement for new build properties.*
- *We have worked to address residents understanding of sprinklers, their effectiveness, how they work and their benefits through a number of means:*
  - *Resident representatives*
  - *Information on our website including photos and a video of an installation and Q&As compiled through engagement with staff and residents https://www.croydon.gov.uk/housing/firesafety?utm_campaign=redirect&utm_medium=alias&utm_source=firesafety*
  - *Prepared a show flat for residents to visit, to show how the sprinklers systems look within the flat – which works alongside the website and video*
  - *Face to face meetings for those households whose homes will have sprinklers installed*
  - *An information booklet for all householders where sprinklers will be installed*

10. How much power do local authorities and the Mayor have to impose more localised fire safety standards, including AFSS? Would more localised standards be desirable?

- *Care needs to be taken in trying to use different strands of legislation to solve issues which should be rightly in the domain of the Building Regulations. This was evidenced with Part L of the Building Regulations Thermal Insulation etc. which saw Councils through their Planning Departments imposing extra targets and conditions on top of what was already stretching requirements by the DCLG.*

- *Confusion can arise as to who should be enforcing such requirements and consequently issues can be missed. Only recently the DCLG abolished all Local Acts such as the Croydon Corporation Act which imposed conditions such as smoke ventilation on certain buildings as these measures have now been adopted by the Building Regulations.*

ABI RESPONSE TO LONDON ASSEMBLY PLANNING COMMITTEE REVIEW FOR INSTALLING SPRINKLERS IN LONDON'S BUILDINGS

About the Association of British Insurers (ABI)

- The Association of British Insurers (ABI) is the voice of the UK's world leading insurance and long-term savings industry. A productive, inclusive and thriving sector, we are an industry that provides peace of mind to households and businesses across the UK and powers the growth of local and regional economies by enabling trade, risk taking, investment and innovation.

- The UK insurance industry is the largest in Europe and the fourth largest in the world. It is an essential part of the UK's economic strength, managing investments of over £1.7 trillion and paying nearly £12bn in taxes to the Government. It employs over 320,000 individuals, of which around a third are employed directly by providers with the remainder in auxiliary services such as broking.

Executive Summary

- We welcome the opportunity to respond to this review, which raises a number of issues that are important to UK property insurers. It is vital that new homes are built in an appropriate and sustainable way that enables continued access to affordable home insurance. Equally, existing housing stock must become more resilient against today's perils and future risks. This submission will discuss some of the considerations that should be taken into account when mitigating against fire risk in buildings. A more detailed account of the insurance industry's views on building regulations is available in our response to the Independent Review on Building Regulations and Fire Safety[1]

- It is important to ensure that an increased quantity and speed of construction does not encourage poor practice and impact on building quality or encourage the use of unsuitable materials. Poorer quality house builds will mean less durable and sustainable housing in the long-term, which is a concern for the insurance industry. Building regulations, construction methods and a skilled workforce need to be kept up to date to ensure properties are resilient against a range of risks, including fire, flooding, windstorm and escape of water (burst pipes).

- The benefits of automatic sprinkler systems are clear - their ability to reduce fire spread results in both a reduction in the risk to life as well as a reduction in the level of fire or smoke damage to a property. Insurers encourage the installation of sprinklers in commercial buildings and offer premium reductions to businesses and schools that install them. Our members are supportive of sprinklers in new-build high rise buildings, but have some concerns about the potential risks of retrofitting sprinkler systems into existing high-rise buildings if not carried out in a safe and comprehensive manner (refer to 2.4 to 2.6 below). The ABI has commissioned the Fire Protection Association (FPA) to complete a research project into suitable standards for installing sprinklers

[1] https://www.abi.org.uk/globalassets/files/consultation-papers/member/2017/11/abi_independent-review-on-building-regulations-and-fire-safety_final.pdf

into multi-occupancy residential buildings. This will consider mechanisms to encourage more tamper-resistant systems, lessening the risk of these systems not working as intended in a domestic setting, as well as the potential for them to pose a significant escape of water risk to insurers. We will look to share the findings of this research when complete, and suggest that the London Assembly Planning Committee considers the FPA's more technical response to this consultation in detail.

- There is abundant evidence - social, environmental, and economical - which highlights the importance of improving the fire protection for buildings that are vulnerable to fire, or which contain vulnerable members of society. The Government should introduce compulsory sprinklers for new build schools, new build care homes and new build warehouses over 2000m^2.

- The ABI believes that the London Assembly review should take into account the implications of the repealed section 20 and 21 of the London Buildings (Amendment) Act 1939 and should strongly consider re-introducing those provisions that are not incorporated within existing Building Regulations.

1. The cost of fire measured in UK property claims

1.1. The cost of fire insurance claims in the UK is significant. In 2016, insurers paid out £1.27bn for property fire claims (£388m from domestic claims, and £885m from commercial and industrial claims).

1.2. If we consider domestic property claims, the average amount paid out on a fire claim has increased from £5,550 in 2006, to nearly £15,000 in 2016 (in real terms). The number of fire claims has decreased from 71,000 in 2006 to 26,000 ten years later, but the marked increase in the average cost of claims clearly illustrates that when fires occur, they are more destructive and cause more widespread damage. Fire is one of the few perils which consistently meets an insurer's estimated maximum loss expectation, and therefore it is important to consider the implications of increasing the fire risk of a property, which insurers will take into account when offering cover.

2. Use of sprinklers

2.1. Sprinklers often help to enable the quick and safe evacuation of those affected, limit any damage to a localised area and control the fire, enabling the fire and rescue services to extinguish it. Today, automatic sprinkler systems are used more than any other fixed fire protection system and tens of millions are fitted around the world each year. The benefits of sprinkler installation are clear:

- In the UK, no-one has ever died from a fire in a fully sprinklered building[2].
- Losses from fires in buildings protected with sprinklers are estimated to be a tenth of those in buildings without sprinkler protection.

[2] Business case for sprinklers, Chief Fire Officers Association

- Their use means consequential losses and inconvenience can drastically reduce, which helps those affected by fire to get back to normal more quickly.
- Alongside the reduced risk to life, there is an abundance of evidence, including social, environmental, and economical, which highlights the importance of improving the fire protection for buildings that are vulnerable to fire.

2.2. Insurance risk management teams often advise customers on the installation of sprinkler systems in areas of high risk to make the customer's property safer. This can also enable insurance cover to be secured, where otherwise that cover might be inaccessible or unaffordable. We are aware that some insurers offer a significant reduction in premiums, in some cases of up to 50%, to recognise the risk mitigation effects of having sprinklers installed. Clearly any reduction will depend on a range of factors, including the type of building, and significant reductions are more prevalent in commercial premises.

2.3. Following Grenfell Tower, we have seen a number of Local Authorities confirming that they will retrofit sprinkler systems into high rise multi-occupancy buildings. With this surge in demand, there is a need to consider the relative performance of automatic fire sprinkler systems in high-rise, multi-occupancy buildings. The current British Standard for sprinkler system performance in a residential setting only applies to the slowing of fire growth for a limited period of time to allow evacuation from an individual dwelling. Insurers would prefer a higher standard of protection, covering the whole building or at least protection of several dwellings simultaneously.

2.4. Fire safety management, compartmentation, panel system construction, combustibility and fire performance of panel material as well as fire mitigation systems all need rigorous regulation. It is important to recognise that sprinklers are one measure which can help reduce the fire risk to a building, but that various passive and active fire risk management measures should work together within a building as a 'system' and should not be considered in isolation.

2.5. There is a risk that the introduction of more pressurised water systems into dwellings will cause an increase in the number and value of escape of water claims. This is of concern to the insurance industry as escape of water claims are the most consistently expensive peril for domestic property insurers.

2.6. If sprinklers are installed as part of a wider fire safety management system, whether retro-fitted, or installed in new builds, the following points should be observed:
- Installed automatic sprinkler systems are of the highest reasonable quality.
- Components and materials of appropriate design, quality and performance are used in systems.
- Installation work is of sound quality.
- Periodic maintenance is undertaken as required.
- Competency of installation and maintenance personnel is assured to a high level.
- Residents have a basic understanding and awareness of their sprinkler systems.

3. Mandating sprinklers in certain properties

3.1. In 2016, the ABI campaigned for the introduction of mandatory sprinklers for new build schools[3], new build care homes and new build warehouses over 2000m^2 [4]. In Scotland, legislation introduced in 2005 requires all newly built care and residential homes to be fitted with sprinkler protection. In order to protect the most vulnerable individuals in our society, the review should recommend adopting the same approach for all newly built care homes and schools in the London area.

3.2. Sprinkler systems are not only proven to drastically improve the safety of individuals, they also help reduce the amount of damage done to the contents and structure of the property, enabling the vital services provided by schools and care homes to be back up and running following a fire as quickly as possible.

3.3. Fires in commercial warehouses, which can contain millions of units of stock, can have a devastating impact on the economy and result in millions of pounds worth of cost and damage alongside causing a significant number of firefighter deaths[5]. Fire regulations in England and Wales currently only recommend that warehouses should have a sprinkler system installed if they are larger than 20,000m^2, however there are no mandatory requirements for smaller warehouses. As a result of this, of the 620 warehouse fires each year around 95 per cent of these warehouses are not protected by sprinklers.

3.4. Research from the Building Research Establishment concluded that sprinklers are a cost-effective investment for warehouses with a floor area of over 2000m^2 [6]. By way of international comparison other European countries require or recommend sprinklers in warehouses in excess of much smaller areas -– Austria 1,800m^2; the Netherlands 1000m$_2$; Spain 2000m^2; and Norway 800m^2. Across Europe and in competitor economies, current regulation and guidance mean that these markets are far better prepared for, and able to recover from, fires that threaten business and the wider economy.

3.5. In July 2016 the ABI wrote to the Secretary of State for Communities and Local Government, Rt Hon Sajid Javid MP[7], to raise the industry's concerns about the fire safety regulations for commercial warehouses, schools and care homes. We recommended at the time, and it remains our view, that the Government must revise fire safety regulations to require all new commercial warehouses over 2,000m^2 to be fitted with sprinkler systems.

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[3] https://www.abi.org.uk/news/news-articles/2016/08/government-warned-against-abandoning-school-sprinkler-guidance/

[4] https://www.abi.org.uk/news/news-articles/2016/07/compulsory-sprinklers-needed-for-warehouses/

[5] In 2007 four firefighters died in a warehouse fire in Atherstone, which is the most firefighters lost in a single incident in the UK since 7 firefighters died whilst fighting a fire at a warehouse in Glasgow in 1972

[6] BRE Global – An Environmental Impact and Cost Benefit Analysis for Fire Sprinklers in Warehouse Buildings, December 2013 (published Jan 2014)

[7] https://www.abi.org.uk/globalassets/files/subject/public/home-insurance/abi-submission--dclg-housing-white-paper.pdf

4. Removal of the Local Building Acts

4.1. Following the Great Fire of London 351 years ago, authorities developed strict regulations which set out to prevent a re-occurrence of the great fire - in 1667 Parliament passed the Rebuilding of London Act. Part of this Act required buildings to be built out of brick and or stone with stone, slate or tiled roofs instead of the timber and thatched constructions that were destroyed in the fire.

4.2. In 2013 Government repealed section 20 and 21 of the London Buildings (Amendment) Act 1939 in an effort to cut costs and deregulate, with the last mandated requirement for Property Protection, the Local Acts, being repealed in April 2015. This was done against the advice of those dealing with the consequences of fire including the Chief Fire Officers, Fire Brigades Union, as well as insurers. Many fire professionals have suggested that had the Local Building Acts not been repealed, tower blocks over 30m in height, such as Grenfell, would go through more rigorous assessments for fire risk, including a higher level of fire resistance for external walls - "*One of the things that the London Building Act specified is that the outside of all buildings had to be fireproof*"[8]. The London Assembly review should review the impacts of the removal of these Acts and consider the re-introduction of those provisions that are not incorporated within current Building Regulations.

Association of British Insurers
December 2017

[8] Quote from Sam Webb, fire expert and architect June 2017. https://www.constructionnews.co.uk/best-practice/health-and-safety/london-building-act-would-have-averted-grenfell-disaster/10020920.article?v=1

[redacted]

Dear Sirs,

My Name is Graham Fieldhouse, I am one of the most experienced fire safety people in social housing. If you google me (graham Fieldhouse fire safety) you will get an overview of my experience.

However as a quick summary; I used to sit on the high-rise forum at LFB with the then assistant commissioner for fire safety Steve Tureck, I was head of fire safety for Southwark Council after Lakanal implementing the findings of the coroner rule 43 letter, including the retro fitting of sprinklers. Ever since the Regulatory Reform (Fire safety) Order 2005, came into force I have been dealing with fire safety as a consultant going into organisations putting correct issues (even when they did not realise they had them) including working on the Olympics, Athletes Village. Some of the various organisations I have worked for:

Local authorities: Hounslow, Brent, Southwark

RSL: Sanctuary housing, East Thames, Family Mosaic, Central and Cecil, Harrow Churches, and Origin Housing

I am also working with Sir Ken Knight and DCLG on their review and have attended meetings with the rapid action group looking into Grenfell.

The issue of sprinklers is complexed and I am not convinced for or against them, however they are NOT the answer they are sold to be by “Sprinkler Companies” at one point calming no one as ever died in a sprinkler building… when I challenged this as I know this is not true they changed what they originally said, but people have been sold an idea of how sprinklers are beyond question the only answer, and only has positives with no negatives.

I attach a document the NFPA Report which is a bit of a bombshell (for some) as it provides the data on deaths in sprinklered buildings in the USA. NFPA is a well-respected international body.

Also there are three fire deaths recorded in fully sprinklered buildings in the UK. The most recent death was just a few weeks ago in a high rise block of flats in Ayr, Scotland which was retrospectively fitted with sprinklers in which a resident died. As with the fire in a care home in Dorset in 2007, the person died in the room of origin which was fitted with sprinklers, but unable to escape when the smoke alarm operated.

In my view it would be incorrect to rely solely on water suppression systems in lulling people into a false sense of life safety from the risk of fire. Effective and maintained passive fire safety together with smoke detection and alarm are a vital part of the package.

Then we have the issue of water pressure which if you go on to Thames water they cannot guarantee.

People will say:

“so fit a tank but a tank” the problem will not cover the whole building

“it will put the fire out in flat of origin” at Grenfell the LFB did that and the fire still spread

There are many more arguments and I am working on ideas for solutions which would be cost effective and more reliable than sprinklers.

I am happy to meet with you before you make any final decisions that could be open to challenge later, particularly by leaseholders.

Yours Sincerely

Graham Fieldhouse MIFSM, FSIDip, AIIRSM

[redacted]

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RESEARCH

U.S. Experience with Sprinklers

July 2017

Marty Ahrens

Abstract

Sprinklers are a highly effective and reliable part of a building's fire protection system. National estimates of reported fires derived from the U.S. Fire Administration's National Fire Incident Reporting System (NFIRS) and NFPA's annual fire department experience survey show that in 2010-2014 sprinklers were present in 10% of reported U.S. fires. The death rate per 1,000 reported fires was 87% lower in properties with sprinklers than in properties with no automatic extinguishing systems (AES). The civilian injury rate was 27% lower and the firefighter fireground injury rate per 1,000 fires was 67% lower in sprinklered properties than in fires in properties without AES.

In fires considered large enough to activate the sprinkler, sprinklers operated 92% of the time. Sprinklers were effective in controlling the fire in 96% of the fires in which they operated. Taken together, sprinklers both operated and were effective in 88% of the fires large enough to operate them. In three-fifths of the fires in which the sprinkler failed to operate, the system had been shut off.

This report provides information about the performance of sprinklers in general as well as wet pipe and dry pipe sprinklers. Estimates are provided of sprinkler performance in all fires, with additional details provided about fires in all homes. Properties under construction are excluded from these estimates.

Keywords: Fire suppression, sprinklers, fire statistics, sprinkler performance, home fires

Acknowledgements

The National Fire Protection Association thanks all the fire departments and state fire authorities who participate in the National Fire Incident Reporting System (NFIRS) and the annual NFPA fire experience survey. These firefighters are the original sources of the detailed data that make this analysis possible. Their contributions allow us to estimate the size of the fire problem.

We are also grateful to the U.S. Fire Administration for its work in developing, coordinating, and maintaining NFIRS.

To learn more about research at NFPA visit www.nfpa.org/research.

Copies of this report are available from:
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Quincy, MA 02169-7471
www.nfpa.org
E-mail: research@nfpa.org
Phone: 617-984-7451

NFPA No. USS14

FACT SHEET » RESEARCH

Sprinklers in Reported U.S. Fires during 2010 to 2014

Fire sprinklers can control a fire while the fire is still small. Some type of sprinkler was present in an estimated average of 49,840 (10%) reported structure fires during 2010 to 2014. Automatic extinguishing systems (AES) are designed to control fires until the fire department arrives. Sprinklers are a type of AES that uses water to control fires. Other types of AES use something other than water.

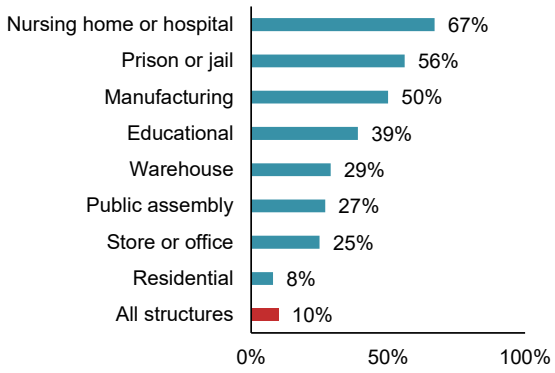
Sprinkler Presence

Sprinklers were most likely to be found in institutional occupancies such as nursing homes, hospitals, and prisons or jails.

Most structure fires and fire deaths occurred in residential properties, particularly homes, but only 8% of the reported residential fires were in properties with sprinklers.

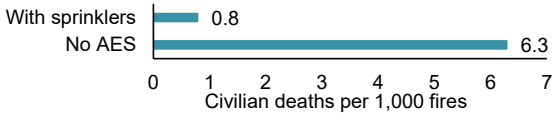
Wet pipe sprinklers accounted for 87% of the sprinklers in reported structure fires, dry pipe systems accounted for 10%, and other types of sprinklers accounted for 3%.

Presence of sprinklers in reported fires by occupancy



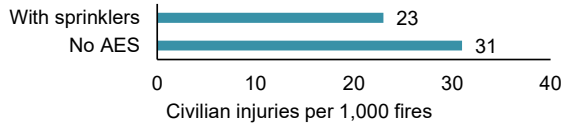
Impact of Sprinklers

Civilian death rates per 1,000 fires in properties with sprinklers and with no AES



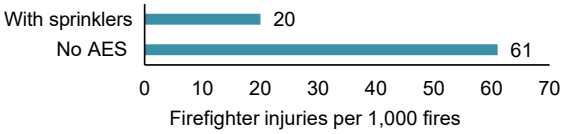
The civilian fire death rate of 0.8 per 1,000 reported fires was 87% lower in properties with sprinklers than in properties with no AES.

Civilian injury rates per 1,000 fires in properties with sprinklers and with no AES



The civilian injury rate of 23 per 1,000 reported fires was 27% lower in properties with sprinklers than in properties with no AES. Many injuries occurred in fires that were too small to activate the sprinkler or in the first moments of a fire before the sprinkler operated.

Firefighter injury rates per 1,000 fires in properties with sprinklers and with no AES



The average firefighter fireground injury rate of 20 per 1,000 reported fires was 67% lower where sprinklers were present than in fires with no AES.

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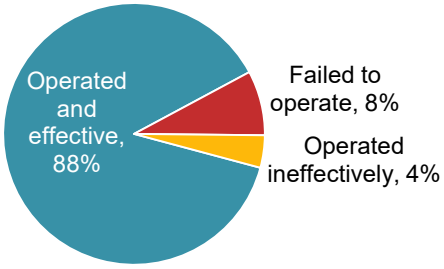
The leading information and knowledge resource on fire, electrical and related hazards

Sprinkler Operation and Effectiveness

Sprinkler operation and effectiveness

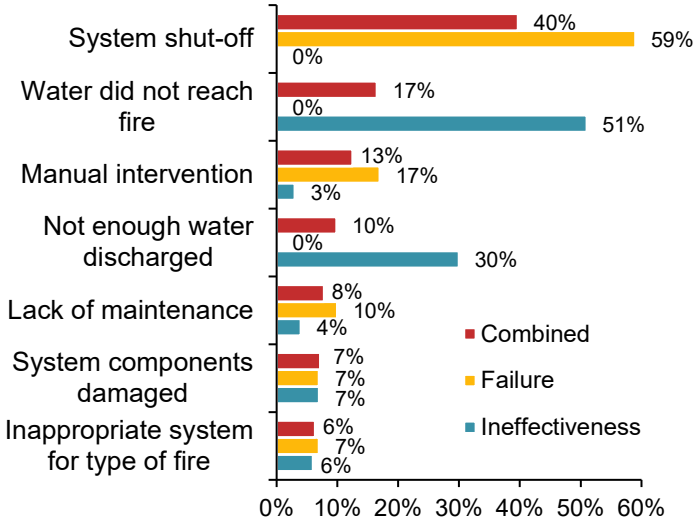


Sprinklers operated in 92% of the fires in which sprinklers were present and the fire was large enough to activate them.

- Sprinklers were effective at controlling the fire in 96% of fires in which they operated.
- Sprinklers operated effectively in 88% of the fires large enough to activate them.

Only one sprinkler head operated in four out of five (79%) fires in which sprinklers operated. In 97% of fires with operating sprinklers, five or fewer heads operated.

Reasons for combined sprinkler failure and ineffectiveness



Source: *U.S. Experience with Sprinklers,* National Fire Protection Association report, 2017.

Reported sprinkler failures (660 per year) were twice as common as reported fires in which sprinklers were ineffective and did not control the fire.

- 40% of the combined sprinkler problems were due to system shut-offs.
- In three of every five (59%) incidents in which sprinklers failed to operate, the system had been shut off.
- In half (51%) of the fires in which sprinklers were ineffective, the water did not reach the fire.

Source: NFPA Research: www.nfpa.org/research
Contact information: 617-984-7451 or research@nfpa.org

FACT SHEET » RESEARCH

Sprinklers in Reported U.S. Home Fires During 2010 to 2014

Some type of sprinkler was present in an estimated total of 24,440 (7%) reported home structure fires during 2010 to 2014. These fires caused an average of 35 (1%) civilian deaths, 616 (5%) civilian injuries, and $198 million (3%) in direct property damage per year. Homes include one- or two-family homes and apartments or other multi-family homes. Properties under construction were excluded from the analysis.

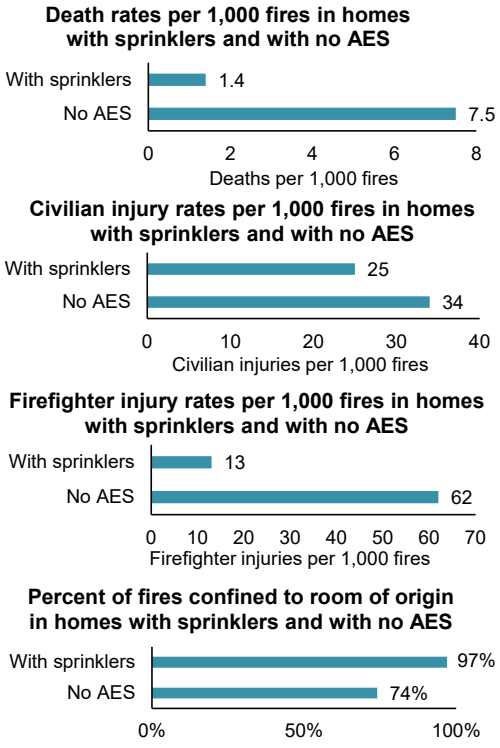
Sprinkler Presence

Automatic extinguishing systems (AES) are designed to control fires until the fire department arrives. Sprinklers are a type of AES that uses water to control fires. Other types of AES use something other than water.

According to the 2011 American Housing Survey, 5% of all occupied housing units had sprinklers. Buildings with more housing units were more likely to have sprinklers. Almost one-third (31%) of units in buildings with 50 or more units were sprinklered.

Wet pipe sprinklers accounted for 89% of the sprinklers in reported home fires, dry pipe systems accounted for 9%, and other types of sprinklers accounted for 2%.

Impact of Sprinklers



The civilian death rate of 1.4 per 1,000 reported fires was 81% lower in homes with sprinklers than in homes with no AES.

The civilian injury rate of 25 per 1,000 reported fires was 31% lower in homes with sprinklers than in homes with no AES. Many of the injuries occurred in fires that were too small to activate the sprinkler or in the first moments of a fire before the sprinkler operated.

The average firefighter injury rate of 13 per 1,000 reported home fires was 79% lower where sprinklers were present than in fires with no AES.

Where sprinklers were present, flame damage was confined to the room of origin in 97% of fires compared to 74% of fires without AES.

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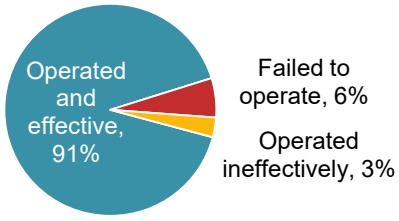
Sprinkler Operation and Effectiveness

Sprinkler operation and effectiveness in home fires



Sprinklers operated in 94% of home fires in which sprinklers were present and the fire was considered large enough to activate them.

- They were effective at controlling the fire in 96% of fires in which they operated.
- Sprinklers operated effectively in 91% of the fires large enough to activate them.

Only one sprinkler head operated in 88% of home fires with operating sprinklers. In 98% of fires with operating sprinklers, five or fewer sprinkler heads operated.

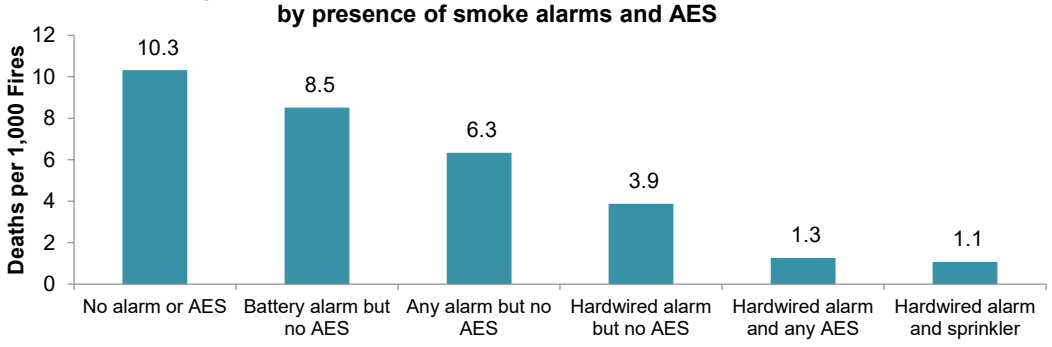
In three out of five (62%) of fires in which sprinklers failed to operate, the system was shut off.

Combined Impact of Smoke Alarms and Sprinklers

The lowest home fire death rate per 1,000 reported fires is found in homes with sprinkler systems and hardwired smoke alarms. Compared to reported home fires with no smoke alarms or AES, the death rate per 1,000 reported fires was as follows:

- 18% lower where battery-powered smoke alarms were present but AES were not
- 39% lower where smoke alarms with any power source were present but AES were not
- 62% lower where hardwired smoke alarms were present but AES were not
- 88% lower where hardwired smoke alarms and any AES were present
- 90% lower where sprinklers and hardwired smoke alarms were present

Average fire death rates per 1,000 reported home structure fires by presence of smoke alarms and AES



Source: *U.S. Experience with Sprinklers,* National Fire Protection Association report, 2017.

Source: NFPA Research: www.nfpa.org/research
Contact information: 617-984-7451 or research@nfpa.org

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U.S. Experience with Sprinklers

INTRODUCTION

Sprinklers play a critical role in fire protection. Information about sprinkler presence and performance in reported fires is essential to understanding the prevalence, impact, reliability and effectiveness of these systems, as well as avenues for performance improvement. This report provides a statistical overview of sprinkler presence and performance in reported fires. Because the majority of deaths are caused by home fires, additional details are provided on sprinklers in fires in homes.

METHODOLOGY

Estimates were derived from the details collected by the U.S. Fire Administration's (USFA's) National Fire Incident Reporting System (NFIRS) and NFPA's annual fire department experience survey. NFIRS collects detailed incident-based information about causes and circumstances of fires from local fire departments. The coding structure is documented in the *National Fire Incident Reporting System Complete Reference Guide* [1]. Participation in NFIRS is voluntary at the federal level. Some states require fire departments to report all incidents or all fires, some have a loss threshold, and in other states, reporting is completely voluntary.

NFPA's annual Fire Experience Survey (FES) collects summary data from a sample of fire departments to calculate estimates of fires and associated losses by broad category. More details can be found in NFPA's report, *U.S. Fire Loss during 2015* and other reports in the series. [2]

To compensate for fires reported to local fire departments but not captured by NFIRS, fire and loss estimates from the FES are divided by comparable totals in NFIRS to develop multipliers. NFIRS data are scaled up by these multipliers. In most cases, unknown data are allocated proportionally. The basic approach was documented in a 1989 *Fire Technology* article by John Hall and Beatrice Harwood. [3]

Fires with one of the six NFIRS confined fire incident types are included in estimates of sprinkler presence, fire spread, and heads operating, but not of operation in general. NFIRS 5.0 includes six types of structure fires collectively referred to as "confined fires," identified by incident type codes 113-118. These include confined cooking fires, confined chimney or flue fires, confined trash fires, confined fuel burner or boiler fires, confined commercial compactor fires, and confined incinerator fires. Losses are generally minimal in these fires, which by definition, are assumed to have been limited to the object of origin. Although NFIRS rules do not require data about automatic extinguishing systems for these fires, local departments do sometimes provide it.

All estimates in this report exclude fires in properties under construction. Fires in which partial systems were present and fires in which sprinklers were present but failed to operate because they were not in the fire area were excluded from estimates related to presence and operation.

Casualty and loss estimates can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Property damage has not been adjusted for inflation. In most cases, fires are rounded to the nearest ten, civilian deaths and injuries are generally rounded to the nearest one, and direct property damage is rounded to the nearest million dollars. Less rounding is used when the numbers are smaller.

Appendix A has more details on how national estimates are calculated and Appendix B contains specific information about the NFIRS data elements.

Sprinklers in All Occupancies

SPRINKLER PRESENCE AND TYPE

Some type of sprinkler was present in an estimated average of 49,840 (10%) of reported structure fires during 2010-2014. Sprinkler presence varies widely by occupancy. Figure 1 shows the percentage of fires by occupancy in which any type of sprinkler was present. Sprinklers were most likely to be found in institutional occupancies, such as nursing homes, hospitals, and prisons or jails. Although the majority of structure fires, civilian fire deaths and injuries, and property damage occurred in residential properties, particularly homes, only 8% of the reported residential fires were in properties with sprinklers. Sprinklers in home fires are discussed in greater detail later in the report. High-rise buildings were much more likely to have sprinklers than were shorter structures. [4]

Figure 1. Presence of sprinklers in U.S. structure fires, by occupancy: 2010-2014

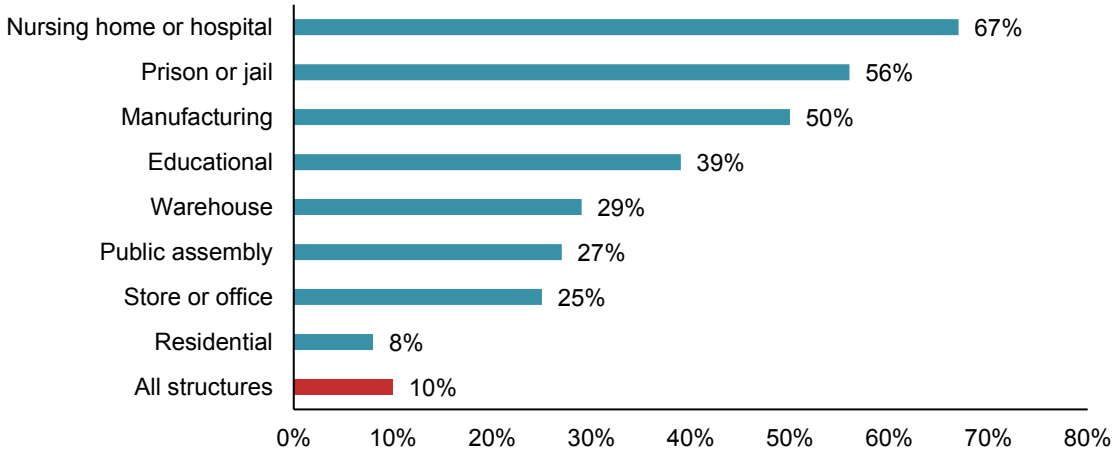


Table 1 provides information about more occupancies and shows estimates of automatic extinguishing system (AES) presence in 1980-1984 and 1994-1998 for historical context.[1] Table A summarizes information about AES in all reported structure fires *except those under construction*.

Table A.
Summary of AES presence and type in reported structure fires
2010-2014 annual averages

AES Presence of Type	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
AES present	**57,430**	**(12%)**	**45**	**(2%)**	**1,259**	**(9%)**	**$793**	**(8%)**
Sprinkler present	49,840	(10%)	42	(2%)	1,148	(8%)	$709	(7%)
Wet	*43,540*	*(9%)*	*39*	*(1%)*	*1,058*	*(7%)*	*$579*	*(6%)*
Dry	*4,770*	*(1%)*	*2*	*(0%)*	*69*	*(0%)*	*$120*	*(1%)*
Other	*1,530*	*(0%)*	*1*	*(0%)*	*21*	*(0%)*	*$10*	*(0%)*
Non-sprinkler AES present	7,590	(2%)	4	(0%)	110	(1%)	$84	(1%)
Partial system AES of any type	2,190	(0%)	5	(0%)	56	(0%)	$66	(1%)
AES of any type not in fire area and did not operate	1,630	(0%)	2	(0%)	47	(0%)	$75	(1%)
No AES present	**422,180**	**(87%)**	**2,659**	**(98%)**	**13,241**	**(91%)**	**$8,609**	**(90%)**
Total	**483,430**	**(100%)**	**2,711**	**(100%)**	**14,602**	**(100%)**	**$9,544**	**(100%)**

[1] Data about specific types of AES was first collected in NFIRS 5.0, introduced in 1999.

Wet pipe sprinklers accounted for 87% of the sprinklers in reported structure fires, dry pipe systems were in 10%, and other types of sprinklers were in 3%. See Figure 2.

Figure 2. Types of sprinklers found in U.S. structure fires: 2010-2014

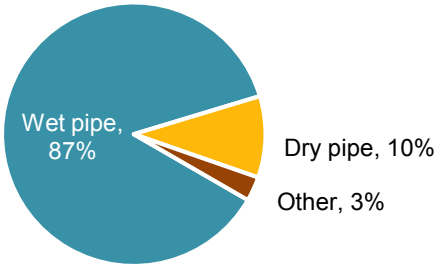
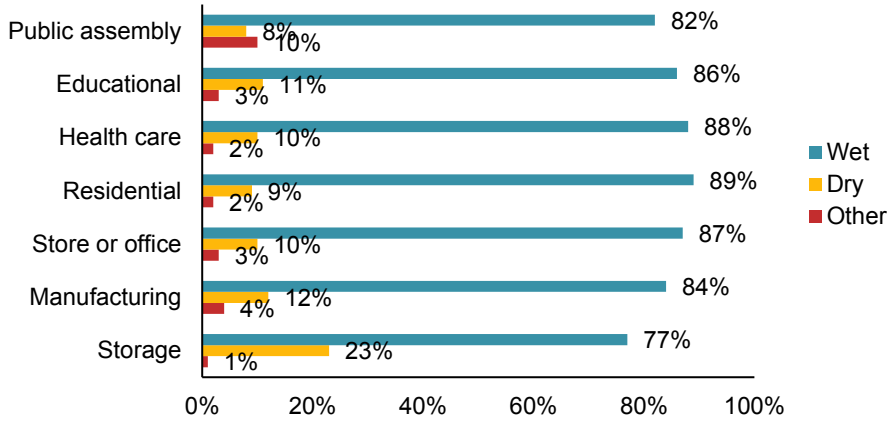


Figure 3 and Table 2 show that dry pipe sprinklers were more common in storage occupancies. "Other" sprinklers were seen most frequently in eating and drinking establishments. It is possible that some of these other sprinklers were actually miscodes of systems designed specifically for cooking equipment.

Figure 3. Sprinkler type by occupancy: 2010-2014

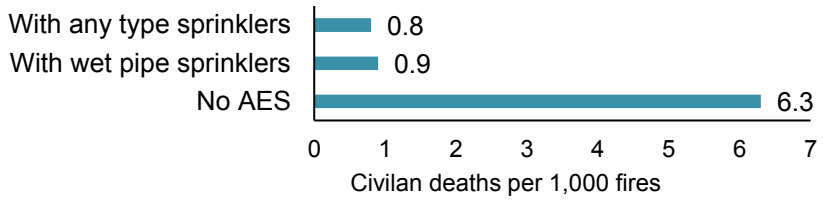


FIRES IN PROPERTIES WITH SPRINKLERS VS. NO AES

The death rate per 1,000 reported fires was 87% lower in properties with sprinklers than in properties with no AES. These rates are based strictly on reported presence or absence. Operation is not considered. Figure 4 shows that in reported structure fires with no automatic extinguishing systems (AES), the civilian death rate was 6.3 per 1,000 fires. When any type of sprinklers were present, the death rate was 0.8 per 1,000 fires. When wet pipe sprinklers were present, the death rate of 0.9 deaths per 1,000 fires was 86% lower than in home fires without AES. Table 3 shows these rates for all sprinklers and wet pipe sprinklers by occupancy. The smallest reduction (33%) was seen in manufacturing properties. Civilian deaths in sprinklered properties are discussed in greater detail later in this report.

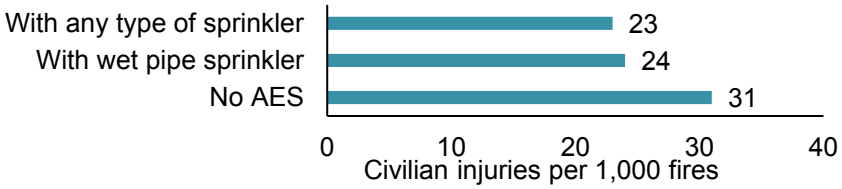
While the reduction in deaths was greater in some occupancies with wet pipe sprinklers than total sprinklers, the differences were small. With so few deaths in sprinklered properties, the differences are not meaningful.

Figure 4. Civilian death rates per 1,000 fires in properties with sprinklers and with no AES: 2010-2014



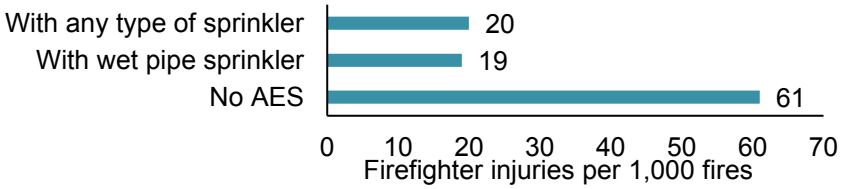
The civilian injury rate per 1,000 reported fires was 27% lower in properties with sprinklers than in properties with no AES. Figure 5 shows that when sprinklers of any type were present, reported civilian injuries averaged 23 per year, compared to 31 per year in which no AES was present. The injury rate in fires with wet pipe sprinklers was 24 per 1,000 fires or 22% lower than in fires with no AES. In more than half of these cases, the fire was too small to trigger the sprinkler. In others, someone was injured while trying to fight a fire in the initial moments before a sprinkler operated.

Figure 5. Civilian injury rates per 1,000 fires in properties with sprinklers and with no AES: 2010-2014



The average firefighter fireground injury rate per 1,000 reported fires was 67% lower when sprinklers were present than in fires with no AES. Figure 6 shows that when sprinklers of any type were present, 20 firefighters were injured per 1,000 fires, compared to 61 firefighter injuries per 1,000 fires in properties without AES protection. The 19 firefighter injuries per 1,000 fires in properties with wet pipe sprinklers was 68% lower than the rate in fires without AES.

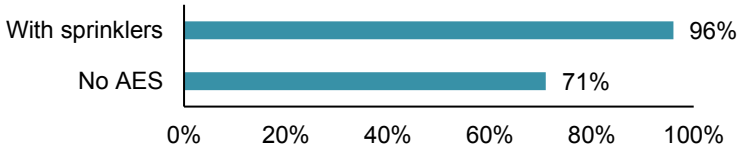
Figure 6. Firefighter injury rates per 1,000 fires in properties with sprinklers and with no AES 2010-2014



Reductions in average dollar loss per fire varied greatly by occupancy. Table 4 shows that compared to properties with no AES, the average overall loss was 30% lower when sprinklers of any type were present and 35% lower when wet pipe sprinklers were present. The average loss was actually higher in sprinklered warehouses than in those with no AES. The reduction in property loss in manufacturing properties ranged from 23% to 34%. Average losses were higher in warehouses and manufacturing than in other properties. A very small fire can damage expensive equipment. Warehouse contents may be rendered valueless by smoke. The reduction in average losses for public assembly and various residential occupancies ranged from 55% to 86%.

When sprinklers were present, fire spread was confined to the room of origin in 96% of fires compared to 71% of fires without AES. See Figure 7. Table 5 shows these percentages in different occupancies. In a change from previous editions of this report, fires with NFIRS incident types indicating confined structure fires (NFIRS incident type codes 113-118) were all considered to have been confined to the room of origin.

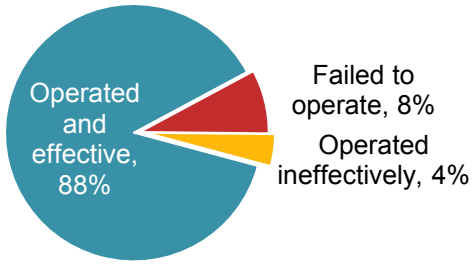
Figure 7. Percent of fires confined to room of origin in properties with sprinklers and with no AES 2010-2014



SPRINKLER OPERATION, EFFECTIVENESS AND PROBLEMS

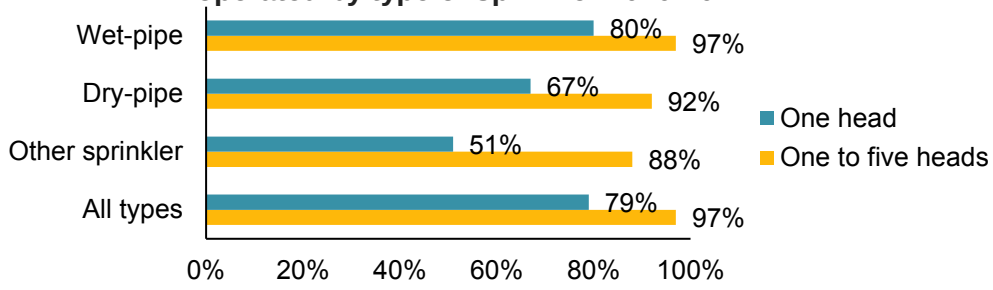
Sprinklers operated in 92% of the fires in which sprinklers were present and the fire was considered large enough to activate them.[2] They were effective at controlling the fire in 96% of fires in which they operated. Figure 8 shows that sprinklers operated effectively in 88% of the fires large enough to trigger them. Table 6 provides details on sprinkler operation and effectiveness in different occupancies and for different types of sprinklers.

Figure 8. Sprinkler operation and effectiveness: 2010-2014



Only one sprinkler activated in four out of five fires in which sprinklers of any type (79%) or wet pipe sprinklers (80%) operated. Figure 9 shows that in 97% of fires with operating sprinklers, five or fewer heads operated. The percentages were smaller for dry pipe and other sprinklers. Table 7 provides more details on number of sprinklers. The percentage of fires in which only one head operated is higher in this report than in previous editions because fires sprinklers operating in fires with the NFIRS confined fire incident types were included in the calculations.

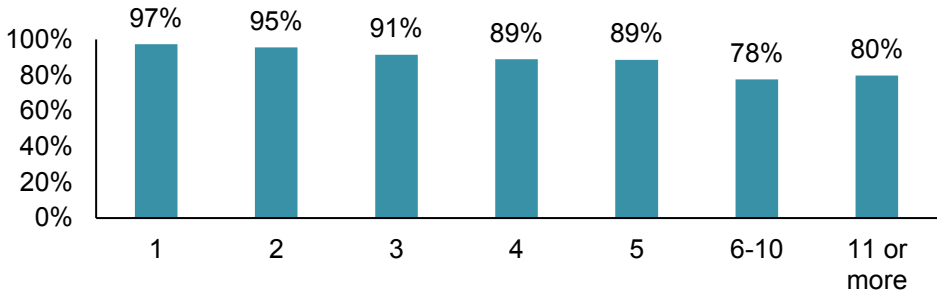
Figure 9. When sprinklers operated, percentage of fires in which one or one to five heads operated by type of sprinkler 2010-2014



In 97% of the fires in which one sprinkler operated, it was effective. Figure 10 shows that sprinklers were somewhat less likely to have operated effectively when more heads operated.

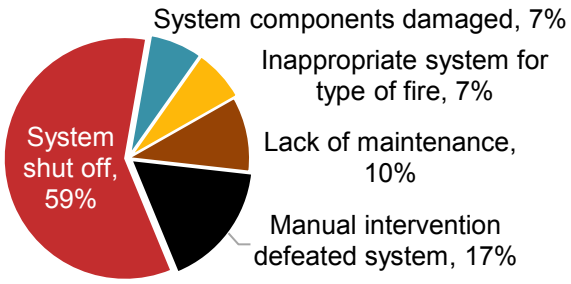
[2] These calculations exclude fires with confined structure fire incident types (NFIRS incident types 113-118). Among confined fires with sprinklers present, the fire was too small to operate 76% of the time, sprinklers operated and were effective 19% of the time and failed to operate 4% of the time. Since these fires are, by definition, confined, it is likely that a substantial share of fires in which the sprinklers were said to fail, were, in fact, too small to cause the sprinkler to operate. The 44% of non-confined (NFIRS incident types 110-123, excluding 113-118) that were too small to activate the sprinkler and 1% of non-confined structure fires with unclassified operation were also excluded.

Figure 10. Percentage of fires in which sprinklers were effective by number operating 2010-2014



In three of every five (59%) incidents in which sprinklers failed to operate, the system had been shut off. Figure 11 shows that manual intervention defeated the system in 17% of the incidents. In some cases, someone turned off the system prematurely.

Figure 11. Reasons for sprinkler failures: 2010-2014.

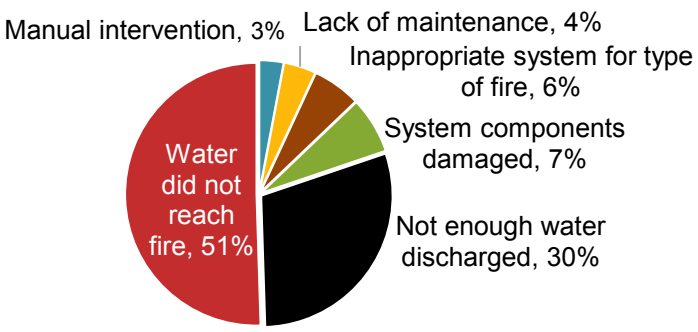


The system was inappropriate for the type of fire in 7% of the incidents in which sprinklers failed to operate. Throughout a building's life cycle, the use and occupancy type may change. A system that was designed for the original purpose may not be sufficient to meet the requirements of the changed building use. In another 7% of sprinkler failures, system components were damaged.

Table 8 shows the failure reasons for different occupancies and different types of sprinklers. In all cases, system shut-off was the leading reason.

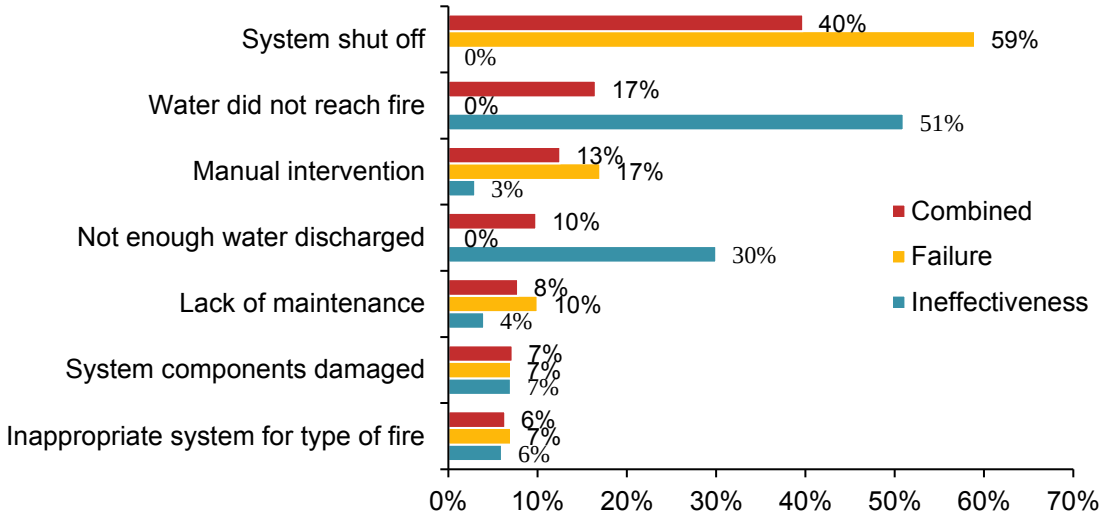
In half (51%) of the fires in which sprinklers were ineffective. the water did not reach the fire. Figure 12 shows that in 30% of the incidents, not enough water was discharged. In 7%, system components were damaged. The system was inappropriate for the type of fire in 6%. Lack of maintenance was identified as a factor in 4% of the incidents. Manual intervention was the cause of 3% of ineffective systems. Table 9 provides more details by occupancy and by type of sprinkler.

Figure 12. Reasons for sprinkler ineffectiveness: 2010-2014



In 2010-2014, reported sprinkler failures (660 per year) were twice as common as reported fires in which sprinklers were ineffective (320 per year). Figure 13 shows that 40% of the combined sprinkler problems were due to system shut-offs. In 17% of these incidents, water did not reach the fire. In 13%, manual intervention defeated the system. In 10%, not enough water was discharged. Lack of maintenance was a factor in 8%, system components were damaged in 7%, and in 6%, the system was inappropriate for the type of fire.

Figure 13. Reasons for combined sprinkler failure and ineffectiveness: 2010-2014

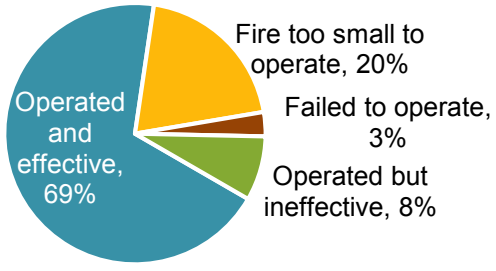


CIVILIAN DEATHS IN SPRINKLERED PROPERTIES

While sprinklers were present in 10% of all properties, only 2% of all fire deaths occurred in these properties. Fires in sprinklered properties killed an average of 42 people per year in 2010-02014. During the same period, fires in properties with no automatic extinguishing systems caused an average of 2,660 civilian deaths per year.

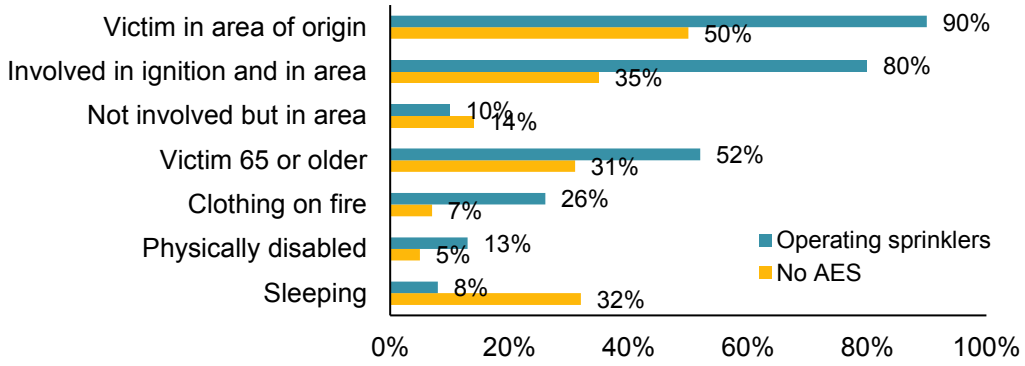
Figure 14 shows that 69% of the deaths in properties with sprinklers were caused by fires in which the sprinklers operated and were effective in controlling the fire. In some of these cases, the sprinklers actually extinguished the fire. The victims were typically fatally injured before the sprinklers activated. In one of every five (20%) such deaths, the fire never became large enough to activate the sprinkler. The sprinklers failed to operate in fires causing 3% of the deaths in sprinklered properties, and operated or were ineffective in controlling fires that caused 8% of the fatalities.

Figure 14. Civilian fire deaths by sprinkler performance: 2010-2014



Compared to victims of fires with no AES, people who died in fires in which sprinklers operated effectively were less likely to have been sleeping and more likely to have been in the area of origin, even more likely to have been involved in the ignition and in the area, to have been at least 65 or older, to have clothing on fire, or to have been physically disabled. Figure 15 shows this contrast; more details are provided in Table 10. Note that many of these differences are also seen in victims of fires with and without working smoke alarms. [5] There are limits to even the best fire protection. When someone is directly involved in the ignition or their clothing is burning, they may be fatally injured before the fire protection operates. If someone is physically incapable of getting themselves to safety, even a fire controlled by sprinklers may still cause harm.

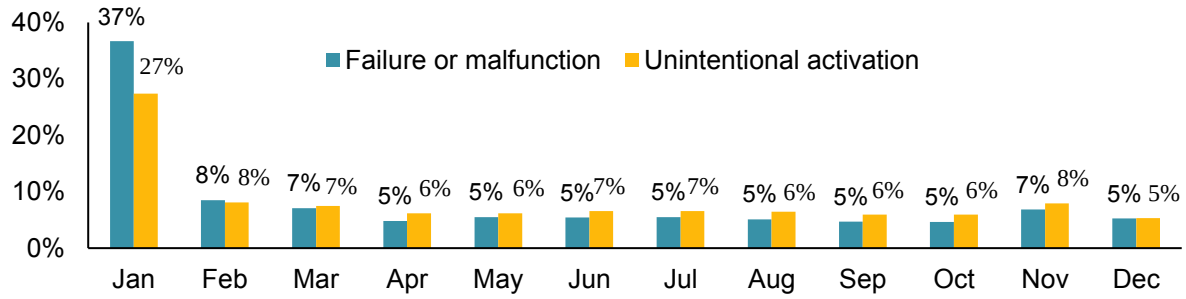
Figure 15. Victim characteristics in fires with effectively operating sprinklers and with no AES 2010-2014



UNWANTED ACTIVATIONS

Fire departments responded to an estimated 29,800 sprinkler activations caused by a system failure or malfunction and 33,600 unintentional sprinkler activations in 2014. According to the *NFIRS 5.0 Complete Reference Guide* [7], false alarms due to sprinkler failures or malfunctions include "any failure of sprinkler equipment that leads to sprinkler activation with no fire present." It "excludes unintentional operating caused by damage to the sprinkler system." Unintentional activations also include "testing the sprinkler system without fire department notification." Figure 16 shows that more than one-third (37%) of the system failures or malfunctions occurred in January, as did one-quarter (27%) of the unintentional activations. This suggests that cold weather may have played a role.

Figure 16. Unwanted sprinkler activations by type and month in 2014



Not all activations result in water flow outside the system. For example, water may flow in the pipes of a dry-pipe system. This could alert a monitoring company and trigger a fire department response.

Sprinklers in Home Fires

SPRINKLER PRESENCE AND TYPE

During 2010-2014, some type of fire sprinkler was present in an average 24,440 reported home structure fires per year. These fires caused an average of 35 civilian deaths, 616 civilian injuries, and $198 million in direct property damage per year. Properties under construction were excluded from these calculations.

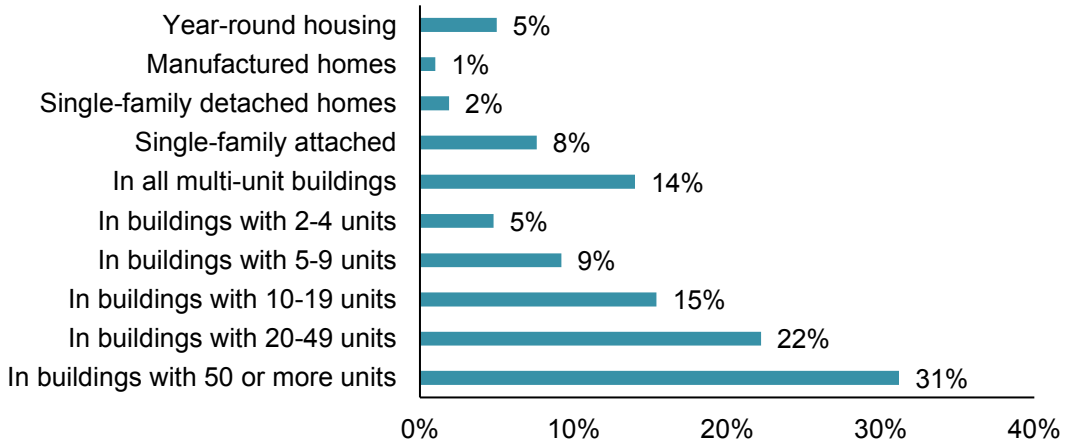
Table B summarizes information about AES in all reported home structure fires except those under construction.

Table B.
Summary of AES presence and type in reported home structure fires
2010-2014 annual averages

AES Presence of Type	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
AES present	**25,700**	**(7%)**	**36**	**(1%)**	**650**	**(5%)**	**$203**	**(3%)**
Sprinklers present	24,440	(7%)	35	(1%)	616	(5%)	$198	(3%)
Wet	*21,760*	*(6%)*	*34*	*(1%)*	*581*	*(5%)*	*$184*	*(3%)*
Dry	*2,140*	*(1%)*	*0*	*(0%)*	*26*	*(0%)*	*$10*	*(0%)*
Other	*540*	*(0%)*	*1*	*(0%)*	*9*	*(0%)*	*$4*	*(0%)*
Non-sprinkler AES present	1,260	(0%)	1	(0%)	34	(0%)	$5	(0%)
Partial system AES	970	(0%)	5	(0%)	31	(0%)	$17	(0%)
AES Not in fire area and did not operate	600	(0%)	2	(0%)	24	(0%)	$19	(0%)
None present	**329,460**	**(92%)**	**2,471**	**(98%)**	**11,979**	**(94%)**	**$6,359**	**(96%)**
Total	**356,740**	**(100%)**	**2,514**	**(100%)**	**12,684**	**(100%)**	**$6,599**	**(100%)**

According to the 2011 American Housing Survey, buildings with more housing units were more likely to have sprinklers. Figure 17 shows that 5% of occupied year-round housing units had sprinklers, ranging from a low of 1% in manufactured homes to a high of 31% in buildings with at least 50 units. [7]

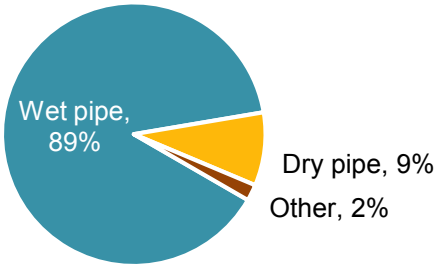
Figure 17. Percentage of occupied units with sprinklers in 2011 American Housing Survey



Source: American Housing Survey

Wet pipe sprinklers accounted for 89% of the sprinklers in reported home fires, dry pipe systems were in 9%, and other types of sprinklers were in 2%. See Figure 18.

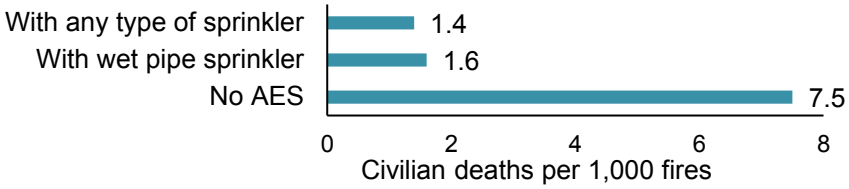
Figure 18. Types of sprinklers found in home structure fires: 2010-2014



FIRES IN HOMES WITH SPRINKLERS VS. NO AES

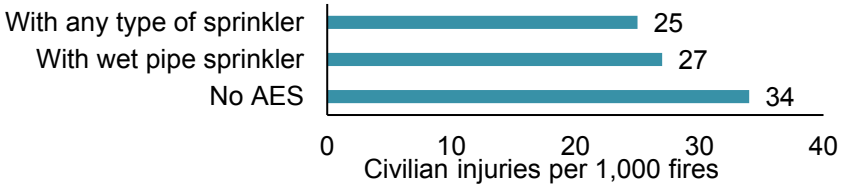
The death rate per 1,000 reported fires was 81% lower in homes with sprinklers than in homes with no AES. These rates are based strictly on reported presence or absence. Operation is not considered. Figure 19 shows that in reported structure fires with no automatic extinguishing systems (AES) present, the death rate was 7.5 per 1,000 fires. When any type of sprinkler was present, the death rate was 1.4 per 1,000 fires, a reduction of 81%. When wet pipe sprinklers were present, the death rate of 1.4 deaths was 79% lower. With so few deaths in sprinklered properties, the differences are not meaningful.

Figure 19. Civilian death rates per 1,000 fires in homes with sprinklers and with no AES 2010-2014



The civilian injury rate per 1,000 reported fires was 31% lower in homes with sprinklers than in homes with no AES. Figure 20 shows that when any type of sprinklers were present, reported civilian injuries averaged 25 per year, compared to 34 per year in which no AES was present. The injury rate for wet pipe sprinklers of 27 per 1,000 fires was 27% lower than in fires with no AES. In many cases, the fire was too small to operate. In others, someone was injured while trying to fight a fire in the initial moments before a sprinkler operated.

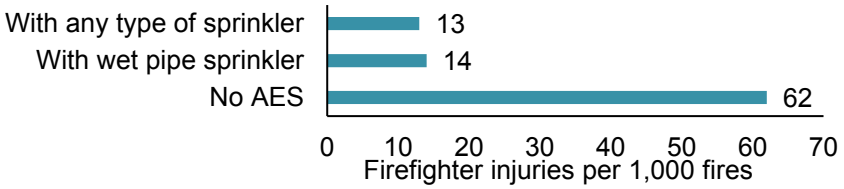
Figure 20. Civilian injury rates per 1,000 fires in homes with sprinklers and with no AES 2010-2014



2012 Fire Protection Research Foundation study found that sprinkler presence was associated with a 53% reduction in the medical cost of civilian injuries per 100 home fires. In addition, larger percentages of injuries in sprinklered homes resulted from fires that were limited to the object or room of origin than in home fires without sprinklers. [8]

The average firefighter fireground injury rate per 1000 reported home fires was 79% lower when sprinklers were present than in fires with no AES. Figure 21 shows that when sprinklers were present, 13 firefighters were injured per 1000 fires, compared to 62 firefighter injuries per 1,000 fires in properties without AES protection.

Figure 21. Firefighter injury rates per 1,000 fires in homes with sprinklers and with no AES 2010-2014

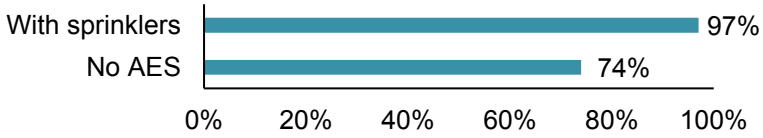


When sprinklers were present in reported home fires, the average property loss per fire was less than half the average in homes with no AES. Figure 22 shows that when any type of fire sprinkler was present in reported fires, the average loss was $8,100 per fire. This was 58% lower than the $19,300 average in home fires in which no AES was present. When wet pipe sprinklers were present, the average loss of $8,500 was 56% lower than in homes with no AES.

Figure 22. Average loss per fire in homes with sprinklers and with no AES 2010-2014

When sprinklers were present, flame damage was confined to the room of origin in 97% of fires compared to 74% of fires without AES. See Figure 23. In a change from previous editions of this report, fires with NFIRS incident types indicating confined structure fires (NFIRS incident type codes 113-118) were all considered to have been confined to the room of origin.

Figure 23. Percent of fires confined to room of origin in homes with sprinklers and with no AES 2010-2014

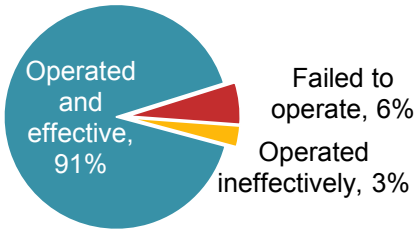


SPRINKLER OPERATION, EFFECTIVENESS AND PROBLEMS IN HOME FIRES

Sprinklers operated in 94% of home fires in which sprinklers were present and fires were considered large enough to activate them.[3] They were effective at controlling the fire in 96% of fires in which they operated. Figure 24 shows that, taken together, sprinklers operated effectively in 91% of the fires large enough to trigger them.

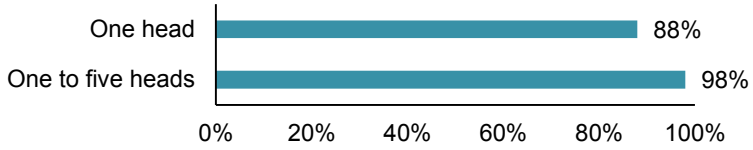
[3] These calculation exclude fires with confined structure fire incident types (NFIRS incident types 113-118). Among confined fires with sprinklers present, the fire was too small to operate 74% of the time, sprinklers operated and were effective 22% of the time and failed to operate 4% of the time. Since these fires are, by definition, confined, it is likely that a substantial share of fires in which the sprinklers were said to fail, were, in fact, too small to cause the sprinkler to operate. The 34% of non-confined (NFIRS incident types 110-123, excluding 113-118) that were too small to activate the sprinkler and 1% of non-confined structure fires with unclassified operation were also excluded.

Figure 24. Sprinkler operation and effectiveness in home fires: 2010-2014



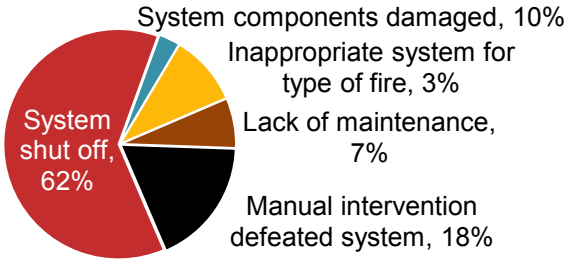
In 98% of home fires with operating sprinklers, five or fewer heads operated. Figure 25 shows that only one sprinkler operated in 88% of fires with operating sprinklers of all types. The percentage of fires in which only one head operated is higher in this report than in previous editions because fires sprinklers operating in fires with the NFIRS confined fire incident types were included in the calculations.

Figure 25. When sprinklers operated, percentage of home fires in which one or one to five heads operated 2010-2014



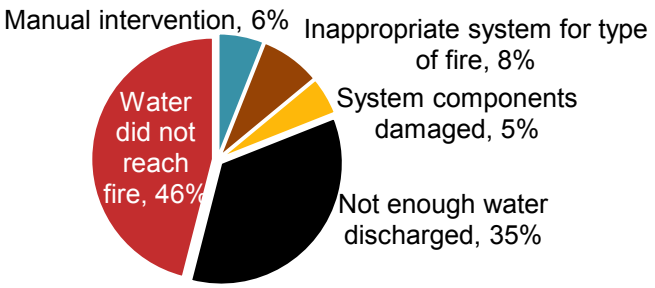
In three of every five (62%) home fires in which sprinklers failed to operate, the system had been shut off. Figure 26 shows that manual intervention defeated the system in 18% of the incidents. System components were damaged in 10% of these fires, lack of maintenance caused 7% of the failures, and 3% occurred because the system was inappropriate for the type of fire that occurred.

Figure 26. Reasons for sprinkler failures in home fires: 2010-2014



In almost half (46%) of home fires in which sprinklers were ineffective, the water did not reach the fire. Figure 27 shows that in one-third (35%) of the incidents, not enough water was discharged. The system was inappropriate for the type of fire in 8% of the incidents. In 5%, system components were damaged. Manual intervention was the cause of 6% of ineffective systems. Table 8 provides more details by occupancy and by type of sprinkler.

Figure 27. Reasons for sprinkler ineffectiveness in home fires: 2010-2014

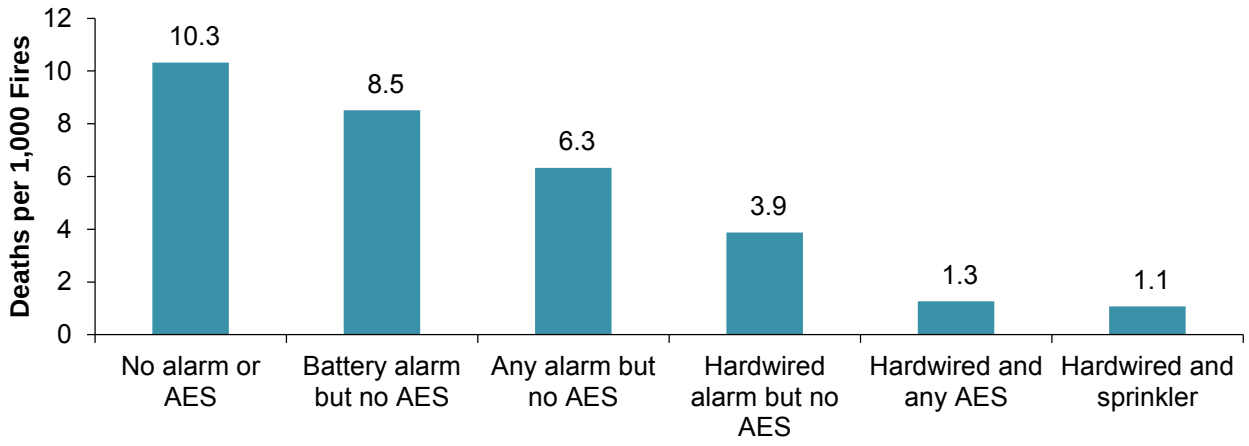


IMPACT OF SMOKE ALARMS AND SPRINKLERS IN DEATHS PER 1,000 HOME FIRES

The lowest home fire death rate per 1,000 reported fires is found in homes with sprinkler systems and hardwired smoke alarms. Figure 28 shows that compared to reported home fires (excluding manufactured home fires) with no smoke alarms or automatic extinguishing systems/equipment (AES) at all, the death rate per 1,000 reported fires was:

- 18% lower when battery-powered smoke alarms were present but AES were not;
- 39% lower when smoke alarms with any power source were present but AES were not;
- 62% lower when hardwired smoke alarms were present but AES were not;
- 88% lower when hardwired smoke alarms and any AES were present; and
- 90% lower when sprinklers and hard-wired smoke alarms were present.

Figure 28. Average Fire Death Rate per 1,000 Reported Home Structure Fires by Presence of Smoke Alarms and AES 2010-2014



UNWANTED ACTIVATIONS

Fire departments responded to an estimated 5,600 non-fire activations of home fire sprinklers caused by a system failure or malfunction and 6,800 unintentional sprinkler activations in 2014. Note that activations in manufactured homes could not be identified or screened out. According to the NFIRS Complete Reference Guide**,** [9] sprinkler failures or malfunctions include "any failure of sprinkler equipment that leads to sprinkler activation with no fire present." It. "excludes unintentional operating caused by damage to the sprinkler system." The latter should be considered unintentional activations. Unintentional activations also include "testing the sprinkler system without fire department notification.

20 Years of Home fire Sprinklers in Scottsdale, Arizona

Survey in Scottsdale, Arizona found that home fire sprinklers were still operational after 20 years. In his 2008 Executive Fire Officer Program Applied Research Project, Residential fire sprinkler reliability in homes older than 20 years old in Scottsdale, AZ, Richard Upham described the results of a survey he conducted of owners of single-family homes built in 1986-1988 after requirements for residential sprinklers systems took effect. [10] Respondents could check yes, no or unsure to four questions. They could also request a free inspection of their system.

Excluding blanks and responses of unsure, all of the respondents answered "Yes" when asked "To the best of your knowledge, is your fire sprinkler system still in operation?"

With the same exclusions, 89% said "No" when asked "Has your sprinkler system ever had a leak or maintenance problem?" The author noted that leaks or maintenance issues on Scottsdale were usually due to either relief valves that had developed a leak or sprinkler heads that were unintentionally damaged. He also noted that more than 300,000 Omega sprinkler heads manufactured between 1983 and 1998 were replaced in Scottsdale after a recall. Some of these may have been considered maintenance issues.

Again, with the same exclusions, slightly more than half (54%) said "Yes" to "Has your fire sprinkler system ever been inspected?" Two (1%) of the respondents said "Yes" to "Has your fire sprinkler system ever been activated as a result of fire?"

Two-thirds provided contact information to request a free fire department inspection of their sprinkler system. No issues were found that would have prevented the systems from working in the 60 inspections completed when his paper was written.

Conclusions and Further Reading

Sprinklers are a very reliable and effective part of fire protection. Their impact is seen most strongly in the reduction of civilian fire deaths per 1,000 reported fires when sprinklers are present compared to fires without AES. Notable reductions are also seen in injury rates, and in most occupancies, average loss per fire. Increasing the usage of sprinklers will the reduce loss of life and property from fire.

NFPA standards provide essential guidance in installation, inspection, testing, maintenance, integration of sprinklers with other systems, and in evaluating needs when an occupancy changes use or contents. See

- NFPA 13: *Standard for the Installation of Sprinkler Systems*,
- NFPA, 13D, *Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes*,
- NFPA 13R, *Standard for the Installation of Sprinkler Systems in Low-Rise Residential Occupancies*,
- *NFPA 25:, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*, 2017 edition, Quincy, MA, U.S.: NFPA, 2016. See NFPA 25 for minimum inspection, testing, and maintenance requirements for sprinkler systems.
- NFPA 4: *Standard for the Integrated Fire Protection and Life Safety Systems Testing*, 2015 Edition, Quincy, MA, U.S.: NFPA, 2014. See NFPA 4 for test protocols to ensure that the fire protection and life safety systems will function correctly together.
- NFPA 1, *Fire Code*, 2015 Edition, Quincy, MA, U.S.: NFPA, 2014. NFPA 1 has evaluation requirements to assess the adequacy of existing sprinkler systems if the use or contents in the space have changed.

Because sprinklers control fires in the early stages, far less water is needed than if the fire extinguished by traditional methods. See FM Global's 2010 report, *The Environmental Impact of Automatic Fire Sprinklers*.

See www.firesprinklerinitiave.org for resources to help increase the number of new one- and two-family homes built protected by sprinklers and to reduce this death toll. Three out of every five fire deaths were caused by fires in one- or two-family homes, excluding manufactured housing. Sprinklers were present in only 1.5% of the fires in these properties.

The Fire Protection Research Foundation has produced a number of reports to inform home fire sprinkler codes and standards. See:

- Stakeholder Perceptions of Home Fire Sprinklers (2016)
- Home Fire Sprinkler Cost Assessment (2013)
- Sprinkler Impact on Fire Injury (2012)
- Residential Fire Sprinklers - Water Usage and Water Meter Performance Study (2011)
- Sprinkler Insulation: A Literature Review (2011)
- Incentives for the Use of Residential Fire Sprinkler Systems in U.S. Communities (2010)
- Analysis of the Performance of Residential Sprinkler Systems with Sloped or Sloped and Beamed Ceilings (2010)
- Antifreeze Solutions in Home Fire Sprinkler Systems - Phase II Interim Report (2010)
- Antifreeze Solutions in Home Fire Sprinkler Systems - Literature Review and Research Plan

Table 1.
Presence of Sprinklers in Structure Fires by Property Use, Excluding Properties under Construction

Property Use	Number of Structure Fires With Equipment Present and Percentage of Total Structure Fires in Property Use							
	Any Automatic Extinguishing Equipment						Any Sprinkler	
	1980-1984		1994-1998		2010-2014		2010-2014	
All public assembly	4,280	(13%)	4,380	(26%)	6,610	(47%)	3,760	(27%)
Variable-use amusement place	120	(8%)	140	(16%)	240	(21%)	190	(17%)
Religious property	50	(2%)	90	(5%)	230	(14%)	180	(10%)
Library or museum	80	(14%)	110	(28%)	260	(44%)	230	(39%)
Eating or drinking establishment	3,310	(16%)	3,240	(29%)	4,360	(59%)	1,860	(25%)
Passenger terminal	70	(20%)	60	(35%)	400	(54%)	390	(53%)
Educational property	1,620	(13%)	1,820	(24%)	2,130	(43%)	1,950	(39%)
Health care property*	6,920	(47%)	4,400	(68%)	3,350	(53%)	3,100	(49%)
Nursing home	2,250	(61%)	2,060	(76%)	1,870	(70%)	1,780	(67%)
Hospital	3,370	(47%)	1,650	(74%)	900	(79%)	770	(67%)
Prison or jail	370	(10%)	430	(19%)	260	(59%)	250	(56%)
All residential	7,090	(1%)	11,110	(3%)	33,880	(9%)	31,500	(8%)
Home (including apartment)	5,120	(1%)	8,440	(2%)	26,390	(7%)	24,440	(7%)
Hotel or motel	1,590	(15%)	1,690	(35%)	2,130	(58%)	2,020	(55%)
Dormitory or barracks	430	(16%)	620	(29%)	2,210	(56%)	2,100	(53%)
Rooming or boarding home	70	(4%)	230	(17%)	1,120	(40%)	1,100	(39%)
Residential board and care home or assisted living	Not available		Not available		990	(52%)	950	(50%)
Store or office	5,510	(13%)	5,230	(21%)	5,380	(32%)	4,270	(25%)
Grocery or convenience store	1,160	(15%)	1,190	(27%)	1,820	(47%)	1,000	(26%)
Laundry or dry cleaning or other professional service	330	(8%)	310	(13%)	320	(21%)	310	(20%)
Department store	1,340	(44%)	1,100	(52%)	460	(46%)	440	(44%)
Office	1,240	(12%)	1,470	(25%)	1,150	(37%)	1,100	(36%)
Manufacturing facility	11,910	(44%)	6,400	(50%)	2,660	(55%)	2,390	(50%)
All storage	1,430	(2%)	1,090	(3%)	680	(3%)	660	(3%)
Warehouse excluding cold storage*	1,060	(13%)	740	(22%)	370	(30%)	360	(29%)
All structures	38,620	(4%)	37,100	(7%)	57,430	(12%)	49,840	(10%)

* "Health care property" includes other facilities not listed separately. In 1980-84 and 1994-98, this category excludes doctors' offices and care of aged facilities without nursing staff (which are assumed to be residential board and care facilities).

Notes: These are structure fires reported to U.S. municipal fire departments and so exclude fires reported only to federal or state agencies or industrial fire brigades. Post-1998 estimates are based only on fires reported in Version 5.0 of NFIRS and include fires reported as confined fires. After 1998, buildings under construction are excluded. Sprinkler statistics exclude partial systems and installations with no sprinklers in fire area.

Table 2.
Type of Sprinkler Reported in Structure Fires
Where Equipment Was Present in Fire Area, Excluding Properties under Construction
by Property Use: 2010-2014 Annual Averages

Property Use	Fires per year with any type of sprinkler	Wet pipe sprinklers		Dry pipe sprinklers		Other sprinklers*	
All public assembly	3,760	3,080	(82%)	300	(8%)	380	(10%)
Variable-use amusement place	190	170	(91%)	20	(8%)	0	(1%)
Religious property	180	160	(88%)	10	(3%)	10	(6%)
Library or museum	230	210	(91%)	20	(9%)	0	(1%)
Eating or drinking establishment	1,860	1,450	(78%)	130	(7%)	280	(15%)
Passenger terminal	390	280	(73%)	50	(13%)	50	(13%)
Educational property	1,950	1,670	(86%)	220	(11%)	60	(3%)
Health care property**	3,100	2,740	(88%)	300	(10%)	60	(2%)
Nursing home	1,780	1,550	(87%)	180	(10%)	40	(2%)
Hospital	770	690	(89%)	80	(10%)	0	(0%)
Prison or jail	250	210	(85%)	30	(11%)	10	(4%)
All residential	31,500	28,050	(89%)	2,700	(9%)	660	(2%)
Home (including apartment)	24,440	21,760	(89%)	2,140	(9%)	540	(2%)
Dormitory or barracks	2,100	1,910	(91%)	160	(8%)	20	(1%)
Hotel or motel	2,020	1,850	(92%)	130	(7%)	40	(2%)
Rooming or boarding house	1,100	970	(88%)	130	(12%)	0	(0%)
Residential board and care or assisted living	950	840	(89%)	90	(9%)	20	(2%)
Store or office	4,270	3,710	(87%)	430	(10%)	140	(3%)
Grocery or convenience store	1,000	830	(83%)	90	(9%)	80	(8%)
Laundry or dry cleaning or other professional service	310	270	(87%)	40	(13%)	0	(1%)
Department store	440	380	(86%)	60	(13%)	10	(1%)
Office	1,100	980	(89%)	100	(9%)	20	(2%)
Manufacturing facility	2,390	2,010	(84%)	290	(12%)	90	(4%)
All storage	660	510	(77%)	150	(23%)	0	(1%)
Warehouse excluding cold storage	360	300	(82%)	60	(17%)	0	(1%)
All structures ***	49,840	43,540	(87%)	4,770	(10%)	1,530	(3%)

* Includes deluge and pre-action sprinkler systems and may include sprinklers of unknown or unreported type.
** Nursing home, hospital, clinic, doctor's office, or development disability facility
*** Includes some property uses that are not shown separately.

Note: These are based on structure fires reported to U.S. municipal fire departments in NFIRS Version 5.0 and so exclude fires reported only to federal or state agencies or industrial fire brigades. Row totals are shown in the leftmost column of percentages, and sums may not equal totals because of rounding error. In Version 5.0 of NFIRS, if multiple systems are present, the system coded is supposed to be the one system designed to protect the hazard where the fire started. This field is not required if the fire did not begin within the designed range of the system. Buildings under construction and partial systems are excluded.
Source: NFIRS and NFPA fire experience survey.

Table 3.
Estimated Reduction in Civilian Deaths per Thousand Fires
Associated With All Types of Sprinklers,
by Property Use (Excluding Properties under Construction): 2010-2014 Annual Averages

Property Use	Without AES	With sprinklers of any type	Percent reduction from no AES	With wet pipe sprinklers	Percent reduction from no AES
All public assembly	0.7	0.0	100%	0.0	100%
Health care	0.9	0.3	71%	0.1	83%
Residential	7.5	1.1	85%	1.2	84%
Home (including apartment)	7.5	1.4	81%	1.6	79%
Dormitory or barracks	0.4	0.0	100%	0.0	100%
Hotel or motel	7.0	0.3	95%	0.0	100%
Rooming or boarding house	8.4	0.3	96%	0.4	96%
Residential board and care or assisted living	7.2	1.3	82%	1.5	80%
Store or office	0.9	0.3	68%	0.3	63%
Manufacturing facility	1.6	1.0	33%	1.2	21%
Warehouse excluding cold storage	2.7	0.6	79%	0.7	74%
All structures	6.3	0.8	87%	0.9	86%

Note: These are national estimates of structure fires reported to U.S. municipal fire departments, based on fires reported in NFIRS Version 5.0, and so exclude fires reported only to federal or state agencies or industrial fire brigades.

Source: NFIRS and NFPA fire experience survey.

Table 4.
Estimated Reduction in Average Direct Property Loss per Fire
Associated With All Types of Sprinklers
by Property Use (Excluding Properties under Construction): 2010-2014 Annual Averages

Property Use	Loss without AES	Loss with sprinklers of any type	Percent reduction	Loss with wet pipe sprinklers	Percent reduction from no AES
All public assembly	$37,900	$9,100	76%	$8,900	77%
Health care*	$14,900	$4,000	73%	$3,700	75%
Residential	$19,200	$7,100	63%	$7,300	62%
Home (including apartment)	$19,300	$8,100	58%	$8,500	56%
Dormitory or barracks	$3,900	$1,300	67%	$1,400	65%
Hotel or motel	$35,200	$10,900	69%	$10,700	70%
Rooming or boarding house	$12,200	$1,700	86%	$1,800	85%
Residential board and care or assisted living	$5,500	$2,300	58%	$2,400	55%
Store or office	$52,400	$26,100	50%	$26,300	50%
Manufacturing facility	$107,200	$82,500	23%	$70,900	34%
Warehouse excluding cold storage	$90,700	$138,300	no reduction	$120,800	no reduction
All structures	$20,400	$14,200	30%	$13,300	35%

*Nursing home, hospital, clinic, doctor's office, or other medical facility.

Note: These are national estimates of structure fires reported to U.S. municipal fire departments, based on fires reported in NFIRS Version 5.0, and so exclude fires reported only to federal or state agencies or industrial fire brigades.

Source: NFIRS and NFPA fire experience survey.

Table 5.
Percentage of Fires with Fire Spread Confined to Room of Origin in Fires with Sprinklers Present vs. No Automatic Extinguishing System
2010-2014 Annual Averages

Property Use	Percentage of fires confined to room of origin excluding structures under construction and sprinklers not in fire area		
	With no AES	With sprinklers of any type	Difference (in percentage points)
Public assembly	75%	93%	18%
Religious property	72%	90%	18%
Library or museum	83%	97%	14%
Eating or drinking establishment	70%	92%	22%
Educational	88%	97%	9%
Health care property*	92%	98%	6%
Residential	73%	97%	24%
Home (including apartment)	74%	97%	23%
Dormitory or barracks	96%	99%	3%
Hotel or motel	82%	97%	15%
Store or office	65%	92%	26%
Grocery or convenience store	69%	93%	24%
Department store	65%	72%	7%
Office building	72%	94%	22%
Manufacturing facility	62%	85%	22%
Storage	26%	87%	61%
Warehouse excluding cold storage	53%	77%	24%
All structures**	71%	96%	25%

* Nursing home, hospital, clinic, doctor's office, or other medical facility.

** Includes some properties not listed separately above.

Note: Percentages are based on structure fires reported in NFIRS Version 5.0 to U.S. municipal fire departments and so exclude fires reported only to federal or state agencies or industrial fire brigades. All fires with one of the six NFIRS confined structure fire incident types were considered confined to the object of origin by definition. Fires that were confined to the room of origin include fires confined to the object of origin. In NFIRS, if multiple systems are present, the system coded is supposed to be the one system designed to protect the hazard where the fire started. This field is not required if the fire did not begin within the designed range of the system.

Source: NFIRS and NFPA fire experience survey.

Table 6.
Sprinkler Reliability and Effectiveness When Fire Was Coded as Not Confined and Large Enough to Activate Sprinkler and Sprinkler Was Present in Area of Fire, by Property Use: 2010-2014 Annual Averages

A. All Sprinklers

Property Use	Number of fires per year where sprinklers were present	Non-confined fires too small to activate or unclassified operation	Fires coded as confined fires	Number of qualifying fires per year	Percent where equipment operated (A)	Percent effective of those that operated (B)	Percent where equipment operated effectively (A x B)
All public assembly	3,760	590	2,540	640	90%	94%	85%
Eating or drinking establishment	1,860	300	1,150	410	90%	92%	83%
Educational property	1,950	420	1,360	180	87%	96%	84%
Health care property*	3,100	600	2,200	310	85%	97%	82%
All residential	31,500	2,490	24,870	4,140	93%	96%	89%
Home (including apartment	24,440	1,900	18,970	3,570	94%	96%	91%
Hotel or motel	2,020	350	1,340	330	90%	98%	89%
Store or office	4,270	1,030	2,200	1,040	91%	96%	87%
Grocery or convenience store	1,000	240	570	190	89%	93%	83%
Department store	440	160	170	120	90%	98%	88%
Office	1,100	230	700	180	91%	96%	87%
Manufacturing facility	2,390	610	760	1,030	91%	94%	85%
All storage	660	140	220	300	86%	96%	82%
Warehouse excluding cold storage	360	80	90	180	84%	97%	81%
All structures**	49,840	6,350	35,460	8,040	92%	96%	88%

* Nursing home, hospital, clinic, doctor's office, or other medical facility.
** Includes some properties not listed separately above.

Note: These are percentages of fires reported to U.S. municipal fire departments and so exclude fires reported only to federal or state agencies or industrial fire brigades. In Version 5.0 of NFIRS, if multiple systems are present, the system coded is supposed to be the one system designed to protect the hazard where the fire started. This field is not required if the fire did not begin within the designed range of the system. Buildings under construction are excluded. Percentages are based on estimated total fires reported in NFIRS Version 5.0 with the indicated type of automatic extinguishing system and system performance not coded as fire too small to activate systems. Fires are excluded if the reason for failure or ineffectiveness is "system not present in area of fire." Fires are recoded from "operated but ineffective" to "failed to operate" if the reason for failure or ineffectiveness was "system shut off." Fires are recoded from "failed to operate" to "operated but ineffective" if the reason for failure or ineffectiveness was "not enough agent" or "agent did not reach fire."

Source: NFIRS and NFPA fire experience survey.

Table 6. (Continued)
Sprinkler Reliability and Effectiveness When Fire Was Coded as Not Confined and Large Enough to Activate Sprinkler and Sprinkler Was Present in Area of Fire, by Property Use: 2010-2014 Annual Averages

B. Wet Pipe Sprinklers Only

Property Use	Number of fires per year where sprinklers were present	Non-confined fires too small to activate or unclassified operation	Fires coded as confined fires	Number of qualifying fires per year	Percent where equipment operated (A)	Percent effective of those that operated (B)	Percent where equipment operated effectively (A x B)
All public assembly	3,080	490	2,030	560	90%	96%	86%
Eating or drinking establishment	1,450	250	860	340	93%	95%	89%
Educational property	1,670	370	1,140	160	90%	96%	86%
Health care property*	2,740	530	1,940	270	88%	97%	85%
All residential	28,050	2,320	21,970	3,770	96%	96%	93%
Home (including apartment)	21,760	1,680	16,730	3,350	95%	96%	91.2%
Hotel or motel	1,850	320	1,240	300	91%	99%	89.8%
Store or office	3,710	890	1,860	950	90%	96%	87%
Grocery or convenience store	830	210	460	170	89%	95%	85%
Department store	380	140	140	110	89%	99%	88%
Office	980	200	620	160	91%	98%	89%
Manufacturing facility	2,010	520	650	850	91%	94%	86%
All storage	510	100	150	250	82%	96%	79%
Warehouse excluding cold storage	290	60	80	160	84%	97%	82%
All Structures**	43,540	5,540	30,790	7,210	89%	96%	86%

* Nursing home, hospital, clinic, doctor's office, or other medical facility.
** Includes some properties not listed separately above.

Note: These are percentages of fires reported to U.S. municipal fire departments and so exclude fires reported only to federal or state agencies or industrial fire brigades. In Version 5.0 of NFIRS, if multiple systems are present, the system coded is supposed to be the one system designed to protect the hazard where the fire started. This field is not required if the fire did not begin within the designed range of the system. Buildings under construction are excluded. Percentages are based on estimated total fires reported in NFIRS Version 5.0 with the indicated type of automatic extinguishing system and system performance not coded as fire too small to activate systems. Fires are excluded if the reason for failure or ineffectiveness is "system not present in area of fire." Fires are recoded from "operated but ineffective" to "failed to operate" if the reason for failure or ineffectiveness was "system shut off." Fires are recoded from "failed to operate" to "operated but ineffective" if the reason for failure or ineffectiveness was "not enough agent" or "agent did not reach fire."

Source: NFIRS and NFPA fire experience survey.

Table 6. (Continued)
Sprinkler Reliability and Effectiveness When Fire Was Coded as Not Confined and Large Enough to Activate Sprinkler and Sprinkler Was Present in Area of Fire, by Property Use: 2010-2014 Annual Averages

C. Dry Pipe Sprinklers Only

Property Use	Number of fires per year where sprinklers were present	Non-confined fires too small to activate or unclassified operation	Fires coded as confined fires	Number of qualifying fires per year	Percent where equipment operated (A)	Percent effective of those that operated (B)	Percent where equipment operated effectively (A x B)
All residential	2,700	240	2,230	230	79%	95%	76%
Homes	2,140	180	1,800	160	91%	95%	88%
Store or office	450	110	260	80	77%	89%	68%
Manufacturing facility	290	70	80	150	82%	93%	77%
All storage	150	40	70	50	73%	93%	68%
All structures*	4,770	660	3,480	630	79%	94%	74%

* Includes some properties not listed separately above.

Note: These are percentages of fires reported to U.S. municipal fire departments and so exclude fires reported only to federal or state agencies or industrial fire brigades. In Version 5.0 of NFIRS, if multiple systems are present, the system coded is supposed to be the one system designed to protect the hazard where the fire started. This field is not required if the fire did not begin within the designed range of the system. Buildings under construction are excluded. Percentages are based on estimated total fires reported in NFIRS Version 5.0 with the indicated type of automatic extinguishing system and system performance not coded as fire too small to activate systems. Fires are excluded if the reason for failure or ineffectiveness is "system not present in area of fire." Fires are recoded from "operated but ineffective" to "failed to operate" if the reason for failure or ineffectiveness was "system shut off." Fires are recoded from "failed to operate" to "operated but ineffective" if the reason for failure or ineffectiveness was "not enough agent" or "agent did not reach fire."

Source: NFIRS and NFPA fire experience survey.

Table 7.
Number of Sprinklers Operating, by Type of Sprinkler
2010-2014 Structure Fires Excluding Properties under Construction

Number of Sprinklers Operating	Percentage of structure fires where that many sprinklers operated			
	Wet pipe	Dry pipe	Other type sprinkler	All sprinklers
1	80%	67%	51%	79%
1 or 2	93%	82%	66%	91%
1 to 3	95%	87%	77%	94%
1 to 4	97%	89%	86%	96%
1 to 5	97%	92%	88%	97%
1 to 10	99%	97%	99%	99%

Note: Percentages are based on structure fires reported in NFIRS Version 5.0 to U.S. municipal fire departments and so exclude fires reported only to federal or state agencies or industrial fire brigades. Percentages are based on fires where sprinklers were reported present and operating and there was reported information on number of sprinklers operating. Figures reflect recodings explained in Introduction: Fires are excluded if the reason for failure or ineffectiveness is "system not present in area of fire." Fires are recoded from "operated but ineffective" to "failed to operate" if the reason for failure or ineffectiveness was "system shut off." Fires are recoded from "failed to operate" to "operated but ineffective" if the reason for failure or ineffectiveness was "not enough agent" or "agent did not reach fire." In NFIRS, if multiple systems are present, the system coded is supposed to be the one system designed to protect the hazard where the fire started. Buildings under construction are excluded, as are partial systems and fires reported as confined fires.

Source: NFIRS and NFPA fire experience survey.

Table 8.
Reasons for Failure to Operate in Fires with Non-Confined Structure Fire Incident Types Large Enough to Activate Sprinkler that Was Present in Area of Fire, by Property Use Based on Estimated Number of 2010-2014 Structure Fires per Year

A. All Sprinklers

Property Use	System shut off	Manual intervention defeated system	System component damaged	Lack of maintenance	Inappropriate system for type of fire	Total fires per year
All public assembly	45%	17%	4%	22%	12%	63
Eating or drinking establishment	43%	12%	3%	27%	15%	39
All residential	59%	21%	9%	7%	4%	257
Home (including apartment)	62%	18%	10%	7%	3%	203
Store or office	62%	16%	7%	5%	9%	97
Manufacturing facility	59%	14%	5%	12%	9%	89
All structures*	59%	17%	7%	10%	7%	657

* Includes some properties not listed separately above.

Note: Percentages are based on structure fires reported in NFIRS Version 5.0 to U.S. municipal fire departments and so exclude fires reported only to federal or state agencies or industrial fire brigades. Percentages are based on fires where sprinklers were reported present and operating and there was reported information on number of sprinklers operating. Figures reflect recodings explained in Introduction: Fires are excluded if the reason for failure or ineffectiveness is "system not present in area of fire." Fires are recoded from "operated but ineffective" to "failed to operate" if the reason for failure or ineffectiveness was "system shut off." Fires are recoded from "failed to operate" to "operated but ineffective" if the reason for failure or ineffectiveness was "not enough agent" or "agent did not reach fire." In NFIRS, if multiple systems are present, the system coded is supposed to be the one system designed to protect the hazard where the fire started. Buildings under construction are excluded, as are partial systems and fires reported as confined fires. Fires reported with unclassified reason for failure are treated as cases of unknown reasons for failure.

Source: NFIRS and NFPA fire experience survey.

Table 8. (Continued)
Reasons for Failure to Operate in Fires with Non-Confined Structure Fire Incident Types Large Enough to Activate Sprinkler that Was Present in Area of Fire, by Property Use Based on Estimated Number of 2010-2014 Structure Fires per Year

B. Wet Pipe Sprinklers Only

Property Use	System shut off	Manual intervention defeated system	System component damaged	Lack of maintenance	Inappropriate system for type of fire	Total fires per year
All public assembly	50%	24%	3%	13%	10%	44.00
Eating or drinking establishment	47%	16%	5%	21%	11%	25.00
All residential	60%	21%	9%	6%	4%	225.00
Home (including apartment)	63%	19%	9%	6%	3%	181.00
Store or office	60%	19%	8%	4%	10%	81.00
Manufacturing facility	58%	18%	2%	8%	14%	64.00
All structures*	59%	20%	7%	7%	7%	530.00

C. Dry Pipe Sprinklers Only

Property Use	System shut off	Manual intervention defeated system	System component damaged	Lack of maintenance	Inappropriate system for type of fire	Total fires per year
All structures	61%	9%	8%	16%	5%	98.00

* Includes some properties not listed separately above.

Note: Percentages are based on structure fires reported in NFIRS Version 5.0 to U.S. municipal fire departments and so exclude fires reported only to federal or state agencies or industrial fire brigades. Percentages are based on fires where sprinklers were reported present and operating and there was reported information on number of sprinklers operating. Figures reflect recodings explained in Introduction: Fires are excluded if the reason for failure or ineffectiveness is "system not present in area of fire." Fires are recoded from "operated but ineffective" to "failed to operate" if the reason for failure or ineffectiveness was "system shut off." Fires are recoded from "failed to operate" to "operated but ineffective" if the reason for failure or ineffectiveness was "not enough agent" or "agent did not reach fire." In NFIRS, if multiple systems are present, the system coded is supposed to be the one system designed to protect the hazard where the fire started. Buildings under construction are excluded, as are partial systems and fires reported as confined fires. Fires reported with unclassified reason for failure are treated as cases of unknown reasons for failure.

Source: NFIRS and NFPA fire experience survey.

Table 9.
Reasons for Ineffectiveness in Fires with Non-Confined Structure Fire Incident Types Large Enough to Activate Sprinkler that Was Present in Area of Fire, by Property Use Based on Estimated Number of 2010-2014 Structure Fires per Year

A. All Sprinklers

Property Use	Water did not reach fire	Not enough water released	System Component damaged	Manual intervention defeated system	Lack of maintenance	Inappropriate system for type of fire	Fires per year
All public assembly	69%	21%	0%	0%	5%	5%	41
Eating or drinking establishment	69%	25%	0%	0%	6%	0%	33
All residential	39%	40%	7%	3%	5%	7%	119
Home (including apartment)	40%	35%	8%	3%	6%	9%	102
Store or office	39%	32%	8%	13%	4%	4%	34
Manufacturing facility	39%	26%	9%	9%	13%	6%	62
All structures*	44%	30%	8%	7%	7%	5%	300

* Includes some properties not listed separately above.

Note: Percentages are based on structure fires reported in NFIRS Version 5.0 to U.S. municipal fire departments and so exclude fires reported only to federal or state agencies or industrial fire brigades. Percentages are based on fires where sprinklers were reported present and operating and there was reported information on number of sprinklers operating. Figures reflect recodings explained in Introduction: Fires are excluded if the reason for failure or ineffectiveness is "system not present in area of fire." Fires are recoded from "operated but ineffective" to "failed to operate" if the reason for failure or ineffectiveness was "system shut off." Fires are recoded from "failed to operate" to "operated but ineffective" if the reason for failure or ineffectiveness was "not enough agent" or "agent did not reach fire." In NFIRS, if multiple systems are present, the system coded is supposed to be the one system designed to protect the hazard where the fire started. Buildings under construction are excluded, as are partial systems and fires reported as confined fires. Fires reported with unclassified reason for failure are treated as cases of unknown reasons for failure.

Source: NFIRS and NFPA fire experience survey.

Table 9. (Continued)
Reasons for Ineffectiveness When Fire Was Coded as Not Confined and Large Enough to Activate Sprinkler and Equipment that Was Present in Area of Fire, by Property Use
Based on Estimated Number of 2010-2014 Structure Fires per Year

B. Wet Pipe Sprinklers Only

Property Use	Water did not reach fire	Not enough water released	System component damaged	Manual intervention defeated system	Lack of maintenance	Inappropriate system for type of fire	Total fires per year
All public assembly	66%	26%	0%	0%	0%	8%	25
Eating or drinking establishment	66%	34%	0%	0%	0%	0%	17
All residential	42%	37%	8%	3%	3%	6%	108
Home (including apartment)	43%	33%	10%	4%	3%	7%	93
Store or office	34%	35%	6%	19%	0%	5%	29
Manufacturing facility	36%	31%	3%	12%	12%	6%	46
All structures*	43%	32%	6%	10%	5%	5%	240

C. Dry Pipe Sprinklers Only

Property Use	Water did not reach fire	Not enough water released	System component damaged	Manual intervention defeated system	Lack of maintenance	Inappropriate system for type of fire	Total fires per year
All structures	**42%**	**27%**	**11%**	**0%**	**12%**	**8%**	**33**

* Includes some properties not listed above.

Note: Percentages are based on structure fires reported in NFIRS Version 5.0 to U.S. municipal fire departments and so exclude fires reported only to federal or state agencies or industrial fire brigades. Percentages are based on fires where sprinklers were reported present and operating and there was reported information on number of sprinklers operating. Figures reflect recodings explained in Introduction: Fires are excluded if the reason for failure or ineffectiveness is "system not present in area of fire." Fires are recoded from "operated but ineffective" to "failed to operate" if the reason for failure or ineffectiveness was "system shut off." Fires are recoded from "failed to operate" to "operated but ineffective" if the reason for failure or ineffectiveness was "not enough agent" or "agent did not reach fire." In NFIRS, if multiple systems are present, the system coded is supposed to be the one system designed to protect the hazard where the fire started. Buildings under construction are excluded, as are partial systems and fires reported as confined fires. Fires reported with unclassified reason for failure are treated as cases of unknown reasons for failure.

Source: NFIRS and NFPA fire experience survey.

Table 10.
Characteristics of Fatal Victims
In Fires with Sprinklers vs. No Automatic Extinguishing Equipment
2010-2014 Annual Averages

A. Fire or Victims by Sprinkler Presence and Performance

Sprinkler/AES Status	Deaths when sprinklers present		Deaths when no AES present	
Total civilian deaths	42	(100%)	2,659	(100%)
Operated and effective	*29*	*(69%)*		
Fire too small to operate	*8*	*(20%)*		
Failed to operate	*1*	*(3%)*		
Operated but ineffective	*3*	*(8%)*		

B. Characteristics in Fires with Operating Sprinklers vs. No AES

Fire or Victim Characteristic	Deaths when sprinklers present		Deaths when no AES present	
With operating Sprinklers	29	(100%)	2,659	(100%)
Victim in area of origin	26	(90%)	1,319	(50%)
Involved in ignition	*23*	*(80%)*	*940*	*(35%)*
Not involved in ignition	*3*	*(10%)*	*379*	*(14%)*
Victim 65 or older	15	(52%)	833	(31%)
Clothing on fire	7	(26%)	192	(7%)
Physically disabled	4	(13%)	139	(5%)
Victim returned to fire, unable to act, or acted irrationally	7	(25%)	535	(20%)
Intentional fire	5	(16%)	368	(14%)
Sleeping	8	(8%)	854	(32%)

Note: Statistics are based on structure fires reported in NFIRS by U.S. municipal fire departments and so exclude fire reported only to federal or state agencies or industrial fire brigades. In NFIRS, if multiple systems are present, the system coded is supposed to be the one system designed to protect the hazard where the fire started. This field is not required if the fire did not begin within the designed range of the system. Buildings under construction are excluded.

Here is an example of how to read this table: Nearly all (90%) the people who died in fires despite the presence of operating sprinklers were located in the area of fire origin, hence closer to the fire and probably less able to escape than victims located farther from the fire, compared to only 50% of fatal victims in fires with no automatic extinguishing equipment present who were located in the area of fire origin.

Source: NFIRS and NFPA fire experience survey.

Appendix A.
How National Estimates Are Calculated

The statistics in this analysis are estimates derived from the U.S. Fire Administration's (USFA's) National Fire Incident Reporting System (NFIRS) and the National Fire Protection Association's (NFPA's) annual survey of U.S. fire departments. NFIRS is a voluntary system by which participating fire departments report detailed factors about the fires to which they respond. Roughly two-thirds of U.S. fire departments participate, although not all of these departments provide data every year. Fires reported to federal or state fire departments or industrial fire brigades are not included in these estimates.

NFIRS provides the most detailed incident information of any national database not limited to large fires. NFIRS is the only database capable of addressing national patterns for fires of all sizes by specific property use and specific fire cause. NFIRS also captures information on the extent of flame spread, and automatic detection and suppression equipment. For more information about NFIRS visit http://www.nfirs.fema.gov/. Copies of the paper forms may be downloaded from http://www.nfirs.fema.gov/documentation/design/NFIRS_Paper_Forms_2008.pdf.

NFIRS has a wide variety of data elements and code choices. The NFIRS database contains coded information. Many code choices describe several conditions. These cannot be broken down further. For example, area of origin code 83 captures fires starting in vehicle engine areas, running gear areas or wheel areas. It is impossible to tell the portion of each from the coded data.

Methodology may change slightly from year to year.
NFPA is continually examining its methodology to provide the best possible answers to specific questions, methodological and definitional changes can occur. *Earlier editions of the same report may have used different methodologies to produce the same analysis, meaning that the estimates are not directly comparable from year to year.*

NFPA's fire department experience survey provides estimates of the big picture.
Each year, NFPA conducts an annual survey of fire departments which enables us to capture a summary of fire department experience on a larger scale. Surveys are currently sent to all municipal departments protecting populations of 5,000 or more and a random sample, stratified by community size, of the smaller departments. Typically, a total of roughly 3,000 surveys are returned, representing about one of every ten U.S. municipal fire departments and about one third of the U.S. population.

The survey is stratified by size of population protected to reduce the uncertainty of the final estimate. Small rural communities have fewer people protected per department and are less likely to respond to the survey. A larger number must be surveyed to obtain an adequate sample of those departments. (NFPA also makes follow-up calls to a sample of the smaller fire departments that do not respond, to confirm that those that did respond are truly representative of fire departments their size.) On the other hand, large city departments are so few in number and protect such a large proportion of the total U.S. population that it makes sense to survey all of them. Most respond, resulting in excellent precision for their part of the final estimate.

The survey includes the following information: (1) the total number of fire incidents, civilian deaths, and civilian injuries, and the total estimated property damage (in dollars), for each of the major property use classes defined in NFIRS; (2) the number of on-duty firefighter injuries, by type of duty and nature of illness; 3) the number and nature of non-fire incidents; and (4) information on the type of community protected (e.g., county versus township versus city) and the size of the population protected, which is used in the statistical formula for projecting national totals from sample results. The results of the survey are published in the annual report *Fire Loss in the United States*. To download a free copy of the report, visit http://www.nfpa.org/assets/files/PDF/OS.fireloss.pdf.

Projecting NFIRS to National Estimates

As noted, NFIRS is a voluntary system. Different states and jurisdictions have different reporting requirements and practices. Participation rates in NFIRS are not necessarily uniform across regions and community sizes, both factors correlated with frequency and severity of fires. This means NFIRS may be susceptible to systematic biases. No one at present can quantify the size of these deviations from the ideal, representative sample, so no one can say with confidence that they are or are not serious problems. But there is enough reason for concern so that a second database -- the NFPA survey -- is needed to project NFIRS to national estimates and to project different parts of NFIRS separately. This multiple calibration approach makes use of the annual NFPA survey where its statistical design advantages are strongest.

Scaling ratios are obtained by comparing NFPA's projected totals of residential structure fires, non-residential structure fires, vehicle fires, and outside and other fires, and associated civilian deaths, civilian injuries, and direct property damage with comparable totals in NFIRS. Estimates of specific fire problems and circumstances are obtained by multiplying the NFIRS data by the scaling ratios. Reports for incidents in which mutual aid was given are excluded from NFPA's analyses.

Analysts at the NFPA, the USFA and the Consumer Product Safety Commission developed the specific basic analytical rules used for this procedure. "The National Estimates Approach to U.S. Fire Statistics," by John R. Hall, Jr. and Beatrice Harwood, provides a more detailed explanation of national estimates.

Version 5.0 of NFIRS, first introduced in 1999, used a different coding structure for many data elements, added some property use codes, and dropped others. The essentials of the approach described by Hall and Harwood are still used, but some modifications have been necessary to accommodate the changes in NFIRS 5.0.

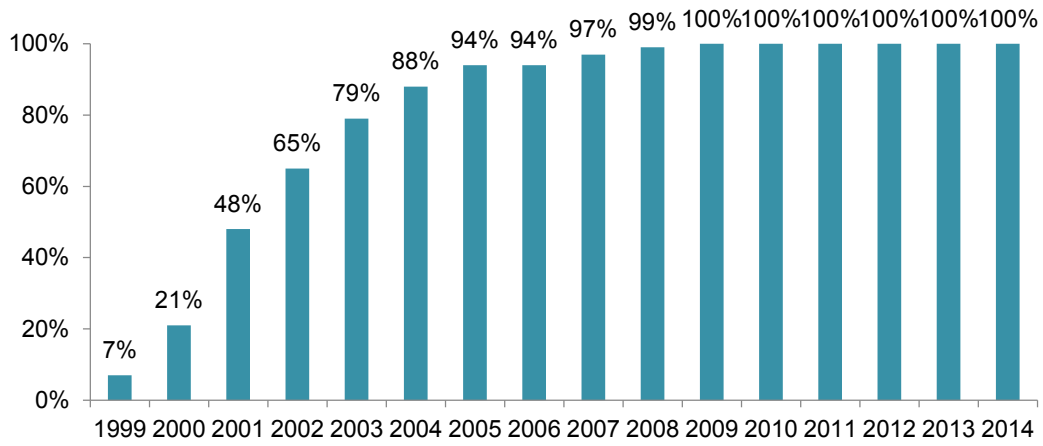
Figure A.1 shows the percentage of fires originally collected in the NFIRS 5.0 system. Each year's release version of NFIRS data also includes data collected in older versions of NFIRS that were converted to NFIRS 5.0 codes.

From 1999 data on, analyses are based on scaling ratios using only data originally collected in NFIRS 5.0:

NFPA survey projections
NFIRS totals (Version 5.0)

For 1999 to 2001, the same rules may be applied, but estimates for these years in this form will be less reliable due to the smaller amount of data originally collected in NFIRS 5.0; they should be viewed with extreme caution.

Figure A.1. Fires Originally Collected in NFIRS 5.0 by Year



NFIRS 5.0 introduced six categories of confined structure fires, including:

- cooking fires confined to the cooking vessel,
- confined chimney or flue fires,
- confined incinerator fire,
- confined fuel burner or boiler fire or delayed ignition,
- confined commercial compactor fire, and
- trash or rubbish fires in a structure with no flame damage to the structure or its contents.

Although causal and other detailed information is typically not required for these incidents, it is provided in some cases. Some analyses, particularly those that examine cooking equipment, heating equipment, fires caused by smoking materials, and fires started by playing with fire, may examine the confined fires in greater detail. Because the confined fire incident types describe certain scenarios, the distribution of unknown data differs from that of all fires. Consequently, allocation of unknowns must be done separately.

For most fields other than Property Use and Incident Type, NFPA allocates unknown data proportionally among known data. This approach assumes that if the missing data were known, it would be distributed in the same manner as the known data. NFPA makes additional adjustments to several fields. *Casualty and loss projections can be heavily influenced by the inclusion or exclusion of unusually serious fire.*

Rounding and percentages. The data shown are estimates and generally rounded. An entry of zero may be a true zero or it may mean that the value rounds to zero. Percentages are calculated from unrounded values. It is quite possible to have a percentage entry of up to 100% even if the rounded number entry is zero. The same rounded value may account for a slightly different percentage share. Because percentages are expressed in integers and not carried out to several decimal places, percentages that appear identical may be associated with slightly different values.

Appendix B
Data Elements in NFIRS 5.0 Related to Automatic Extinguishing Systems

M1. Presence of Automatic Extinguishment System (AES)
This is to be coded based on whether a system was or was not present in the area of fire and is designed to extinguish the fire that developed. (The latter condition might exclude, for example, a range hood dry chemical extinguishing system from being considered if the fire began in a toaster.)

Codes:

N	None Present
1	Present
2	Partial system present (Added in 2005 for use beginning in 2006)
8	NFPA recode when M1AES Presence was coded as 1- Present, M3 AES Operation was coded as 4- Failed to operate and M5 AES Failure Reason was coded as 5- Fire not in area protected
U	Undetermined (restored to coding in 2003 for use beginning in 2004)

M2. Type of Automatic Extinguishment System
If multiple systems are present, this is to be coded in terms of the (presumably) one system designed to protect the hazard where the fire started. This is a required field if the fire began within the designed range of the system. It is not clear whether questions might arise over a system that is not located in the area of fire origin but has the area of fire origin within its designed range; this has to do with the interpretation of the "area" of fire origin.

Codes:

1	Wet pipe sprinkler
2	Dry pipe sprinkler
3	Other sprinkler system
4	Dry chemical system
5	Foam system
6	Halogen type system
7	Carbon dioxide system
0	Other special hazard system
U	Undetermined

M3. Automatic Extinguishment System Operation
This is designed to capture the "operation and effectiveness" of the system relative to area of fire origin. It is also said to provide information on the "reliability" of the system. The instructions say that "effective" does not necessarily mean complete extinguishment but does mean containment and control until the fire department can complete extinguishment.

Codes:

1	System operated and was effective
2	System operated and was not effective
3	Fire too small to activate the system
4	Failed to operate
0	Other
U	Undetermined

M4. Number of Sprinklers Operating
The instructions say this is not an indication of the effectiveness of the sprinkler system. The instructions do not explicitly indicate whether this data element is relevant if the automatic extinguishment system is not a sprinkler system (as indicated in M2). The actual number is recorded in the blank provided; there are no codes.

M5. Automatic Extinguishment System Failure Reason
This is designed to capture the (one) reason why the system "failed to operate or did not operate properly." The instructions also say that this data element provides information on the "effectiveness" of the equipment. It is not clear whether this is to be completed if the system operated properly but was not effective.

Text shown in brackets is text shown in the instructions but not on the form. Note that for code 4, the phrase "wrong" is replaced by "inappropriate" in the instructions; the latter term is more precise and appropriate, although it is possible for the type of fire to be unexpected in a given occupancy.

Codes:

1	System shut off
2	Not enough agent discharged [to control the fire]
3	Agent discharged but did not reach [the] fire
4	Wrong type of system [Inappropriate system for the type of fire]
5	Fire not in area protected [by the system]
6	System components damaged
7	Lack of maintenance [including corrosion or heads painted]
8	Manual intervention [defeated the system]
0	Other _____ [Other reason system not effective]
U	Undetermined

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ARMA: CONSULTATION RESPONSE

The Association of Residential Managing Agents [ARMA] do not in principal have any objections to the installation of sprinklers in London's buildings. There are however, we believe, a number of obstacles to the retrofitting of sprinklers in residential leasehold properties. The main issues are:

1. To allow a sprinkler system to be maintained, all parts of the system that need proactive maintenance will need to be installed within the common parts of the property. The common parts of the property may not however contain sufficient available space for the required installation.

2. The ability to inspect sprinkler heads located within the leaseholder's demise will be determined by the provisions of the lease. Most, but not all, leases permit Landlords access for inspection. Even when the lease permits access, access can very difficult to achieve in blocks where the majority of occupants are at work during the day. Annual inspection of heads is required by most sprinkler head manufacturers.

3. Landlords' leases may not allow service charges to be used for the installation of sprinkler systems. Most are very clear that you can only recover the repairs to the building.

4. Although there are no technical or practical reasons to prevent the installation of a partial system; it would be unreasonable for those Leaseholders who opt for installation to pay for the additional capacity will be built in to the system to allow leasehold flats whose leaseholders choose to opt out to be added at a later stage when future Leaseholders decide to be connected to the installed system.

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The Association of Residential Managing Agents [ARMA]

- ARMA is the leading trade body for residential leasehold property management in England & Wales
- ARMA promotes the highest standards of leasehold management and campaigns for improvements in legislation and policy
- ARMA has 258 Members, 56 Partners, 27 Affiliates and over 20 Associates. Between them, members look after around half of all leasehold flats in England and Wales
- Members range from small family run businesses looking after local properties, to national companies managing tens of thousands of flats across numerous developments
- ARMA's governing Council reflects the full range of membership portfolios
- ARMA is also an important resource for leaseholders. Many of the flats where ARMA members are employed as agents are controlled by the leaseholders
- ARMA members work to high professional standards and our members are independently regulated
- ARMA members manage over 50,000 developments, 1m homes and £1 billion of client money per annum
- ARMA introduced its own self-regulatory regime in 2015 to further improve standards in the industry (formerly called ARMA-Q when launched, it is now known simply as 'ARMA Accreditation')
- ARMA is strongly in favour of statutory regulation for the managing agent market.

Dear The London Assembly Planning Committee,

As someone who has lived in a tower block in an area of West London less than 5 miles away from Grenfell Tower, myself, my family and several of my neighbours were affected by Grenfell. One thing that must be taken from this tragedy is that the safety of people who reside in tower blocks must be made more of a priority. The installation of sprinklers is an investment that is so crucial for safety, and can really benefit those living in blocks now and in the future. I vehemently feel that this must be done to ensure no further tragedies like we saw in June 2017.

Yours sincerely,

LONDON FIRE AND EMERGENCY PLANNING AUTHORITY

Consultation Response

21 December 2017

Installing sprinklers in London's buildings

Response to London Assembly Planning Committee review

Introduction

The London Fire and Emergency Planning Authority (LFEPA) runs the London Fire Brigade (LFB). The 17 members of the Fire Authority are appointed by the Mayor of London. Eight are nominated from the London Assembly, seven are nominated from the London boroughs and two are Mayoral appointees. LFB is the busiest fire and rescue service in the country and one of the largest firefighting and rescue organisations in the world. We are here to make London a safer city and our vision is to be a world class fire and rescue service for London, Londoners and visitors. We will always respond to fires and other emergencies, but our work has changed over the years with a much stronger emphasis now on fire prevention and community safety.

Benefits of Sprinklers

Q1. In general, what advantages do buildings with AFSS installed, particularly residential buildings, have over buildings without these systems?

- Automatic Fire Suppression Systems (AFSS) play a significant role, as part of an appropriate package of fire safety measures, in reducing the impact of fire on people, property and the environment. They also assist firefighters in carrying out search and rescue operations by limiting fire development, which significantly reduces the risks to firefighters.

- Generally, buildings without AFSS installed have an increased risk of a fire developing to a size that may cause:

    - Loss of life and injury.
    - Loss of property and homes. There is an additional impact on buildings that house vulnerable residents that have specific housing needs.
    - Loss of critical community assets with a subsequent major impact on society.
    - Impact on the environment, surrounding property and communities.

- The reason that buildings without AFSS installed have an increased risk is because in most cases AFSS operates in the very early stages and either extinguishes the fire or slows its development until the fire service arrives.

- In theory, purpose built flats are designed with compartmentation that will contain the fire within the flat for 30-60 minutes to allow the fire service to arrive and tackle the fire. However, the contents of the flat will often be totally lost due to fire or smoke damage. In addition, the compartmentation can be compromised over time and fires may spread beyond the room of origin to corridors, affect the utilities of the building or to other flats. This can cause damage that takes significant time and cost to repair

and may mean the rehousing of many residents for extended periods. The likelihood of a fire spreading beyond the compartment of origin is reduced if a fire is controlled in its earliest stages.

- With commercial, industrial and public buildings, particularly those which are larger or complex in layout, firefighting is often very difficult. Regulations covering certain commercial buildings mean that they must be protected by sprinklers if the compartment sizes are greater than 2000 m2, but even smaller commercial buildings can pose significant risks to firefighters, due to the processes and/or materials stored and firefighting may only be able to be carried out from outside the building. An AFSS will provide internal fire suppression when the operating environment is too dangerous to risk firefighters entering the premises.

- Restricted access to buildings and lack of sufficient water supplies can also cause firefighting difficulty and AFSS should be considered at the planning stage for all these cases.

- Water damage from AFSS operating on smaller fires is significantly less compared to the use of fire hoses used to extinguish larger fires as they tackle the fire at an earlier stage. The Business Sprinkler Alliance, for example, has found that modern sprinklers release 45-200 litres of water per minute, compared to 700-4000 litres per minute discharged by fire service hoses and jets.

Q2. Which groups of people are more likely to benefit from the cost of installing AFSS than others?

- Providing AFSS in buildings that house vulnerable residents (e.g. Care Homes, Sheltered Housing, Supported Living/Hostels) is critical due to the potential delays in evacuation of people who are vulnerable and less mobile, and the greater impact that a serious fire may have on their health and re-housing needs. In care homes, sheltered and social housing, a fire can mean having to rehouse large numbers of people, which represents a significant challenge to the health and housing service providers. The social impact for these type of occupancies is greater because the adaptations and features in place for the individual's needs are harder to replicate if the home becomes untenable due to a fire.

- In schools, fire has a significant impact on pupils and a considerable knock-on effect on parents, on parents' employers, the education and local authority services, and on the local community as a whole. The fire service has been vocal about the risk of fires in schools and the need for making AFFS a legislative requirement for many years. Building Bulletin 100 (BB100): Design for fire safety in schools, published in 2007, introduced the 'expectation' that all new schools would have AFSS installed. We expressed serious concerns when the government consulted in 2016 on whether to remove this expectation. We are pleased that BB100 is no longer being revised to remove the recommendation that sprinklers be included in new schools. However, we recommend that BB100 goes further than currently worded and that AFSS is mandatory in all new school builds and as part of major refurbishments.

- Installing AFSS also has the potential to help safeguard housing stock which is in particularly high demand in London.

Feasibility

Q3a. What are the typical costs of installing a sprinkler system in a new-build flat or block of flats and how much is this as a proportion of development cost?

- The cost of installing AFSS depends on a number of factors:
    - Size of the development/coverage, specifically room sizes, property type and water supply.
    - Many new developments incorporate commercial premises requiring a separate commercial AFSS. These systems are more robust/expensive compared with residential/domestic systems.
- There are three areas associated with installing AFSS in residential premises:
    - Installation cost. For a high rise building, this would be £18-25 per square metre of the building or 1.5-1.9 per cent of new build costs.[1]
    - Water supply costs - the water connection charge. If confirmation of choice of water supply is not confirmed at the pre-installation phase with all relevant stakeholders, it can result in higher costs at later stages.
    - Whole life cost of the system – the maintenance costs.

Q3b. Are there mechanisms available to reduce these costs?

- Good communication at design stage between relevant partners/stakeholders will allow the most cost effective system to be designed and installed.
- Design freedoms and the resultant potential reduction in other passive fire safety measures can save money and compensate for the installation costs of AFSS. For more detail, please see our response to Q8a.
- If AFSS is fitted, insurers may agree a reduction in insurance premiums generating financial savings which may compensate for installation costs of AFSS.

Q4. How far is it feasible to extend the existing Building Regulations to mandate AFSS in new residential buildings with a height lower than 30 metres?

- We believe that 30m was a determination based on cost benefit analysis rather than consideration of firefighting operations. The fire service has typically referred to high rise as being above 18m, a figure determined some time in the past taking into account the limitation of firefighting equipment. This is also the figure that is used in building regulations to apply higher standards for the fire resistance of structural elements, inclusion of dry rising mains and flammability of external cladding to account for the potential complexities of fire fighting at height. In establishing firefighting operations for high rise premises, there are challenges for the fire service including limited access to the fire floor, limited options to 'tackle' the fire, relying on entry via the front door in the main and added commitment to resource the firefighting operations.
- As referenced in Q1 above, an AFSS will potentially extinguish a fire or at least slow its development, which in light of the above mentioned challenges already associated with high rise firefighting, would help to reduce the damage, risk to life and property and conditions firefighters might face.

[1] CFOA Business case for sprinklers

Retrofitting

Q5. What factors do you consider necessary to justify installing AFSS in existing residential buildings?

- The key factors to be considered for retrofitting AFSS in existing residential buildings need to be based on the risks and factors outlined in Q1 and Q2 above.

Q6. What is the typical cost of retrofitting an existing residential flat with sprinkler systems?

- Figures from the British Automatic Fire Sprinkler Association (BAFSA) for the period 2012-2017 demonstrate that the average cost per flat is between £1500 and £2500.
- Information from developers and organisations such as housing associations indicates that the cost of installing sprinklers in refurbishment and conversion projects is in the region of 1-2 per cent of the total project costs.[2]
- LFEPA ran a match funding competition in February 2014 where local authorities, private housing providers could apply for match funding to assist meeting the costs of installing AFSS within premises that housed the most vulnerable. The full report is attached with this consultation response. [redacted] This information has been redacted at the request of the London Fire Brigade. The report referred to is not yet finalised.

[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	
[redacted]	
[redacted]	[redacted]

- Retrofitting AFSS requires a more bespoke and complex installation than would be necessary if fitted during development. Generally a retrofitted solution requires more valve groups (flow switch/isolation valves) and therefore is approximately 25 per cent more expensive than a system installed during initial development.

Q7. What are the main factors affecting the feasibility of retrofitting existing residential buildings with AFSS? Are there differences between the private and public sectors?

- The significant investment required - many councils/housing associations lack funds to retrofit AFSS.
- There is a lack of understanding and knowledge of the benefits of AFSS by local authorities, housing providers and developers.
- There could be issues with the capacity of the sprinkler industry to cope with a sudden and extensive demand for sprinkler retrofitting alongside the ongoing provision of sprinklers in new build developments. There is a risk that if the industry has to expand rapidly to cope with this demand in a short timeframe some standards may be lowered which may compromise the safety of the building. For example if sprinklers are fitted but the basic construction work around that was not up to standard and led to holes between the different rooms in the building – breaching the compartmentation and

[2] BAFSA information file 10 retrofitting

therefore allowing more rapid fire spread in a fire. If the industry has to expand rapidly to accommodate large numbers of retrofitting projects there is a risk of companies coming online without proper certification, technical competence or skills which raises concerns. This could be managed through accreditation and training schemes.

- There is also a risk that these companies will be given building control permission to install sprinklers without wider consideration of other fire safety measures that may be appropriate. This should be managed through the usual building control measures.

- The nature of the occupancy will impact upon the feasibility and potential costs. In local authority/housing association buildings there is likely to be a greater number of tenants and therefore greater control over access to the building and the individual flats. This can make it more straight forward to retrofit AFSS compared to the private sector where privately owned flats will generate legal implications in gaining permission and access to retrofit within flats.

Technical issues

Q8a. What are the main technical issues with installing AFSS in new residential buildings?

- Architectural design within new builds needs to take account of AFSS at the earliest stages to ensure that ceiling designs enable the optimum positioning of nozzle heads to ensure they are located within their design parameters. As above, to make a building safe from fire compartmentation needs to be in place to stop the spread of fire. This can sometimes restrict the design of the building`s internal layout. However, if AFSS is fitted, the restrictions can diminish and so a designer has more freedom with the internal space of the building, e.g. reduction in compartment fire rating, increase fire escape travel distance.

- The installation of mechanical, electrical, plumbing, fire protection and other systems needs to be coordinated.

- Proper maintenance of AFSS and other critical safety systems such as smoke control, firefighter lifts etc is essential to ongoing safety and effectiveness. However, the experience of LFB is that the operation and importance of these systems to the safety of residents and firefighters in the event of a fire are not always well understood by building owners or maintained to the standards required.

Q8b. Which issues are most likely to make AFSS unviable?

- Where water storage tanks are necessary, there needs to be space available and the structure must be able to take the weight.

- The existing structure must be capable of accommodating pipe routing and ensure there is enough space above existing ceilings to accommodate piping.

- A building may also have an aesthetic level of quality that needs to be maintained, in which case it would need to be considered whether ceilings need to be dropped in certain areas, or if the installation of bulkheads – wall mounted pipework and fittings – could be permitted.

- The most important consideration is that the system will operate when required and this involves having the installation properly designed and fitted in the first place and properly maintained by a competent installer – this can mitigate against all of the scenarios above.

Q9. What is the general level of public perception and knowledge of sprinkler systems? How can these issues be addressed?

- Anecdotally, there is widespread misunderstanding of how sprinkler systems operate, including the myth that all sprinklers in a building will go off if a fire is detected.

- Sprinkler systems are very reliable and the risk of accidental activation is very low. In fact, there is a 16 million to one chance of a sprinkler malfunctioning – which are greater odds than winning the lottery.

- There is clear evidence that supports the installation of sprinklers systems – on the risks, fatalities, injuries, costs, and the role of the insurance industry. LFB has undertaken extensive work to communicate the benefits that sprinklers bring including 'myth-busting' work to reduce the misunderstanding around their operation.

- For key audience groups, there is a lot more that could be done to explain how sprinklers work, the cost impact and the potential benefits.

Q10. How much power do local authorities and the Mayor have to impose more localised fire safety standards, including AFSS? Would more localised standards be desirable?

- LFB is only consulted at building control stage and for some specific planning matters and does not have the power to require changes, only to recommend them. It would be beneficial for LFB to be consulted about fire safety for a building at an earlier stage, ideally at the planning application stage, to ensure fire safety plans are incorporated and correctly implemented. LFB should also be notified of any design changes throughout the process, to ensure that these do not compromise fire safety.

- The need for ongoing maintenance needs to be better considered within the planning and building control process, and councils need to understand their obligations under the Regulatory Reform (Fire Safety) Order 2005.
- Under the Local Acts[3], there was stricter regulation and greater provision of sprinkler systems and LFB supports the reintroduction of localised standards in the absence of Building Regulation provision.

For further information please contact Helen Newton [redacted]

[3] Section 20 of the London Building Acts (Amendment) Act 1939 was repealed in 2013

I am writing on behalf of the London Borough of Tower Hamlets in response to your request for information on the issues you identify in your email.

This Council has yet to make a decision about retrofitting sprinklers to the Council's high rise blocks. At present there has been no change in Government guidance or regulation about sprinklers. We note the comments of the London Fire Brigade Commissioner and we expect the Government to address this issue as part of its response to the Grenfell Tower public inquiry and the parallel review of building regulations.

With around 130 blocks of six storeys or higher, the estimated cost of installing sprinklers in all Council high rise blocks would amount to many millions of pounds which at this stage the council does not have identified capital investment budgets for, so we would hope any recommendations are backed by financial support from the Government. The safety of our residents is, of course, paramount.

I am aware that this response may not answer the specific points you raise in your call for evidence but the Council doesn't have specific local information on typical costs or technical feasibilities, as we have not installed sprinklers in any of our buildings.

I nevertheless hope that my comments are of assistance.

Owen

Owen Whalley
Divisional Director
Planning & Building Control
Place Directorate
London Borough of Tower Hamlets

SMARTER TOGETHER

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Installing sprinklers in London's buildings – Response from Optivo

Summary

Optivo can see the role Automatic Fire Suppression Systems (AFSS) can play in supporting the fire strategy in residential buildings, especially more complex buildings. AFSS are relatively cost effective and simple to fit into new build developments. Retrofitting AFSS is technically feasible for most buildings but is more expensive and technically challenging. We'd welcome more clarity about where AFSS should be installed and consider we need to improve how the fire strategy of the planned building is considered at planning stage. We do not consider that AFSS should be required for all new homes. A holistic consideration of the fire strategy at planning stage should consider the most appropriate solution for each building

1. **In general, what advantages do buildings with AFSS installed, particularly residential buildings, have over buildings without these systems?**

- AFSS saves lives. A functional fire suppression system will prevent the fire spread or slow it down enough to allow for more time to evacuate a building .
- Rapid fire containment in a building with an AFSS allows the fire & rescue services to focus on the seat of the fire rather than having to fight fires in multiple locations.

- AFSS significantly reduce the extent of any damage to a building as a result of a fire

- If installed during construction phase, they are a relatively cost effective fire safety measure, particularly when you consider the extent of other fire safety measures can be reduced.

- Modern AFSS are generally inexpensive to service and maintain with some systems not requiring major repairs or upgrades for 20+ years.

- Modern AFSS are flexible and can be designed with several different protection features depending on the type of building and its use.

- Insurance premiums for the building will be reduced.

- Does not require any physical intervention to operate.

2. Which groups of people are more likely to benefit from the cost of installing AFSS than others?

- From the point of view of a landlord, an AFSS benefits the more vulnerable residents we have, particularly the frail and elderly, those with mobility issues, those with sensory issues, hoarders, residents with mental health and those with drug and alcohol issues.

- Generally all residents and visitors benefit from a fire being attacked rapidly, contained and the speed of spread of fire and smoke reduced significantly.

- Everybody benefits, to different degrees, i.e. it will push up Service Charges for Residents, but they will have peace of mind.

Feasibility

3. What are the typical costs of installing a sprinkler system in a new-build flat or block of flats, and how much is this as a proportion of development cost? Are there mechanisms available to reduce these costs?

- Between £800 and £1,000 per flat if plumbers and M&E engineers can have access from first fix and AFSS has been included as part of the original design
- Between £18-£25 per M2 (70m2 Flats app. £1750.00) Design stage as above

4. How far is it feasible to extend the existing Building Regulations to mandate AFSS in new residential buildings with a height lower than 30 metres?

- Straight forward to revise the Building Regulations to include installation of AFSS for all buildings over a certain storey height rather than a dimension.
- As above.

5. What factors do you consider necessary to justify installing AFSS in existing residential buildings?

- Location, construction type, height, design and layout of building and number of means of escape

- Exiting fire safety precautions

- Feasibility of installing an AFSS, type of AFSS required, ability and continuity of supply services to support an AFSS

- Type and vulnerability of residents

- Tenure – shared ownership block would make it difficult to install under Section 20 along with leaseholders in a general needs block

- Management of the building and the residents/visitors

- Cost of installation, disruption and amount of post installation making good.

- Ongoing service charge costs for leaseholders.

- Legal requirements

6. What is the typical cost of retrofitting an existing residential flat with sprinkler systems?

- This can vary dramatically, depending on the property, the type of AFFS to be installed, the requirement for additional equipment – such as additional pumps and water supplies. However, we would look at an average indicative cost of between £2,000 and £2,500 per flat. This includes assumptions about asbestos removal as most homes build in the post war period will have asbestos which needs to be removed to facilitate installation. This would account for 30% of costs.

- It is however noticeable that the number of installers and their ability to install more complex high rise projects is relatively small due to the current size of the market and that demand has and will continue to increase, resulting in an subsequent increase in costs of installation.

7. What are the main factors affecting the feasibility of retrofitting existing residential buildings with AFSS? Are there differences between the private and public sectors?

- Cost, viability and extent of installation. As previously mentioned there are difficulties in getting acceptance of retrofitting AFSS in blocks which are shared ownership or a number of leaseholders. Unless you can get agreement for coverage in 100% of flats, the effectiveness of systems are compromised.

- Disruption to residents during installation and subsequent service/maintenance and the service charge costs.

- Lack of legal requirements

- Alternative robust passive fire safety works along with a strict inspection regime

- Insufficient M&E technical expertise to manage design, installation and commissioning of most suitable AFSS type for building.

- Guarantee of continuity of services for the AFSS.

8. What are the main technical issues with installing AFSS in new residential buildings? Which issues are most likely to make AFSS unviable?

- The technical issues are simplified and are straightforward to deal with if installation of an AFSS is included from design stage. The real technical difficulties arise when you retrofit systems.
- Lack of riser spaces, spaces in sacrificial ceilings, water pressures, size of site if water pump rooms have to be installed

9. What is the general level of public perception and knowledge of sprinkler systems? How can these issues be addressed?

- Post Grenfell I would say it has improved – but it was at a fairly low level to start with. The biggest misconception is that once an individual sprinkler head is activated, all the sprinkler heads in the room, flat or building are also activated simultaneously.

- A full programme of consultation and knowledge share would be provided to all residents where a retrofit programme were to take place.

10. How much power do local authorities and the Mayor have to impose more localised fire safety standards, including AFSS? Would more localised standards be desirable?

- Existing powers are adequate. Safety standard need to be national to ensure consistency – particularly for landlords with varied stock throughout the UK.

- Building Control inspections need to be more robustly adhered to and monitored – particularly the installation of specialist equipment like AFSS

- We'd welcome a more thorough fire strategy document at planning stage which looks at likely occupants and how the building will be managed, and how the design of the building will support this fire strategy.

- Enforcement authorities need to be more rigid and systematic with inspections, focussing audits on areas of higher risk

RIBA

Submission from the Royal Institute of British Architects to the London Assembly Planning Committee Review on Installing Sprinklers in London's Buildings

The Royal Institute of British Architects (RIBA) is a global professional membership body that serves its members and society in order to deliver better buildings and places, stronger communities and a sustainable environment. We provide the standards, training, support and recognition that put our members – in the UK and overseas – at the peak of their profession.

Architecture is a regulated profession (the only fully independently regulated built environment profession); the Architects Registration Board (ARB) maintains the register of those entitled under the Architects Act to use the title "architect".

Overview

The Grenfell Tower fire disaster caused the largest loss of life in a single peacetime building fire since the Exeter Theatre Royal fire of 1887 in which 186 people died. Grenfell Tower is a catastrophic event that must be a turning point in the UK approach to fire safety regulation and building procurement.

The results of the DCLG testing programme suggest either a widespread lack of competence in the design, building control and contracting branches of the construction industry and/or a very serious systemic regulatory failure.

Following the Grenfell Tower fire disaster, the RIBA established an Expert Advisory Group on Fire Safety. The terms of reference of the Expert Advisory Group as approved by RIBA Council:

i. Advise on emerging RIBA policy on design for fire safety, including recommendations to Government.
ii. Provide information to RIBA members in relation to design for fire safety and relevant regulations.
iii. Make recommendations for further RIBA work on the broader procurement and regulatory context that affects project quality and safety.

The RIBA Expert Advisory Group on Fire Safety has developed the submission by the RIBA to the Independent Review of Building Regulations and Fire Safety.

The RIBA has proposed the immediate review and introduction of practical changes to Building Regulations Approved Document B, which is now widely recognised to be a confusing and flawed document, including more prescriptive guidance in relation to use of non-combustible materials in external wall construction, alternative means of vertical escape, central alarm systems and automatic fire suppression/sprinkler systems.

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Specifically, these proposals include:

i. Introduction of a Building Regulations requirement for central fire alarm systems, with phased /staged capabilities, in multiple occupancy residential buildings.

ii. Introduction of requirements for sprinklers/automatic fire suppression systems in all new and converted residential buildings, as currently required under Regulations 37A and 37B of the Building Regulations for Wales, or at least for residential buildings over three storeys in height.

iii. Introduction of a requirement for more than one means of vertical escape from new multiple occupancy residential buildings of more than three storeys in height, and no use of compensatory features for omission of a staircase or alternative means of escape.

iv. External walls of buildings over 18m in height to be constructed of non-combustible (European class A1) materials only.

v. Retro-fitting of central fire alarm systems in existing residential buildings over 18m in height.

vi. Retro-fitting of sprinklers/automatic fire suppression systems to existing residential buildings over 18m in height, and perhaps extended to all existing residential buildings above three storeys in height.

vii. For new refurbishment projects involving “material alterations” to high-rise, multiple occupancy residential buildings, the retro-fitting of central fire alarm systems and sprinklers/automatic fire suppression systems should be mandatory. This could be structured on a similar basis to the “consequential improvements” required under Part L of the Building Regulations to the energy performance of existing buildings where they are subject to renovation and/or extension. Consequential improvements are currently required in relation to energy efficiency but not in relation to fire safety.

Key Questions

Benefits of Sprinklers

1. In general, what advantages do buildings with AFSS installed, particularly residential buildings, have over buildings without these systems?
2. Which groups of people are more likely to benefit from the cost of installing AFSS than others?

Traditionally, in the UK in terms of protecting both life and property we have relied heavily upon passive fire protection methods: alternative means of escape, limits in use of combustible materials, and most importantly effective fire compartmentation. This is also the fundamental basis on which the "stay put" or "defend in place" strategy for high rise buildings in multiple occupancy and hospital and other buildings is based.

Evidence of recent fire performance in high rise residential buildings suggests that fragmentation of ownership, fire safety responsibility and design and construction responsibility has placed at risk the effectiveness of compartmentation and other passive fire protection strategies. In such circumstances we need to employ a balance of passive and active fire protection measures.

As a society we cannot afford to miss the opportunity to significantly strengthen official Building Regulations guidance through simple prescriptive requirements for the use of non-combustible materials in external wall construction in higher risk buildings, alternative means of vertical escape from high rise buildings, and central alarm and sprinkler systems in all residential buildings. Just like the introduction of seat belts in cars, apparently simple measures can save many lives.

Fewer people die today in house fires largely because of less use of open fat fryers in homes, fewer smokers and the widespread installation of smoke alarms. Sprinklers represent the single most effective prescriptive measure we could introduce. People with reduced mobility, including disabled and elderly residents, who would not be able to exit a building quickly in the event of a fire and a call for evacuation would particularly benefit.

Feasibility

3. What are the typical costs of installing a sprinkler system in a new-build flat or block of flats, and how much is this as a proportion of development cost? Are there mechanisms available to reduce these costs?
4. How far is it feasible to extend the existing Building Regulations to mandate AFSS in new residential buildings with a height lower than 30 metres?

The RICS has provided to the Construction Industry Council an indicative range of broad benchmark costs, for the purposes of which it has been assumed that the entire building will have sprinkler protection via a dedicated sprinkler system and that individual apartments will be fitted to a sprinkler head density of 1:10m2. It has also been assumed that the building will be larger than 10,000m²:

- Shell & Core - £30-40 per IPMS-2/GIA (Gross Internal Area) m2
- Fit Out - £25-31 per IPMS-3 /NIA (Net Internal Area) m2

Buildings with sprinkler systems would see reduced insurance premiums, offsetting some of the installation costs.

An extensive cost – benefit analysis of sprinkler systems in single dwellings and multiple residential buildings was carried out by BRE Global Ltd for the Welsh Assembly Government prior to the mandating of sprinklers on all new and converted residential buildings in Wales. This report concluded that residential sprinklers as additional safety measures are cost effective for:

i. All residential care homes for elderly and disabled people and children.
ii. Most blocks of purpose-built flats and large converted blocks.
iii. Most traditional bedsit type dwellings where there are at least six bedsit units per building.

It suggested that residential sprinklers in two storey dwellings would not currently be cost effective.

Methodologies for valuation of prevented fatalities remain controversial.

The full report contains very comprehensive information and can still be downloaded at:

www.cfoa.org.uk/download/22311

Subsequently, the Welsh Assembly Government legislated under its devolved powers to mandate sprinklers in all new and converted residential buildings.

John Griffiths AM, Minster for Environment and Sustainable Development in the Welsh Assembly Government, made the following statement on 30 May 2012:

> *"We accept that there is a cost to introducing sprinklers but, as a society, we must seek to prevent avoidable death and injury arising from house fires".*
>
> *"Notwithstanding this progress, the number of deaths and injuries is still too high. On average, over the last 10 years, 17 deaths and 503 injuries have resulted from fires in residential properties each year in Wales"*
>
> *"The BRE report indicates the cost benefit analysis case for installing sprinkler systems in new build care homes, halls of residence and potentially for flats, sheltered flats, and traditional houses in multiple occupation (HMOs)".*
>
> *"The study indicates that the cost benefit case is less strong for regulating all new domestic properties but the Welsh Government believes that care is required when considering any policy that has the potential to protect life".*

The introduction of this legislation in Wales, where in most other respects the Building Regulations mirror those in England, demonstrates that it is perfectly feasible to extend the existing Building Regulations to mandate AFSS in new residential buildings with a height lower that 30 metres.

Retrofitting

5. What factors do you consider necessary to justify installing AFSS in existing residential buildings?

6. What is the typical cost of retrofitting an existing residential flat with sprinkler systems?

7. What are the main factors affecting the feasibility of retrofitting existing residential buildings with AFSS? Are there differences between the private and public sectors?

The RIBA has recommended the retrofitting of sprinkler systems to all existing residential buildings over three storeys in height; the RIBA argues that this could be reinforced by a requirement for sprinkler systems as a "consequential improvement" where "material alterations" are made to existing high rise residential buildings.

Costs of retrofitting sprinklers will vary depending on building design, construction, height, availability of adequate water pressure, and availability of water storage space. A number of landlords are already commencing retrofitting sprinkler systems to high rise residential buildings and real cost data is becoming more readily available.

A surge in demand for sprinkler retro-fitting may result in an increase in supply and installation and maintenance and testing/inspection costs if the industry cannot readily meet the increase in demand.

Technical issues

8. What are the main technical issues with installing AFSS in new residential buildings? Which issues are most likely to make AFSS unviable?

9. What is the general level of public perception and knowledge of sprinkler systems? How can these issues be addressed?

10. How much power do local authorities and the Mayor have to impose more localised fire safety standards, including AFSS? Would more localised standards be desirable?

The RIBA does not believe that there are significant or insurmountable barriers to the installation of AFSS in new and existing residential buildings.

There is a large body of evidence that the chances of fire deaths, serious fire and smoke injuries and fire damage to property is significantly reduced in sprinklered buildings. Extensive media coverage since the Grenfell Tower fire disaster means that there is a widespread and growing public awareness of the role that sprinklers and other active fire protection measures have to play in fire safety, especially in high rise and other higher risk buildings. It is likely that this public interest will increase and lead to greater public demand for AFSS.

In general any fragmentation of regulatory regimes or introduction of localised standards can lead to confusion and differential standards. However, on an issue of such importance, which requires political will as well as a rational evidence base, it is appropriate for devolved authorities to use their powers to drive change, as has been actioned in relation to residential sprinklers in Wales. As powers to make Building Regulations are not devolved in London, this would probably have to be achieved via the London Assembly's responsibility for planning and development control policy.

Wholesale Water

Name [redacted]
Phone
E-Mail

Dear Mr Shah

Installing sprinklers in London's buildings: London Assembly Planning Committee review

I wanted to follow up my colleague Phillip Boothroyd's recent attendance at the roundtable event you chaired on 4th December exploring the feasibility and technical challenges of installing sprinklers in London's residential buildings.

We are grateful for the opportunity to be involved in the discussion, and I trust that Phillip's contributions provided helpful input into this important review.

The majority of the questions in the call for evidence you have published seek views on topics outside of our experience and remit as a statutory water and sewerage undertaker. However, while we do not feel we can comment in sufficient detail at this stage to aid your review, I wanted to make clear our commitment to supporting the review with any further information you would find helpful.

In particular, if and when further plans are developed exploring the potential for wider installation of sprinklers in the capital we would be happy to work with you and others to explore what work on our part might be necessary to support any changes in approach.

Please don't hesitate to contact me directly if you would like any further information, or to discuss any of the issues your review has raised.

Yours sincerely,

[redacted]

Sarah McMath
Managing Director, Wholesale Water.

Dear Reece,

Further to our conversation earlier, please find attached our password protected petition submission to the consultation. If you would like to open the file please let me know and I can provide the password.

We are submitting to 'Installing sprinklers in London's buildings'. 11,590 38 Degrees members in London have signed the petition and many have submitted responses to the consultation, which are also included in the document.

Here is a link to the petition: https://38d.gs/sprinkers_consultation

We hope the consultation takes the views of London residents into account. I look forward to hearing from you soon and as I said, please get in touch if you would like the password to the petition document.

Best wishes,

Aiyan Maharasingam and Jess Hodge - 38 Degrees

Installing sprinklers in London's buildings: London Assembly Planning Committee Review

Survitec response

2 February 2018

Introduction

1. Survitec Group is a highly experienced, trusted global leader in survival and safety solutions. We are a supplier to the Ministry of Defence and a partner to the London Fire Brigade, and fire and rescue authorities across the country.

2. We protect people by designing and manufacturing safety and survival equipment, including AFSS, which is regularly offered alongside multiple evacuation options. Pioneers in critical safety for over 160 years, we are always looking for applications to improve people's survival. We welcome the opportunity to respond to the GLA Planning Committee inquiry into Installing sprinklers in London's buildings – the effectiveness and economic viability of requiring Automatic Fire Suppression Systems (AFSS) in certain London buildings.

3. The safety and survival community has a long track record of coming together in the aftermath of many catastrophic events to understand what lessons can be learned, and what new applications could prevent future loss of life. Survitec has been instrumental in this process, from developing the first inflatable life raft in the aftermath of the sinking of the Titanic, introduction of Mass Evacuation Systems following the Townsend Thoresen disaster to today providing new safety products following the loss of a Super Puma transporting passengers offshore.

4. We are a proud British success story, with three centres of excellence in the UK: Dunmurry, Birkenhead and Gosport. They house all of our innovation, design and IP and employ over 1,000 highly-skilled people, and a further 2,200 globally.

5. We are a leader in safety solutions for the Government, blue-chip companies including British Airways, Siemens and BP, and leading rescue organisations including the RNLI. We work closely with the Government, partnering with the Department for International Trade, and support efforts by the UK and Scottish Governments to drive up safety standards in the military, oil and gas and transport sectors. Our products and services are used in some of the most challenging environments and demanding circumstances. We take responsibility for the entire product lifecycle from precision engineering and R&D, to manufacturing and servicing.

6. We also have an established track record of providing fire safety solutions in complex environments including on oil and gas rigs and we are the largest supplier of fire safety equipment to cruise ships with some 65% of the market share. We also provide equipment for firefighters, including protective clothing and breathing apparatus, and are trusted as the sole supplier of fire safety equipment for helicopters in the military and those transporting personnel offshore.

Survitec's views on the benefits of AFSS

7. The most important benefits of AFSS are:

    a. Reduction in death from fire;
    b. Reduction in injury from fire by 80%;
    c. Reduction in the risks to firefighters;
    d. Protection of property and heritage by 90%;
    e. Reduction in the effects of arson;
    f. Reduction in the environmental impact of fire;
    g. Reduction in fire costs and the disruption to the community and business.

8. A further benefit of AFSS is the fact that insurance companies encourage the installation of sprinkler systems, specifically where arson is considered within a fire risk analysis. Buildings fitted with sprinkler systems to an approved standard sometimes qualify for substantial reductions in premiums for property so protected. Often these discounts can amount to 30 to 40% of an insurance premium, meaning significant reductions in costs for homeowners and tenants.

9. Rooms protected by sprinklers are usually back in use within a few hours and damage to the wider building is often limited.

10. The installation of sprinklers reduces demand on the fire service. When sprinklers are fitted, fire brigades need to employ fewer resources in fighting the fire and know that their teams will be less likely to suffer injury.

11. The installation of sprinklers also allows additional flexibility for designers and builders when designing buildings. In unconventional buildings, including sprinklers in a specification will often enable Building Regulations compliance to be achieved in a very cost-effective manner and where a truly green or carbon neutral building is demanded, a sprinkler system will ensure that no fire will destroy that building.

12. The installation of an AFSS should be actively encouraged where the premises are occupied by or intended for people with some or all of the following characteristics:

    a. Limited mobility;
    b. Cognitive issues such as dementia;
    c. Mental health issues;
    d. Smokers;
    e. Dependencies such as drug or alcohol;
    f. People who have had a fire or fires in their home before.

13. Those who would most benefit from the installation of an AFSS are those who would find it difficult to either alert the emergency services in the event of a fire and/or who would find it difficult to escape or even move away from the seat of the fire.

Typical costs associated with AFSS installation

14. In 2011 the Callow Mount project was the first AFSS installation conducted without decanting residents and was completed in four weeks. Callow Mount is a 13 storey block with 47 flats.

15. The project was sponsored by the BAFSA and, in 2011 prices cost £55,134 in total, a cost of £1,150 per flat.

Evacuation and suppression

16. As a world leader providing equipment for suppressing fire (e.g. sprinkler systems) and for evacuation, history and experience tells us that suppression through AFSS alone has not always proved successful and is not always the best way of preserving the maximum number of lives.

17. In our view, housing regulation focusses on suppression and overlooks escape. Evacuation systems can get the maximum number of people out of immediate danger, allowing the fire authorities and sprinkler systems to protect the assets, and rescue anyone who is unable to leave the building.

    a. Sprinklers are most effective at protecting buildings rather than people, and tend not to address the issue of smoke for people in the building.
    b. Internal stairwells are susceptible to smoke and often have trip hazards.

18. In other situations where there are a high number of people and a high probability of catastrophic failure, there is a mandatory requirement for more than one way of exiting the building or vessel. Equally, tower blocks, often with only one exit route (the internal stairwell), are not well suited to evacuation given potential trip hazards and the difficultly of maintaining control in an evacuation situation. Given the additional issue of smoke this means there is a real problem with evacuation.

19. It is for this reason, and given our experience in fire safety, that we wanted to understand what solutions could save the most amount of lives in a fire situation in a tower block. Survitec believe that the best way to ensure the maximum level of survivability, is to evacuate people as soon as the alarm is raised by using multiple evacuation routes.

20. Systems like our own, on which we would be happy to provide more detail, can enable up to 1,000 occupants to escape a fire in under 20 minutes. It is an immediate evacuation procedure, able to be retrofitted to existing housing and commercial stock.

21. The ability to retrofit evacuation facilities is important because many older buildings do not allow sprinklers to be retrofitted.

Effective evacuation criteria

22. As fire suppression through AFSS is only part of the solution to this challenge, we have set out the criteria for how, from our experience, effective fire evacuation facilities should function.

23. Effective fire evacuation facilities should:

    a. Be simple and easy for people to navigate, including, children, the elderly and less-abled people who struggle to use stairwells – particularly at times of speed or panic.
    b. Allow family members to evacuate buildings together.
    c. Be able to withstand smoke, extreme temperatures and falling debris.
    d. Be easy to retrofit to existing housing stock or incorporate onto new build developments.
    e. Be retrofitted with minimal disturbance for existing residents. AFSS systems require residents to be moved out of their homes while they are fitted. This is also a very expensive process.
    f. Be cost-effective.

24. It is our professional opinion that these criteria should be applied when assessing any fire evacuation facilities, in addition to AFSS.

Survitec's solution

25. Survitec has adapted its evacuation chute currently installed on cruise ships and oil rigs to the domestic environment, for use on high-rise properties. This domestic solution is the RESCU Chute.

26. The RESCU Chute is a double-helix vertical spiral exit slide enabling fast evacuation from the top of a tower block.

27. It is designed to be fitted to the top of a building, from where it can be deployed to enable around 1,000 people to exit a building in under 20 minutes. The double-helix element allows for two sets of people to evacuate the building at any one time, leaving the possibility of using one slide as a 'fast lane' and a second, slower lane for less mobile individuals including those on stretchers.

28. It can be retrofitted to existing housing stock, or built into new developments, in line with the objectives and responsibilities of local authorities and public bodies.

29. In contrast with the retrofitting of sprinklers, or the removal of cladding, the installation of the RESCU Chute does not require residents to be moved out of their homes, representing a financial saving to authorities. Moreover, on a 'cost per person' basis, the product is markedly less expensive than retrofitting sprinklers.

30. Stairways are not an effective way for the infirm to leave a building. Since the RESCU Chute relies on gravity alone to get people out of the building, it has proved easier for less mobile people and children to exit buildings. Children can accompany an adult down the slide, and families are less likely to be separated.

31. Unlike other fire safety measures, the RESCU Chute is not susceptible to smoke, is inflammable, and the structure can withstand extremely high temperatures and the impact of falling debris. Users are shielded from heat by the inflated chute.

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32. The RESCU Chute is designed to withstand vandalism or misuse, and multiple deployment methods can be required to ensure it is not used unless in an emergency situation. The product can be remotely overridden by fire authorities who can control when it should be used.

Conclusions

33. Ensuring that a building has effective AFSS facilities to supress fire is important. Among other things they can: reduce injury and loss of life; protect property; protect the local environment; reduce insurance premiums.

34. However, recent tragedies have shown that suppression is only part of the solution when dealing with potential fires, particularly in medium and high-rise buildings. It is also vitally important to ensure that people are able to evacuate in a fast, efficient and safe manner. As the recent tragedy at Grenfell Tower has shown, this is too often not the case.

35. Conventional stairwells do not allow for the capacity or the speed needed to evacuate medium to high-rise buildings but Survitec does have a solution which would help.

Ends

Dear The London Assembly Planning Committee,

Over 6 months after the tragedy of Grenfell, we have yet to get a response from our building's freeholder about the cladding on our 10 storey building... luckily we do have sprinklers... I can only imagine the anxiety of the many families going to sleep at night in buildings which do not.

The tragedy of Grenfell seemed unthinkable in one of the world's richest and most modern cities... but it seems nobody is responsible for residents' health and safety, and they are powerless to take the necessary action themselves.

Health and safety duties and responsibilities should be first and top priority for all landlords, freeholders and housing authorities.

Grenfell must change the world - please take whatever action you can to help ensure this type of thing never happens again.

Yours sincerely,

Dear The London Assembly Planning Committee,

It is of the greatest importance to avoid another Grenfell disaster and therefore it is essential that sprinkler systems be installed in all Tower Blocks.

Yours sincerely,