A GUIDE TO AUTOMATIC WATER SUPPRESSION SYSTEMS (AWSS) AND THEIR PRACTICAL APPLICATION







THE CHIEF FIRE OFFICERS ASSOCIATION
The professional voice of the UK fire and rescue service

FIRE KILLS
YOU CAN PREVENT IT

CFOA President, Chief Fire Officer Phil Toase, CBE, BSc, MCGI FIFire E, West Yorkshire Fire and Rescue Service

The Chief Fire Officers Association (CFOA) is committed to saving life and protecting property through the application of sprinklers and other water suppression systems.

CFOA are independently progressing and contributing to a number of initiatives, which seek to promote the use of sprinklers in our communities, these include:

- The legal requirement to fit sprinklers in schools and other education establishments.
- To widen the use of sprinklers and other water suppression systems in domestic properties.
- To support the development and application of low cost sprinklers in domestic properties.
- To secure the use of water suppression systems in any property, which would save life, permit design freedoms and encourage innovative modern architecture.
- To support and work in partnership with all stakeholders from within the water suppression industry towards the combined vision of wider use of water suppression systems in our society.

Fire and Rescue Services are engaging with an unprecedented range of legislative change, which has as its very core a risk based approach to the delivery of our preventative, protective and response services.

The business case is compelling, water suppression systems save life, reduce injuries, protect any property and sustains businesses all at a competitive and potentially reduced cost.

I would like to acknowledge the work of the professionals from within our service who have produced this guidance and I commend it to you in promoting the development of sprinklers and other water suppression systems within our communities

Phil Toase
President
Chief Fire Officers Association

THE CHIEF FIRE OFFICERS ASSOCIATION
The professional voice of the UK fire and rescue service

Chair, Automatic Water Suppression Systems (AWSS) Work Group
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Professionals within the fire and rescue service who have considerable experience and knowledge of sprinklers and other water suppression systems have produced this guidance.

It has been produced with the practitioner in mind and is aimed predominantly at fire safety officers and strategic managers within the service. It is our vision that this guidance will be used by fire and rescue service professionals to promote, offer advice and form networks for AWSS applications.

The guidance has four sections:

Section 1: The business case
Section 2: Facts, information and descriptions of common systems
Section 3: Alternative design strategies
Section 4: Case studies

CFOA Policy

CFOA strongly advocates the use of Automatic Water Suppression Systems (AWSS) in potentially all premises for:

- The protection of life.
- To protect property, heritage and the environment.
- To sustain business continuity.

I would like to acknowledge the individuals who have produced this guidance, and thank those fire and rescue authorities that supported the work. It is my desire that those people listed below; along with those reading this guidance will form a network, which will support the application of AWSS within our society. Therefore those people listed below are encouraging contact with them to discuss, support and share relevant issues.

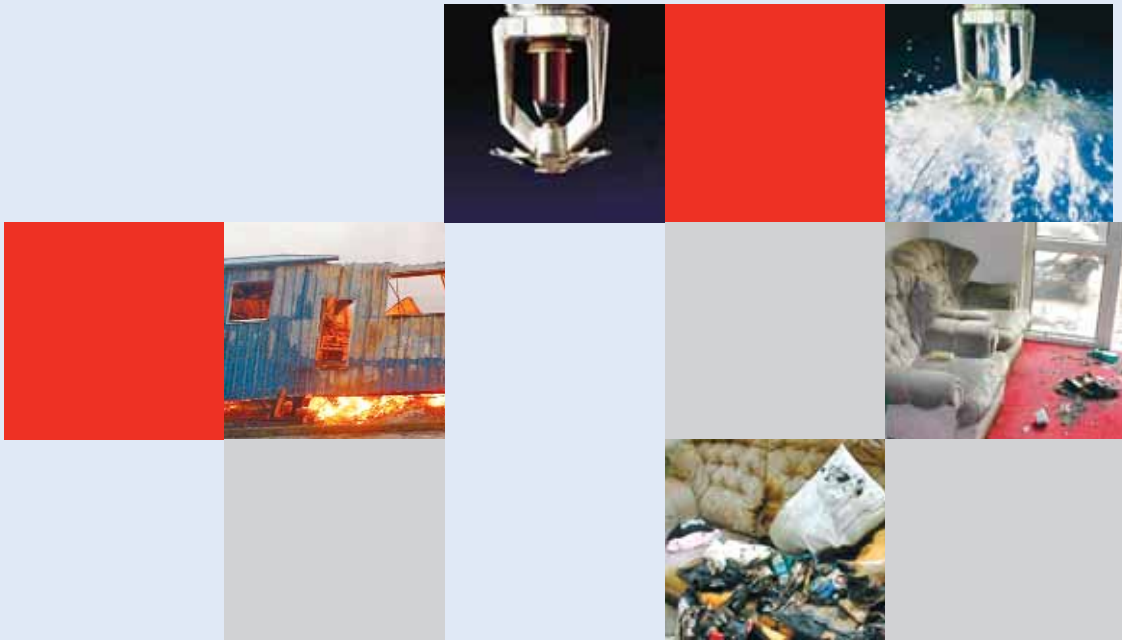
Gerry Campbell	*Dumfries and Galloway Fire Brigade*
Andy Cloke	*South Yorkshire Fire and Rescue Service*
Gary Fredericks	*London Fire Brigade*
Steve Hamm	*Hampshire Fire and Rescue Service*
Paul Hardy	*Hertfordshire Fire and Rescue Service*
Peter Howard	*Cheshire Fire and Rescue Service*
Gareth Lloyd	*South Wales Fire and Rescue Service*
James Marsden	*Greater Manchester Fire and Rescue Service*
Steve Mills	*West Midlands Fire and Rescue Service*
Ali Moseley	*Suffolk Fire and Rescue Service*
David Penman	*Strathclyde Fire and Rescue Service*
Peter Reading	*Cheshire Fire and Rescue Service*
Duncan Stainthorpe	*West Yorkshire Fire and Rescue Service*
John Streets	*Fire Service College*
Steve Wain	*Oxfordshire Fire and Rescue Service*
Peter Wignall	*Nottinghamshire Fire and Rescue Service*

THIS DOCUMENT DETAILS THE CFOA POLICY FOR AWSS AND GIVES RECOMMENDATIONS AND GUIDANCE TO FIRE AND RESCUE SERVICES IN THE UK, TO ENABLE THEM TO OFFER ADVICE ON AWSS APPLICATIONS. THE GUIDANCE CONTAINED RELATES TO ALL TYPES OF PREMISES, REGARDLESS OF THEIR USE, AND SEEKS TO ACHIEVE A CONSISTENT APPROACH TO THE PRACTICAL USE OF THESE TYPES OF SYSTEM

The latest official figures estimate that the total cost of fire to the country was £7.03bn, with the average cost of a domestic fire put at £34,000 and for a commercial premises fire £147500[1]. The threat of a fire occurring within a building in the United Kingdom is still regarded as an event that is not likely to happen to most people whether they are part of a large commercial concern, local authority building or single private dwelling. However the consequences of one fire event can be devastating.

For local authority buildings that are often the target for arsonists the financial loss for the community is often compounded by the loss of civic amenities this directly affects community cohesion especially when it is a school that is the target.

Each year more than 1500 schools (1512 in 2004[2] table 18) in the United Kingdom have a fire large enough to be attended by the fire and rescue services. These fires directly impact on the education needs of nation and the average cost of each school fire in 2004 was £33,3001 table A1) with costs increasing at a rate of over £5000 for each fire per year. Figures from a leading insurance company also indicate school losses still increasing (£75m in 2003, £84m in 2004). The additional traumatic effects of lost course work are said to disrupt the education of over 50,000 children every year



[1]The Economic cost of Fire estimates for 2004 published by ODPM
[2]Fire Statistics United Kingdom 2004 published by ODPM

THE COST BENEFITS OF FITTING AUTOMATIC FIRE SUPPRESSION SYSTEMS

- Reduced fire costs to society
- Reduced property damage and disruption due to fire damage
- Installation costs offset by reduction in other areas of fire safety provision.
- Alternative approach for building design to meet the functional requirements of building regulations

REDUCED FIRE COSTS TO SOCIETY

Approximately 400 (395 in 2004[1]) people lose their lives each year due to fire in the UK, tragically this also occasionally includes fire fighters, each of these losses will have an individual human story behind it, but it will also be at a cost to the general society.

A reduction in fire casualties will result in lower costs to the National Health Service, reduction of lost output in industry from time off work (if of working age), and although difficult to quantify a reduction in the emotional and physical suffering of the victim, their friends and family members (human cost).

Average value of prevention per casualty by severity and element of cost

2003				£ June 2003
Injury severity	Lost output	Medical and ambulance	Human costs	Total
Fatal	451,110	770	860,380	1,312,260
Serious	17,380	10,530	119,550	147,460
Slight	1,840	780	8,750	11,370
Average all casualties	9,060	1,910	31,880	42,850

This table is taken from Department of Transport document 'Highways Economics Note No 1[3]

The values in the table above are those used to give the value society places in preventing the incident occurring, this includes fire casualties and is therefore used by the ODPM.1 If these figures are collated for 2003 total figures for deaths and injuries relating to fire are:

Deaths by fire (593)	£778.2m
Serious injuries (3,302)	£486.9m
Slight Injuries (9,875)	£112.3m

REDUCED PROPERTY DAMAGE AND DISRUPTION DUE TO FIRE DAMAGE

In private companies it is estimated that 60% of businesses that suffer a fire never recover and eventually go out of business. If a company ceases trading jobs are lost, the local area suffers commercial disruption due to the economic loss within that community and ultimately families may break up due to the strain placed upon them.

Disruption of services provided, such as information systems or physical public services, either for a short time or over a longer period can cause immeasurable frustration and inconvenience for both the supplier and the user. Examples would be fires that have occurred in telecommunications installations, bus depots, libraries and local council offices.

Increasingly of concern when a fire occurs is the impact on the environment from both the fire and the fire-fighting action with toxic products entering the atmosphere, land and watercourses.

Containing a fire or even extinguishing it by installing an AWSS can radically reduce all of these catastrophic effects

[3]*Department of Transport document "Highways Economic Note No. 1 2003 – Valuation of the benefits of prevention of road accidents and casualties" published in December 2004*

INSTALLATION COSTS OFFSET BY REDUCTION IN OTHER AREAS OF FIRE SAFETY PROVISION.

One reason commonly encountered at many pre-submission stage meetings for new buildings is that the cost of installing an AWSS is prohibited by cost. In the past this may have been the case but not anymore. New building materials, production methods and off site construction have dramatically reduced the cost of installing AWSS. Along with the relaxation of more traditional methods of providing a fire safety regime costs can be reduced to as little as 1% of the total cost.

Lancashire Fire and Rescue Service report that Devonshire Primary School Blackpool, (replacing one burnt down in September 2003) an exemplar designed school was fitted with automatic sprinklers at a cost of £73,000 (July 2005) including an above ground tank. The total project cost is projected to be £7m.

Details of design freedoms for specific projects are provided elsewhere in this document but significant savings on traditional fire safety requirements and then ongoing maintenance and even staff fire training costs will in most cases offset the cost of installing AWSS

Fitting these systems is an investment in the community; often with a reduction in associated insurance premiums the cost of installation can be recouped in around five years. One insurance company for schools offers a 75% discount off the fire insurance rate for an approved British Standards system.

It is now time for the client at pre-tender stage to include the requirement for AWSS.

ALTERNATIVE APPROACH FOR BUILDING DESIGN TO MEET THE FUNCTIONAL REQUIREMENTS OF BUILDING REGULATIONS

A further significant advantage to the installation of AWSS is to give more freedom to designers and building users in meeting the functional requirements of the Building Regulations. They can now move away from buildings that do not conform to specific codes such as Approved Document B of the Building Regulations (ADB), or The Scottish Building Standards Technical Handbooks, allowing innovative use of new and refurbished buildings and also the possibility of positioning buildings that do not give adequate access for the fire service (B5 compliance of ADB).

CONTROL OF FIRES USING AWSS

Although the figures given below relate to statistics for sprinklers within Europe over a ten-year period, the advantages of all water suppression systems is likely to give similar benefits.

In buildings fully protected by sprinklers:

- Sprinklers alone controlled 99% of fires
- 93% of fires are controlled within the design area of operation
- The spray from no more than 4 sprinklers controlled 60% of fires

Remember that suppression systems react quickly to fire, the speed of operation not only reduces actual fire damage, but both smoke, (toxicity) and water damage are reduced with the often-additional benefit of summoning assistance by raising an alarm.

Why should you install a water suppression system to a new building project?

In the example below this fire started on the settee in the lounge of a flat and was controlled when the automatic fire suppression system activated. Damage was limited mainly to the room of origin. The occupant of the flat was found sitting on the chair adjacent to the window in the same room as the settee when the fire service arrived. Compare the pictures below of a domestic fire – controlled by an Automatic Water Suppression System with the earlier pictures of a house devastated by fire.

The fitting of this system within the property probably saved the life of the occupier and certainly prevented a more severe fire developing to affect the rest of this dwelling and others within the flat complex. Additional expenditure associated with temporary accommodation and re-housing was also eliminated.

Residential suppression systems are now being installed for around £1000 in new build three bedroom semi-detached properties.

Although generally of a smaller economic loss fire in the home is of devastating proportion to the occupier and sadly results in approximately 300 preventable fire deaths each year. This photograph shows the unobtrusive nature of a modern AWSS installed in a dwelling house. Changing standards accompanied by technological advances should lead to even better designs with all heads been fully recessed into ceilings.

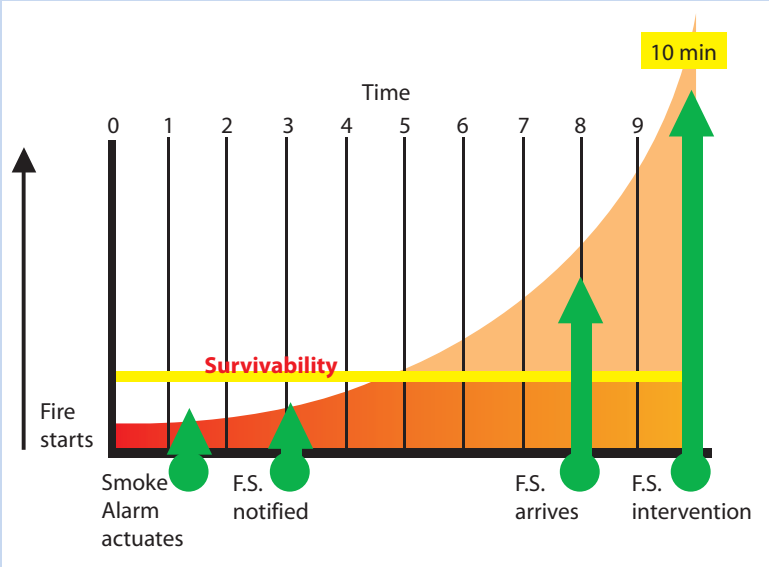


Fig.1 Uncontrolled fire growth

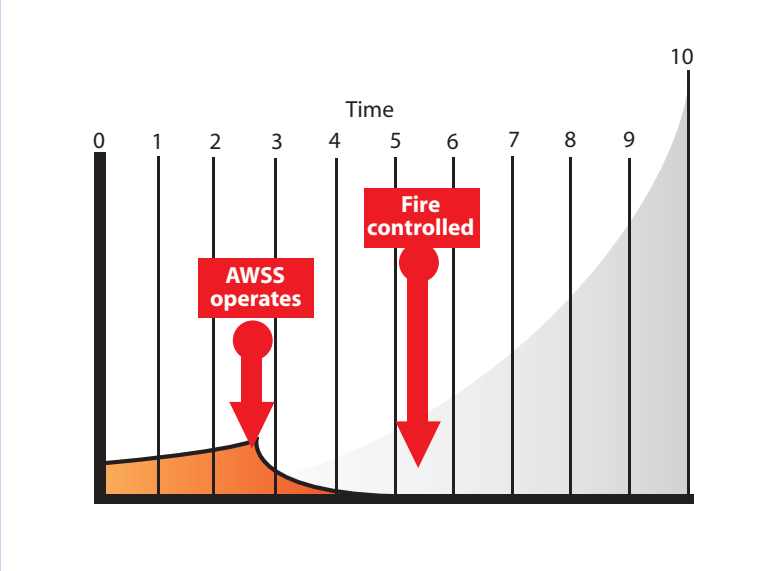


Fig.2 Controlled fire growth using AWSS

The diagrams illustrate two scenarios with either a sprinkler controlled or free burning fire. The fire growth rates are shown and overlaid with a graph depicting the time intervals that make up the fire service emergency response to the situation.

The emergency response has various components including time to detection, time to alarm, the subsequent call handling and mobilisation times, there is also the variable of travel time together with the time taken to commence effective fire fighting operations – this includes the dynamic risk assessment, deployment of physical resources and a factor of safety. Each of these time steps has been assessed to be representative of typical situation and therefore contains some assumptions, however the ability to include significantly longer time steps for the large variable of fire and rescue travel time is clearly illustrated, as is the timescale available to safely risk assess the developing fire situation, deploy resources and put in place a tactical operational plan.

There is therefore a clear benefit from the provision of AWSS protection in this scenario for both travel and response times and the safe deployment of operational resources. It should be emphasised that the benefit of increased scope for attendance times by the fire service should be viewed as an opportunity to amass the necessary resources to mount an effective fire attack, in many cases for example this would require two fire attack teams each requiring breathing apparatus and main jets. In this case the additional attendance time available is in respect of make up appliances responding to a request for more resources from the initial attendance.

The prime advantage from a response perspective is the larger time span available to ensure that all possible safety considerations have been taken, in terms of amassing the resources required prior to entering a risk area, but also in the formation of a sound tactical plan that includes a factor of safety.

In contrast the unsprinklered fire development shows that there is a significant danger of the flashover phase of the fire development coinciding with the need for deployment of fire service personnel into the risk area. The safety of fire fighters is therefore clearly enhanced to a significant degree by the provision of sprinklers, and the opportunity for a successful fire attack operation is also enhanced to a similar degree.

FACTS AND INFORMATION ABOUT AUTOMATIC WATER SUPPRESSION SYSTEMS (AWSS)

- Automatic Water Suppression Systems (AWSS) were first devised in the mid-19th century. Modern systems protect life, property and the environment from the effects of fire, heat and smoke. More than 70 million sprinkler heads are fitted every year across the globe.
- Modern fast response AWSS designs have a proven track record of saving lives should a fire occur, especially in the home environment. They increase survivability by controlling fire, reducing heat and toxic smoke output.
- AWSS systems are designed to contain or even extinguish a fire in its early stages and so dramatically reduce fire damage. Data from the USA 2 suggests a 90% reduction in damage caused by fire compared to a non-sprinklered building.
- AWSS can be effectively employed as part of a holistic fire safety strategy in order to enhance life safety, building sustainability and business continuity.
- AWSS enhance fire-fighter safety by preventing flashover and back-draught situations through early intervention, fire suppression and temperature reduction.
- Because AWSS are extremely effective in controlling fire size with minimal water, they help to protect the environment by reducing the smoke plume fallout and contaminated water run off from a fire.
- AWSS are becoming more popular for the protection of heritage property from the effects of fire. A disastrous fire at the National Motorcycle Museum (now fitted with sprinklers) is reported to have cost over £20 million. Fires at Windsor Castle and Hampton Court are just two examples where water suppression systems could have saved life and reduced fire damage.
- AWSS systems are not activated by smoke. There has to be a real fire situation for them to operate.
- Each ‘sprinkler’ head is a stand alone, heat sensitive device, and is individually activated by the heat from a fire. THEY DO NOT all go off at once, contrary to that portrayed in movies and TV adverts.
- Most fires in commercial premises are controlled by four heads or less, whilst for residential premises a maximum of two heads only usually operate.
- AWSS systems are not prone to accidental operation. A typical head will activate at 68° Celsius, over 30°C above most ambient room temperatures. The chance of activation due to faulty apparatus is 1 in 16 million.
- A ‘sprinkler’ head typically issues one tenth of the water of that used in Fire Service operations.
- When a fire activates an AWSS system, an alert can be automatically relayed to a control centre. The Fire Service response will be more effective and efficient because, unlike automatic smoke detection, AWSS are not prone to false alarm signals.
- A correctly designed, installed and maintained system will provide years of service. Some systems installed in the early part of the 20th Century are still providing fire protection today!
- The most cost effective time to install an AWSS system is when undertaking building work or refurbishments. Currently (2005), typical installation costs on average about 2% of total build costs when building a new property. The system is best installed during the first fix of plumbing or electrical systems.
- In certain circumstances, the use of concealed heads can provide effective, aesthetic and vandal resistant fire protection. The fitting of AWSS may also afford the opportunity to employ greater design flexibility in certain premises.
- When considering AWSS, always use a qualified and competent installer and obtain ‘like for like’ system quotes. A number of ‘third party accreditation’ schemes are in operation in the UK.
- The Loss Prevention Council, in their Technical Briefing Note 14 of May 1999 state: -
- “The conditions normally found within fire-fighting systems are not thought able to support the growth of populations of Legionella”.

Fire and Rescue Personnel should refer to the Fire Service Manual Volume 3 Fire Safety Fire Protection of Buildings for more detail on this subject, and must refer to the appropriate technical documents when evaluating specific schemes submitted for comments involving AWSS.

The Fire Service Manual describes Fire Extinguishing systems at Section 1, and in the subsequent sections goes on to describe Fire Warning and Detection Systems, and Smoke Control and fire venting systems.

Any AWSS should be designed to work in conjunction with other fire safety arrangements in a premises or building to achieve the objectives identified by the fire strategy.

COMMERCIAL AND INDUSTRIAL PREMISES

Automatic Fire Sprinklers are normally specified to deal with commercial and industrial risk and can be designed to meet specific needs such as high bay warehouse storage or aircraft maintenance and assembly areas or to provide enhanced fire safety arrangements to improve asset protection and business continuity. Sprinkler systems are designed in accordance with British Standard 5306: Part 2 and/or LPC Rules for Automatic Sprinkler Installations incorporating BS EN12845: 2003.

Such systems include a range of specifications to deal with different hazards described as Risk Categories

LIGHT HAZARD

Generally smaller non-industrial type premises such as certain parts of office premises where the volume and flammability of contents is low

ORDINARY HAZARD

Commercial and industrial premises involving risks which are unlikely to burn intensely in the early stages of a fire

- Ordinary Hazard: Group I
  Breweries, libraries dairies and restaurants
- Ordinary Hazard: Group II
  Engineering works, garages, medium sized retail shops
- Ordinary Hazard: Group III
  Soap factories, sugar refineries, aircraft factories
- Ordinary Hazard: Group IIIS
  Film and television studios, cotton mills, match factories

HIGH HAZARD

Commercial and industrial occupancies having above normal fire loads divided into further sub-categories

- Category I
  Process high hazards
- Category II
  High piled storage hazards
- Category III
  Potable spirit storage hazards
- Category IV
  Oil and flammable liquids hazards

The classes of systems each have individual design densities for the delivery of water onto a fire and the maximum design area of operation, thus it is essential to match the class of system with the actual risk to ensure the AWSS will efficiently deal with any outbreak of fire.

Whilst sprinklers were originally installed to protect property they are increasingly being used as part of life safety systems. In such cases additional provisions are required to enhance the reliability and availability of the system. Where these additional recommendations are not included it is essential that suitable and sufficient management procedures are operated including for example the temporary closure of premises to allow maintenance to take place.

Automatic Sprinkler Systems can be constructed in a variety of ways to meet specific needs of premises including

- Wet Pipe Systems
- Dry Pipe
- Alternate (combination of wet and dry pipe)
- Life Safety
- Pre-action
- Recycling
- Deluge

It is not the purpose of this document to reproduce information that is available elsewhere but to draw the attention of readers to the different types, which are fully described elsewhere.

RESIDENTIAL AND DOMESTIC SYSTEMS

These types of system are designed to meet the specific needs of dwellings and some other residential uses such as group homes for the elderly, and are both described in British Standard BS 9251: 2005. Whilst these systems are not as complex as the commercial versions they will significantly improve the chances of occupiers surviving a fire and reduce the associated fire losses.

FIRE SERVICE INLETS

Wherever possible, it should be considered best practice for all sprinkler systems to be provided with a fire brigade inlet to permit the brigade to supplement the system's water supply. This provision should be considered essential in buildings such as school premises, and any larger premises that may be subjected to an arson attack. In these conditions it is reasonable to assume that a multi-seated fire may result. The effect of this would be that a larger number of sprinkler heads may be actuated than the system was designed effectively supply, with the consequence that insufficient water will be available to each head to be effective.

To combat this, a fire service inlet would allow the fire service to pump water into the system and augment the supply. Consultation with the Water Authority should take place as to the location and type of equipment to be provided as some water companies may require additional back flow prevention devices in respect of sprinkler systems with direct service main connections. The inlets should be clearly labelled or signed as such on the exterior of the installation, and the maximum pressure, which can be delivered to the system, should be clearly and permanently indicated directly above the inlet.

SPECIAL APPLICATIONS

Drenchers

A sprinkler system protects a building from the inside, drenchers placed on roofs and over any external openings such as windows loopholes and doors protect the building from fire in neighbouring properties. They may also be used internally such as to protect the fire curtain in theatre premises.

Water-spray projector system

There are two basic systems in this category, high velocity system used to extinguish fires and medium velocity systems to provide a cooling function.

Water mist systems

These were originally designed for marine application however work is being undertaken to develop a standard for a water mist system to use in terrestrial applications. Water mist systems generate a water spray pattern of finely divided droplets from a very small water supply. Water mist systems extinguish fire by a combination of cooling, oxygen displacement and radiant heat blocking.

Foam installations

The use of foam is well known to Fire and Rescue Personnel but this can also be used as part of a fixed installation to protect specific risks. Foam installations may use high expansion foam or low expansion foam depending on the most appropriate medium to deal with the fire risk being protected.

Fire fighting techniques and knowledge management

Risk management databases will hold information on buildings protected with fire sprinklers, as the presence of such systems will impact on the selected fire fighting tactics adopted in any given situation.

ALTERNATIVE DESIGN STRATEGIES

This section of the document provides practical guidance to fire officers (and other interested parties) on the use of AWSS. It details applications and design freedoms for consideration (otherwise referred to as design variations, trade-ups, or trade-offs) made possible by the fitting of AWSS. The purpose of this section is to detail common design freedoms and to make comment on their suitability and areas for consideration. This guidance should assist fire officers and promote consistency at a national level.

The guidance contained in this section is not a replacement or alternative technical specification or design guide. It should be used in conjunction with the various national guides, Scottish Technical Handbooks and Approved Documents. As AWSS is a dynamic and fast moving sector of fire protection, it is important to take account of any recent developments such as research, ODPM guidance / determinations etc. *The various technical standards, codes and guides that have been considered for this publication are listed at the end of this section.*

Where necessary, the relevant enforcing authorities (Building Control Bodies under the Building Regulations) and water authority must be consulted at the earliest stage to approve the installation of any AWSS.

DESIGN PROCESS

At the design stage the enforcing authority should determine the necessary standard of fire safety taking into account the nature and number of occupants, the nature of the building structure, the use of the building, the processes undertaken and/or the materials stored in the building; the potential sources of fire; the potential of fire spread through the building; and the standard of fire safety management proposed. Where it is not possible to identify with any certainty any of these elements a judgement as to the likely level of provision must be made.

Consideration should be given to technical standards, guidance documents and other associated standards, Scottish Technical Handbooks and Approved Documents.

The risk-based assessment should take account of the enhanced fire safety benefits offered by an AWSS. The provision of such a system may allow the enforcing authority (usually the building control body) to vary or depart from prescriptive codes and guidance where adherence is seen as unduly restrictive.

Factors that should be taken into account at the design stage include:

- The anticipated probability of a fire occurring;
- The anticipated fire severity;
- The ability of a structure to resist the spread of fire and smoke; and
- The consequential danger to people in and around the building.

A wide variety of measures could be considered and incorporated to a greater or lesser extent, as appropriate to the circumstances. These include:

- The adequacy of means to prevent fire;
- Early fire warning by automatic detection and warning system;
- The standard of means of escape;
- Provision of smoke control;
- Control of the rate of fire growth;
- The adequacy of the structure to resist the effects of a fire;
- The degree of fire containment;
- Fire separation between buildings or parts of buildings;
- The standard of active measures for fire extinguishment or control;
- Facilities to assist the fire service;
- Availability of powers to require staff training in fire safety and fire routines;
- Consideration of the availability of any continuing control under other legislation that could ensure continued maintenance of such systems; and
- Management.

Reasons for installing AWSS

There are numerous reasons for installing AWSS in all premises. Whilst commercial (non-dwelling) applications are well known, residential systems are a relatively new concept in the UK. A national survey conducted by CFOA[4] for the ODPM funded BRE research project[5] has indicated the following areas of application for residential AWSS (listed in order of frequency):

- 30% for Building Regulations compensatory feature for means of escape. These include open plan, gallery floor, loft conversion, extended travel distances, single stair condition etc.
- 22% for HMO alternative approach to prescriptive passive fire safety measures.
- 20% Local Authority policy. These include council policy, national policy (Welsh Assembly) pilot projects, social housing etc.
- 14% for protection of ‘at risk’ groups. These include ‘fire setters’, disabled etc.
- 9% for Building Regulations compensatory feature for fire service access/facilities.
- 3% choice of developer/housing association for example as a safety feature
- 2% in order to satisfy Building Regulations by providing a compensatory feature in lieu of compartmentation restrictions.

The Scottish Building Standards Technical Handbook (Non Domestic) includes a mandatory functional standard 2.15 stating “Every building must be designed and constructed in such a way that, in event of an outbreak of fire within the building, fire and smoke will be inhibited from spreading throughout the building by the operation of an automatic life safety fire suppression system.

This standard applies only to a building which:

- Is an enclosed shopping centre;
- Is a residential care building;
- Is a high rise domestic building; or
- Forms the whole or part of a sheltered housing complex

[3]*Chief Fire Officer’s Association Residential Sprinkler Installation Survey for BRE Research Project, July 2003, Paul Hardy, Herts. F&R.*
[5]*Effectiveness of sprinklers in residential premises, Report No. 204505, February 2004, Dr Corinne Williams, BRE.*

Design Freedoms

Approval from the relevant enforcing authority (usually the Building Control Body) must be sought where there are any variations from codes/guides or where design freedoms are requested due to the fitting of an AWSS. Where an AWSS is proposed as a compensatory feature this should be robustly justified to ensure an equivalent (or higher) level of protection can be achieved when compared with the traditional code based approach.

Where design freedoms are submitted for approval, the enforcing authorities would expect:

- An adequate and comprehensive fire risk assessment to have been carried out.
- An assessment made to determine that the use of an AWSS as a compensatory feature does not worsen the fire safety provision (when compared with a traditional code based approach).
- The AWSS is designed, installed and maintained to an appropriate standard recognised by the enforcing authority.
- The functional requirements of the Building Regulations, Fire Regulations and other relevant regulations are deemed to have been met by the authorities having jurisdiction.

Where the above criteria are followed design freedoms may be deemed appropriate and receive the necessary approval from the enforcing authority. Detailed below are some common applications fire officers are asked to comment upon with regard to design freedoms or compensatory features utilising AWSS. This list is not exhaustive, as there are numerous scenarios and permutations.

For ease of reference, design freedoms are detailed in two parts; Part 1; those relating to Buildings Other than Dwellings (industrial, commercial and certain residential premises), and Part 2; those relating to Dwellings (primarily residential dwellings and apartments). These two parts correlate with The Scottish Building Standards Technical Handbooks (Domestic) and (Non Domestic), together with the two ADB consultation documents[6].

Where buildings are put to mixed use, careful consideration should be given to ensure the appropriate design criteria is applied to the whole building.

Part 1: Buildings other than dwellings

This section covers those occupancies detailed within the Approved Document B, Volume 2 (Buildings Other Than Dwellings) consultation document. These occupancies cover Purpose Groups 2-7, i.e. office, shop and commercial, assembly and recreation, industrial, storage and some residential (other than dwellings). The Scottish Building Standards Technical Handbook (Non Domestic) includes a mandatory functional standard 2.15 stating “Every building must be designed and constructed in such a way that, in event of an outbreak of fire within the building, fire and smoke will be inhibited from spreading throughout the building by the operation of an automatic life safety fire suppression system.

This standard applies only to a building which:

- Is an enclosed shopping centre;
- Is a residential care building;
- Is a high rise domestic building; or
- Forms the whole or part of a sheltered housing complex

[6]*The proposed new edition of Approved Document B: Fire safety, Volume 1 (Dwellings), ODPM, July 2005.*
The proposed new edition of Approved Document B: Fire safety, Volume 2 (Buildings Other Than Dwellings), ODPM, July 2005.

Note 1: AWSS maintenance and reliability: When design freedoms are put forward for occupancies covered by this section, fire officers may wish to take account of their ongoing enforcement powers under fire regulations. This could ensure that adequate levels of maintenance are undertaken to ensure system reliability is not compromised. This would be particularly important where AWSS are heavily relied upon for life safety (occupant and fire fighter safety). These enforcement powers are not extended to every occupancy group such as non-workplaces.

Note 2: Additional life safety requirements: Where sprinkler systems are installed for compliance with building and/or fire regulations, the building should be fitted throughout with an automatic sprinkler system meeting the relevant recommendations of BS 5306-2 or BS EN 12845, i.e. the relevant occupancy rating together with the additional requirements for life safety. (See Appendix 1)

Listed below are common design freedoms or applications in buildings other than dwellings:

(It must be stressed that not all AWSS systems will be appropriate to allow all types of design freedom. For example, a 10-minute duration domestic sprinkler system may not be considered appropriate to relax a requirement for 30 minutes fire resistant structure requirement)

Shopping complexes and buildings containing one or more atria: These will usually require sprinkler protection and reference is made to the relevant British Standards covering these premises. The Scottish Building Standards Technical Handbook contains a mandatory standard 2.15 for automatic life safety fire suppression systems to be fitted within enclosed shopping centres.

Residential care homes: Possible future Building Regulations requirement to sprinkler protect all care homes, or only new-build care homes (to BS 9251 and BS DD 252). Sprinklers may also be required for progressive horizontal evacuation strategies. The Scottish Building Standards Technical Handbook contains a mandatory standard 2.15 for automatic life safety fire suppression systems to be fitted within residential care buildings and to buildings that may form the whole or part of a sheltered housing complex.

Compartmentation: Single storey shops limited to 2000mÇ compartment area without sprinklers and unlimited area with sprinkler protection. Larger compartment sizes allowed for in other Purpose Groups where sprinkler protection is provided (no change to previous guidance). There may be possible future Building Regulations requirement to limit the size of single storey storage buildings without sprinklers and unlimited compartment volume with sprinklers.

Boundary distances and unprotected areas: The installation of a sprinkler system permits boundary distances to be half that for an otherwise similar, but unsprinklered building, subject to they're being a minimum distance of 1m. Alternatively, the amount of unprotected area may be doubled if the boundary distance is maintained.

Fire fighting shafts: Where fire fighting shafts are required (i.e. buildings with a floor level over 18m), fewer shafts are required where sprinklers are installed.

Consideration could be given to allow greater distances from fire main outlets if sprinklers protect the building.

Venting of heat and smoke from basements: Mechanical extraction can be used as an alternative to natural venting where sprinkler protection is provided.

Periods of fire resistance: Reductions in the minimum periods of fire resistance for the elements of structure where sprinkler protection is provided.

Glazing: Consideration could be given to use non-fire resisting glazing in fire-resisting walls if an AWSS is fitted to protect the glass.

Compartmentation between different Purpose Groups. Authorities having jurisdiction may give consideration to reduce the level of fire resistance between different Purpose Groups providing the whole building is protected by an AWSS.

Travel distances: Authorities having jurisdiction may give consideration to allowing increased travel distances. The provision of a correctly specified, designed and installed AWSS will significantly reduce the risk of a fire developing and spreading beyond the room of origin. This reduced risk to occupants, allows the potential for greater evacuation times. Therefore, there is scope to introduce increased flexibility in travel distances. Special care would be required in situations involving single direction escape scenarios and single stair conditions.

Open plan designs and protected stairway enclosures: Sprinkler systems are sometimes suggested as an alternative to a protected stair enclosure, thereby creating an open plan stairway forming part of the escape route. Although the origins of this concept appear to be from residential applications, the general principles, research and fire tests from residential AWSS's may be deemed to have relevance to non-dwelling situations. Risk ratings will usually be lower for non-residential applications, but toxicity and tenability levels will remain a critical factor. Such designs should be treated with extreme caution, as staircases should be enclosed. A full Fire Safety Engineered submission may be necessary to validate any such design. *Please refer to Part 2, for more information.*

Door standards: Authorities having jurisdiction may, in some situations, give consideration to relaxing the requirement for fire resisting doors (i.e. allowing a non-rated fire door to be fitted in situations where a fire door would normally be required). BRE research[7] highlighted the importance of fire separation afforded by doors and walls in maintaining escape routes clear of smoke. Therefore, it may be acceptable to relax the need for fire resisting doors in certain areas. However, doors and associated partitioning should remain in place, where necessary, and be such that they are of suitable construction and integrity to enable escape routes to be safely used during the evacuation period.

Intumescent/smoke seals and self-closing devices on doors: Where doors would normally be required to be fire-resisting it may be acceptable to relax the need for Intumescent seals on such doors as research has demonstrated that AWSS limit room temperatures below that required to activate these seals. Smoke seals and self-closing devices should be fitted where there is a requirement to do so.

[7] *Effectiveness of sprinklers in residential premises, Report No. 204505, February 2004, Dr Corinne Williams, BRE.*

Fire Alarm and Automatic Fire Detection Systems: There should be no relaxation in this area as AWSS activate via heat sensing elements, and do not respond to smoke (the most harmful product of combustion). There are however, a few variations that could be considered. As AWSS operate by an effective heat sensing element, it will not usually be necessary to duplicate this with a fire alarm heat detector where these are provided, in areas such as in kitchens, boiler rooms, etc (smoke detectors are not usually recommended in these areas as they are likely to generate high incidence of false alarms).

It will usually be appropriate to inter-link the AWSS with the fire alarm system particularly on larger buildings and those deemed of higher fire risk.

Fire fighting equipment: Authorities having jurisdiction may give consideration to relaxing or reducing the provision of fire fighting equipment subject to the findings of the fire risk assessment. Consideration could be given to occupancy profile, fire/evacuation strategy and AWSS operating characteristics.

Access and facilities for the Fire Service: Buildings fitted with AWSS have a greatly reduced likelihood of a serious fire and the occupants (and fire fighters) are at a much lower risk from fire. Therefore, the local fire and rescue service (FRS), taking account of their operational tactics/response (in association with their Integrated Risk Management Plan) and following a comprehensive risk assessment may offer relaxations in this area. It should be noted that although the Building Control Body are the enforcing authority for the building regulations requirement (B5), consultation and agreement from the local FRS is vital (for all buildings regardless of Purpose Group) as it is only the local fire and rescue service that has the necessary knowledge with regard to its operational tactics and response. Some areas where the FRS may consider relaxations are:

- Vehicle access for fire appliances: certain situations may allow the FRS to relax the requirement for fire appliance access to within 45m of every point on the projected plan. However, it is still necessary to carry equipment, casualties etc therefore careful consideration must be given to the extent of the relaxation .
- The provision of fire mains within the building (see fire fighting shafts above).
- The provision of adequate water supplies: consideration to increase hydrant spacing for buildings not provided with fire mains. Buildings with fire mains should have the required or enhanced hydrant spacing to facilitate fire service operations (fire appliance tank requires supplementing from hydrant prior to commencing fire fighting operations due to large volume of water required to fill fire main and hose).
- Where no piped water supply is available, or there is insufficient pressure and flow in the water main an alternative source of supply is required. The FRS may allow a lower capacity of that recommended.

Fire service attendance times: The local FRS may adopt a more flexible approach in their attendance times detailed within their Integrated Risk Management Plan where entire areas/communities are fully protected by suitable AWSS's. Consideration would focus on AWSS design, installation, and the robustness and management of ongoing maintenance to ensure effectiveness and reliability of the installations.

Part 2: Dwellings

This section covers those occupancies detailed within the Approved Document B, Volume 1 (Dwellings) consultation document. These occupancies being 'residential' (Purpose Group 1) which include dwelling house, apartments, and HMOs or registered group homes of up to six residents.

The Scottish Building Standards Technical Handbook (Non Domestic) includes a mandatory functional standard 2.15 stating "Every building must be designed and constructed in such a way that, in event of an outbreak of fire within the building, fire and smoke will be inhibited from spreading throughout the building by the operation of an automatic life safety fire suppression system.

Including:

- A residential care building;
- A high rise domestic building; or
- Any building that forms the whole or part of a sheltered housing complex

Note: When design freedoms are put forward for occupancies covered by this section, it is important to take account of possible reliability issues affecting AWSS due to maintenance shortfalls. A number of the occupancies covered by this section (e.g. private dwellings) have no ongoing legislative or enforcement control. Difficulties can therefore arise in ensuring that these active systems are maintained to an appropriate standard, thus ensuring they operate effectively when needed. Therefore caution should be exercised, especially in the departure from traditional designs that may have an effective and proven track record. There is a balance to be struck, and undue or total reliance on any one system should receive very careful consideration.

Listed below are common design freedoms or applications in dwellings:

(It must be stressed that not all AWSS systems will be appropriate to allow all types of design freedom. For example, a 10-minute duration domestic sprinkler system may not be considered appropriate to relax a requirement for 30 minutes fire resistant structure requirement)

Tall Apartment buildings: Possible future Building Regulations may require Apartment buildings above a specified height to be fitted throughout with an AWSS. CFOA believe the height threshold should be 11m to take account of fire fighting and external rescue capability. The Scottish Building Standards Technical Handbook contains a mandatory standard 2.15 for automatic life safety fire suppression systems to be fitted within high-rise domestic buildings

Multi-storey apartments: Consideration could be given to use AWSS and a protected stairway in lieu of alternative escape route in multi-storey apartments.

Houses of four or more storeys: Consideration could be given to use AWSS in lieu of alternative escape route in houses of typically four storeys and above.

Boundary distances and unprotected areas: Sprinkler system permits boundary distances to be half that for an otherwise similar, but unsprinklered building, subject to there being a minimum distance of 1m. Alternatively, the amount of unprotected area may be doubled if the boundary distance is maintained.

Fire fighting shafts: Where fire fighting shafts are required (i.e. buildings with a floor level over 18m), fewer shafts are required where sprinklers are installed. Consideration could be given to allow greater distances from fire main outlets if sprinklers protect the building.

Travel distances: Authorities having jurisdiction may give consideration to allowing increased travel distances. The provision of a correctly specified, designed and installed AWSS will significantly reduce the risk of a fire developing and spreading beyond the room of origin. This reduced risk to occupants, allows the potential for greater evacuation times. Therefore, there is scope to introduce increased flexibility in travel distances. Special care would be required in situations involving single direction escape scenarios and single stair conditions.

Open plan designs and protected stairway enclosures: HTM 88[8] , LGA sprinkler guide for domestic premises[9] together with some locally produced building control technical guides permit a residential sprinkler system as an alternative to a protected stair enclosure, thereby allowing an open plan stairway forming part of the escape route. This concept has also received support from a number of designers and fire consultants as it has formed the basis of applications submitted for building control approval (sometimes as a 'fire engineered solution').

A fundamental principle of fire safety and building regulations is that building occupants should not have to make their escape through smoke filled areas. Current guidance to the building regulations[10], proposed amendments[11] and the relevant British Standard[12] require dwelling houses of 3 storeys and above to be provided with a protected stairway. This effectively precludes the use of open plan staircase delivering into ground floor living room in a house exceeding two stories.

The residential sprinkler research conducted by BRE[13] does not bring into question the ODPM and BSI recommendations referred to above. The sprinkler controlled fire tests showed escape routes with higher levels of toxicity and, on occasions with untenable conditions in 'open lounge' layouts when compared with an enclosed stair configuration. The research project also highlighted the benefits of doors, even if they were partially or fully open, in achieving lower toxicity levels on escape routes when compared with an open stair design.

ODPM determinations and some technical journal articles also offer opinion on this subject, which is consistent with the BRE research findings.

AWSS have been proven to reduce smoke toxicity; however this reduction is not always sufficient to ensure tenable conditions are maintained on escape routes. When combined with protected routes, AWSS considerably enhance the protection given to the means of escape thereby allowing flexibility in travel distances/escape times.

Without further research, AWSS would not usually be an acceptable alternative to a protected stairway enclosure.

Periods of fire resistance: Since the provision of AWSS will effectively confine a fire to room of origin by controlling or extinguishing the fire, periods of fire resistance required to the elements of structure and escape routes could be reduced in certain circumstances. However, it should be ensured that where necessary, doors, floors, walls and partitions are of sound construction, integrity and maintained in good condition to enable escape routes to be safely used during the evacuation period. In certain situations, any glazing between habitable rooms and the stair enclosure (excluding glazing to a bathroom or WC) may still be required to be fire-resisting and retained by a suitable glazing system and beads compatible with the type of glass. Consideration should be given, where necessary, to under-stair cupboards used for storage as these may require protection by AWSS or be upgraded to a fire resisting standard.

[8]Fire precautions in housing providing NHS-supported living in the community, an update of health technical Memorandum 88, NHS Estates, 2001.
[9]LGA Guide.

[10]Approved Document B: Fire safety, ODPM, July 2002.
[11]The proposed new edition of Approved Document B: Fire safety, Volume 1 (Dwellings), ODPM, July 2005.
[12]BS 5588: Part 1, Code of practice for residential buildings, BSI, 1990.
[13]Effectiveness of sprinklers in residential premises, Report No. 204505, February 2004, Dr Corinne Williams, BRE.

Door standards: As detailed above, fire resistance required to doors protecting escape routes could be reduced in certain circumstances (i.e. allowing a non-rated fire door to be fitted in situations where a fire door would normally be fitted). The BRE residential sprinkler research project highlighted the importance of fire separation afforded by doors and walls in maintaining escape routes clear of smoke. Therefore, it may be acceptable to relax the need for fire resisting doors, but doors and associated partitioning should remain in place, where necessary, and be such that they are of suitable construction and integrity to enable escape routes to be safely used during the evacuation period.

Intumescent/smoke seals and self-closing devices on doors: Where doors would normally be required to be fire-resisting it may be acceptable to relax the need for Intumescent seals on such doors as research has demonstrated that AWSS limit room temperatures below that required to activate these seals. Smoke seals and self-closing devices should be fitted where there is a requirement to do so (note: ADB Volume 1 consultation document has suggested the removal of the requirement for self-closing devices in dwellings).

Fire Alarm and Automatic Fire Detection Systems: There should be no relaxation in this area as AWSS activate via heat sensing elements, and do not respond to smoke (the most harmful product of combustion). There are however, a few variations that could be considered. As AWSS operate by an effective heat sensing element, it may not be necessary to duplicate this with a fire alarm heat detector where these are normally deemed necessary such as in kitchens, boiler rooms, etc (smoke detectors are not usually recommended in these areas as they are likely to generate high incidence of false alarms).

Consideration should be given to inter-linking the AWSS with the fire alarm system particularly on larger buildings and those deemed of higher fire risk (note that although BS 9251[14] requires an internal audible sprinkler alarm, it does not specify audibility levels to the standard required by fire alarm systems). It follows from this that should the AWSS and the fire alarm system is inter-linked, the internal AWSS alarm could be omitted, as it is duplication. This would however, require very careful consideration in certain occupancies and where robust management could not be demonstrated. External AWSS alarms should remain.

Fire fighting equipment: In occupancies where portable fire extinguishers would normally be required, subject to a suitable fire risk assessment, consideration could be given to relaxing or reducing the provision of this requirement. Occupancy, fire/evacuation strategy and AWSS operating characteristics should be taken in to account. Provision of fire blankets (conforming to BSEN 1869) in bed-sits with cooking facilities and kitchen areas may still be deemed appropriate.

[14]*BS 9251: Sprinkler systems for residential and domestic occupancies. Code of Practice, BSI, 2005*

Access and facilities for the fire Service: Buildings fitted with AWSS have a greatly reduced likelihood of a serious fire and the occupants are at a much lower risk from fire. Therefore, the local fire and rescue service (FRS), taking account of their operational tactics/response (in association with their Integrated Risk Management Plan) and following a comprehensive risk assessment may offer relaxations in this area. It should be noted that although the Building Control Body are the enforcing authority for this building regulations requirement, consultation and agreement from the local FRS is vital (for all buildings regardless of purpose group) as it is only the fire and rescue service that has the necessary knowledge with regard to its operational tactics and response. Some areas where fire and rescue authorities may consider relaxations are:

- Vehicle access for fire appliances: certain situations may allow the FRS to relax the requirement for fire appliance access to within 45m of all points of dwelling houses and apartments. A number of FRS already allows a doubling of this figure in certain situations. However it is still necessary to carry equipment etc. to the incident, therefore careful consideration must be given to the extent of the relaxation.
- The provision of fire mains within the building (see fire fighting shafts above).
- The provision of adequate water supplies: consideration to increase hydrant spacing for buildings not provided with fire mains. Buildings with fire mains should have the required or enhanced hydrant spacing to facilitate fire service operations (fire appliance tank requires supplementing from hydrant prior to commencing fire fighting operations due to large volume of water required to fill fire main and hose).
- Where no piped water supply is available, or there is insufficient pressure and flow in the water main an alternative source of supply is required. The FRS may in certain circumstances allow a lower capacity of that recommended.

Fire service attendance times: The local FRS may adopt a more flexible approach in their attendance times detailed within their Integrated Risk Management Plan where entire areas/communities are fully protected by suitable AWSS's. Consideration would focus on AWSS design, installation, and the robustness and management of ongoing maintenance to ensure effectiveness and reliability of the installations.

The following case studies are presented as examples of where AWSS has been successfully used as part of a risk based solution to overcome a fire safety problem or to provide an enhanced level of fire protection. Each scenario sets out the context of the specific case and describes briefly the solution adopted, and if further information is required a contact number is provided.

These are not determinations such as those published by the ODPM in respect to Building Regulations and therefore cannot be used in the same way, however they do provide a starting point for considering the many different ways in which AWSS can be used and each scenario has been approved and is currently in use somewhere in the UK.

Each proposal to install AWSS must be considered on its own merits alone, and be subjected to a specific fire risk assessment to determine the best possible range of fire safety solutions for the situation, which can then be considered by the applicant and a final proposal submitted for approval.

In most cases AWSS will be a very effective solution as discussed elsewhere in this document, but this approach will need to be positively marketed by the Officer proposing its use, as while sprinkler technology is not itself new, and its fire safety benefits well known, the idea that it should be used more extensively is seen by many as simply a tool to drive down the annual cost of fire in the UK which is considered to be an issue for the Fire Authorities who they see as the sole beneficiaries of the use of AWSS in reducing service demand.

The benefits to the community, its people, its business and commercial enterprises, the UK economy, and both the built and natural environment, are of course equally important if not more so. Clearly fewer and less serious fires means potentially less fire fatalities and injuries, less disruption to business or service provision, less damage to the environment or the economy, and as explained earlier the business case for provision of sprinklers is sound, but as with all new ideas and changes to policy it needs Fire Officers to be actively promote it use.

The case studies that follow are not exhaustive but just some of the examples captured during the research carried out in support of the production of this policy guidance. It is acknowledged that each Officer will be able to and should wherever possible relate to the many local examples of where AWSS has been effective in delivering the best fire safety solution in a given set of circumstances; these should be used to promote the installation of AWSS wherever possible.

In order to keep the information current and up to date as possible it is planned to set up a site to hold further examples as they are identified, details of which will follow in due course.

DOMESTIC DWELLING

SAFETY FEATURE BY DEVELOPER

The application of a sprinkler system within residential dwelling houses as a safety feature by the developer

TYPE OF WATER SUPPRESSION SYSTEM

Residential sprinklers installed in accordance with DD251 (now BS 9251: 2005)

DESCRIPTION OF BUILDING

The building comprises of luxury flats in a building that comprises of three floors of which the top floor is within a Mansard type roof. The building is a typical type residential design in accordance with ADB. In this case the developer installed a sprinkler system as a selling point emphasising the safety features that sprinklers offer.

INSTALLATION DETAILS

A sprinkler system complying with DD251 was installed throughout the building including all common areas

DOMESTIC DWELLING

RESTRICTED ACCESS

The proposal required a Fire appliance to access 25 metres into the alleyway in order to fall in line with B5 access requirements. However, inspection of the site revealed that this proposal was not feasible due to the lack of space available which would restrict safe, effective, and efficient fireground operations. Effectively fire appliance access could not be provided within 80 metres of the front door of the nearest proposed new residence.

SFRS considered this proposal unacceptable without the provision of a domestic sprinkler system in each new build bungalow. The Local Authority Building Control Officer (LABCO) was initially unsure about using sprinklers as compensation for fully compliant B5 access arrangements. However, after some lengthy debate, and several weeks of correspondence, the LABCO agreed with the guidance offered by SFRS

All parties were ultimately happy as the developer was able to build the properties more or less as proposed, the LABCO and local planning officer were able to facilitate the local need for this type of housing, and SFRS are satisfied that the occupants of the new bungalows (who are likely to be elderly and at risk from fire) are safer than most people from a fire in their own homes despite the onerous access arrangements provided.

TYPE OF WATER SUPPRESSION SYSTEM

BS 9251 Domestic sprinkler system

DESCRIPTION OF BUILDING

Two bungalows built on land only accessible through an alleyway between terraced housing.

INSTALLATION DETAILS

The life safety benefits highlighted by recent BRE research into the effectiveness of residential sprinkler systems, damage limitation advantages, SFRS IRMP and local housing needs were all considered before all party agreement was reached regarding this proposal. Both bungalows were fitted with a domestic sprinkler system, supplied by the local water mains, complying with BS 9251. Rapid response residential sprinkler heads were used throughout using recessed housings for aesthetic reasons.

CONTACT DETAILS

Suffolk Fire and Rescue Service

DOMESTIC DWELLING

Provided as a Community Fire Safety/Multi Agency partnership initiative

Following a fire at the family home started by one of the adults suffering from long term alcohol related problems and now resorting to fire setting and self abuse, the only option left available to Social Services was to remove the adult from the family home to undergo treatment which would have been difficult for the children to cope with. The means of escape provisions whilst acceptable when originally built would not be acceptable by current standards. A proposal by the Fire and Rescue Service to install a domestic sprinkler system to deal with the potential for fire setting and at the same time to improve the existing fire safety arrangements in the dwelling was considered to be an innovative solution which was acceptable to the multi agency panel and the family, and following negotiations a domestic sprinkler system has been installed.

TYPE OF WATER SUPPRESSION SYSTEM

Domestic Sprinkler System

DESCRIPTION OF BUILDING

Three storey terraced single private dwelling; means of escape from the second floor is by a stair open to the first floor lounge through which you pass onwards into the kitchen and from there access the next flight of stairs to ground floor exiting the building from ground level direct to open air. The premises benefits from single point smoke alarms located at each level and these are fitted with ten year batteries

INSTALLATION DETAILS

System designed, installed and commissioned in accordance with BS: 9251

CONTACT DETAILS

Oxfordshire County Council Fire and Rescue Service

RESIDENTIAL CARE PREMISES

Compensatory feature for excessive travel distance

This building is now used as a residential care home having recently been converted from a Public House. Concerns from the Fire Authority included excessive dead ends in ground first floor sleeping corridor escape routes, and space limitation which physically restricted options to protect principal escape routes including the main escape

TYPE OF WATER SUPPRESSION SYSTEM

Residential Sprinkler system fitted partially in premises otherwise in accordance with DD251 (Now BS 9251: 2005)

DESCRIPTION OF BUILDING

Abbeyfields is now used as a residential care home. The building is very old with timber construction, comprises ground and first floor with a basement (approximately 35 m x 15 m) and provides 12 residential care bedrooms.

INSTALLATION DETAILS

The consultation was satisfied by providing a combination of traditional means of escape and fire precautions, and a partial Residential Sprinkler system conforming to DD 251 to provide a means of escape solution, which satisfied functional requirements and the Fire Authority. The sprinkler system was provided in a manner that effectively cut the building in half leaving a sprinklered half (where the problematic structural issues were present) and unsprinklered side where traditional measures were sufficient. Cut off sprinklers were provided on the unsprinklered (risk side) of all non-structural openings in the separating wall communicating with the sprinklered side. Recessed heads were provided in most other compartments on the sprinklered side including the basement, sidewall sprinklers suitably located on boundary walls as ceiling depth was insufficient to house the pipe work necessary for centrally located recessed heads. All heads were rapid response and provided in accordance with DD 251.

CONTACT DETAILS

Suffolk Fire and Rescue Service

HIGH RISE DWELLINGS

Compensatory feature for excessive travel distance

Increase in travel distance in a single staircase 23-storey residential development.

TYPE OF WATER SUPPRESSION SYSTEM

BS 5306 Part 2 sprinkler system

DESCRIPTION OF BUILDING

The building consists of residential apartments covering some 23 storeys, access to these floors are by means of a single staircase and lift for the residents coupled with a fire fighting shaft, riser and fire fighting lift. An extended travel distance has been proposed at 23m travel in one direction with smoke clearance in the corridor. A fire-engineered solution was considered to address equivalence to the 7.5m suggested by ADB, this equivalence has been achieved by the installation of smoke flushing and sprinklers installed within the building

INSTALLATION DETAILS

A relaxation of Building Regulations has been approved by the Local Building Control and the Fire Authority in respect to extending the travel distance in a residential corridor. As a result, all residential flats will be fitted with a sprinkler system in accordance with BS 5306 Part 2. At the present time the building is under construction

CONTACT DETAILS

Greater Manchester Fire and Rescue Service

DOMESTIC DWELLINGS

Proposed relaxation of Scottish Technical Standards

This case study relates to the Glasgow Harbour Development on the banks of the river Clyde in Glasgow. The building was constructed in 2005 and is in broad compliance with the requirements of the Building Standards (Scotland) Regulations 1990 as amended. A relaxation was proposed of Technical Standard E10.15f, which relates to smoke ventilation of basement storeys, which requires mechanical smoke and heat extraction systems for basements to be complimented by a fire control system (i.e. sprinklers). However in this case, a specialised smoke ventilation system (impulse ventilation) was proposed claiming that it would provide better than a standard system and would not rely on the provision of sprinklers. Thus it was proposed that sprinklers be omitted from the basement.

TYPE OF WATER SUPPRESSION SYSTEM

Automatic Water Fire Sprinkler System

DESCRIPTION OF BUILDING

The development consists of 8 separate residential buildings. The basement car parking levels are separated from the remainder of the building by long duration (120 minute) fire resisting compartmentation. There are two basement car parking levels located entirely below ground.

INSTALLATION DETAILS

Following discussion with Developer, fire engineer, architect, and manufacturer and installer of ventilation system the application for relaxation from Technical Standard E10.15f was refused by building control on the following grounds

- Currently no British Standard for this type of system
- Design fire size cannot be calculated, as fire will grow at a rate that is difficult to determine due to the lack of automatic suppression.
- Designer of system unable to confirm fire rating of system
- Developer unable to justify proposals using CFD modelling as effects of immersed ceiling jet difficult to predict
- Fire fighter safety compromised due to omission of sprinklers

The final outcome is that this development will be fitted with an Automatic Fire Suppression System in accordance with Technical Standard E10.15f.

CONTACT DETAILS

Strathclyde Fire
and Rescue Service

SCHOOL

To provide additional protection to assets and business continuity

The system was installed as part of an overall fire strategy to protect a new community primary school constructed in a large high-density housing estate, with many impacting socio-economic issues including potential for arson, and funded via the County Council risk management budget.

TYPE OF WATER SUPPRESSION SYSTEM

Automatic Water Fire Sprinklers.

DESCRIPTION OF BUILDING

Extensive single storey community primary school constructed in 1995, used as traditional school and for extended community use in the evenings.

INSTALLATION DETAILS

Automatic Sprinkler System installed to BS 5306, and designed installed and commissioned to provide protection to Ordinary Hazard 1 standard.

CONTACT DETAILS

Oxfordshire County Council Fire and Rescue Service.

EDUCATIONAL BUILDING

Installation as a result of LEA Policy

The system was installed in a New Build City Learning Centre, built in co-operation between Sandwell Education Authority and The Sony Corporation. This building has been fitted with sprinklers as a result of a decision at LEA executive level to fit sprinklers to all new educational premises following a disastrous fire at Dartmouth High School in November 2003.

TYPE OF WATER SUPPRESSION SYSTEM

BS 5306 OH system in all areas of this building.

DESCRIPTION OF BUILDING

The two storey new build technology centre features computer suites, TV, music and drama studios. The premise is built on the site of former 1960's design school buildings, some of which continue to function. It is anticipated that as further redevelopment takes place, sprinklers will be installed in other new buildings on the site.

INSTALLATION DETAILS

Pumping and storage tank facilities situated in external pump house. Tank capacity 51m with dual pumps.

CONTACT DETAILS

West Midlands Fire Service Community Protection.

SHELTERED HOUSING

Protection of vulnerable group

The system has been installed as a result of Local Authority Policy to sprinkler protect all new-build elderly care premises

TYPE OF WATER SUPPRESSION SYSTEM

Domestic Sprinkler system conforming to DD 251 (Now BS 9251: 2005)

DESCRIPTION OF BUILDING

The Housing Association Bungalows (13 in number) were commissioned by Stevenage Borough Council for older people. The decision to install sprinklers was in response to advice and guidance from Hertfordshire Fire & Rescue Service with support from local councillors. The Bungalows also have a fire alarm and detection system linked to a remote 24-hour call centre. The sprinkler system is linked to the fire alarm system via a flow switch, thereby promptly alerting fire service of any sprinkler actuation.

INSTALLATION DETAILS

Full coverage Sprinkler system conforming to DD 251. Concealed heads used throughout. Flow switch-linking system with AFD system.

CONTACT DETAILS

Hertfordshire Fire and Rescue Service

SOCIAL HOUSING

Protection of vulnerable group

The systems were installed in Local Authority sheltered housing for vulnerable persons. The Sprinkler installations were funded by the Fire and Rescue Service under the ODPM Home Fire Risk Check Initiative.

TYPE OF WATER SUPPRESSION SYSTEM

Residential sprinkler system to BS 9251

DESCRIPTION OF BUILDING

Four terraced 3-storey HMOs. Five family 'units' in each, shared kitchen and lounge on ground floor, single stair condition, and poor fire history. AFD to BS 5839-1 (L2).

INSTALLATION DETAILS

Residential sprinkler system to BS 9251. Concealed and sidewall heads were used. A single connection to town main was made, feeding a 4-way manifold to individual properties. The Sprinkler system was linked to AFD via a flow switch, transmitting the signal of activation to a 24hr alarm call centre.

CONTACT DETAILS

Hertfordshire Fire and Rescue Service

HOUSE IN MULTIPLE OCCUPATION (HMO)

Additional Protection

The installation of the sprinkler system was undertaken to provide additional protection in a house converted into a house in multiple occupation

TYPE OF WATER SUPPRESSION SYSTEM

A Sprinkler System complying to DD251 (Now BS 9251: 2005)

DESCRIPTION OF BUILDING

The building was formally a large domestic dwelling that has subsequently been converted into a House in Multiple Occupation. The dwelling now contains flats and the construction of the dwelling is of the traditional type with brick walls and slate roof

INSTALLATION DETAILS

The sprinklers were installed in accordance with DD251 and fitted throughout the property

HOTEL

To provide flexibility in design allowing extended travel distance in single direction

The system was installed to compensate for extended single direction travel as part of an extension to a hotel involving 8 new bedrooms where alternative escape was not possible due to the nature of the landlocked site. A combination of an active water fire suppression system, traditional passive and active fire safety provisions and fire safety management procedures dealing with periods when fire suppression is not available was found to be acceptable to all the relevant parties. The details of the arrangements have been included in the Fire Certificate issued under the Fire Precautions Act 1971.

TYPE OF WATER SUPPRESSION SYSTEM

Water Mist System

DESCRIPTION OF BUILDING

Large traditional city centre 5-storey hotel with extensive basement area used as restaurant and bar, the hotel providing accommodation for approximately 200 guests in over 100 bedrooms.

INSTALLATION DETAILS

Aqua-Mist LP2000 Low – Pressure Fire Suppression System

CONTACT DETAILS

Oxfordshire County Council Fire and Rescue Service

HOTEL

Application – To allow character retention and asset protection

This system was installed to improve fire safety arrangements as part of a hotel refurbishment. It allowed retention of the existing doors, enhanced the protection afforded to the occupants and served to secure improved potential for business continuity in case of fire.

TYPE OF WATER SUPPRESSION SYSTEM

Residential Fire Sprinkler System

DESCRIPTION OF BUILDING

It is a 3-storey hotel building with single escape stair, with single door protection and automatic fire detection

INSTALLATION DETAILS

System installed designed, installed and commissioned in accordance with BS DD: 251

CONTACT DETAILS

Oxfordshire County Council Fire and Rescue Service

PUBLIC ASSEMBLY

Compensatory feature for compartmentation relaxation

This case study shows the installation of an AWSS to a life safety standard to compensate for non-compliance with compartmentation requirements within a building of four storeys. It also brought the premises in line with the requirements of BS 5588 part 10.
The club when fully occupied can accommodate 2400 revellers; this is an increase in the occupancy figure that would have been allowed following agreement on an increased evacuation time, again due to the installation of a water suppression system.

TYPE OF WATER SUPPRESSION SYSTEM

Life Safety Sprinkler System

DESCRIPTION OF BUILDING

The building is a conversion of an unoccupied bank and disused nightclub, (with current licences maintained), that form part of an old shopping centre created in the early 1970's by enclosing an open street. The nightclub is open plan in design, (the footprint size of the building is 50m x 45m), covering four floors without traditional compartmentation, although themed areas within the club are separated off for management control.

INSTALLATION DETAILS

The system has been installed to comply with LPC Ordinary Hazard Group III with added life safety features but has only one source of supply from a superior mains supply. For aesthetic reasons recessed sprinkler heads have been used that are quick response type 68ºC rated. The system includes a booster pump and backflow prevention device.

CONTACT DETAILS

West Yorkshire Fire and Rescue Service

WAREHOUSE

Compensatory feature for extended travel distance

The system was provided as part of a fire engineered solution to overcome extended travel distances.

TYPE OF WATER SUPPRESSION SYSTEM

BS EN 12845 Sprinkler System

DESCRIPTION OF BUILDING

The building is a large single-storey warehouse 15000mÇ, 16m high racking, facilitating the storage of tiles, bathroom equipment and accessories, contained in cardboard and polythene shrink-wrapped packaging. 112m travel distances. Sprinklers and AFD (L1 standard)

INSTALLATION DETAILS

The system conforms to BS EN 12845, High-Hazard Classification sprinkler system with standard response roof sprinklers (rated @ 141ºC) and quick response in-rack sprinklers (rated @ 68ºC). The System is fitted with additional Life Safety requirements, and AFD (L1 standard) is also provided.

CONTACT DETAILS

Hertfordshire Fire and Rescue Service.

FIRE STATION

Community asset protection and education

The building is a Community Fire Station and District Offices, provided for identified fire cover shortfalls in attendance times and supported under Integrated Risk Management Planning

TYPE OF WATER SUPPRESSION SYSTEM

BS5306: Part 2: 1990 OH1 Hazard Classification

DESCRIPTION OF BUILDING

This is a six-bay Local Authority Fire Station, the first fulltime shift fire station to be built in the area for over 30 years at a cost of £4M. It includes state of the art learning and practice facility, advanced environmental systems, with full AFD and CCTV coverage.

INSTALLATION DETAILS

Automatic Sprinkler system conforming to BS 5306 fitted throughout with a variety of heads used for demonstration purposes, these include Upright, Pendant, Sidewall, Concealed and Recessed.

CONTACT DETAILS

Hertfordshire Fire and Rescue Service

FACTORY

To allow relaxation of passive structural fire protection

The installation was provided to allow the use of unprotected steel work to construct large single compartment with multi levels to accommodate manufacturing process based upon continuous assembly line. The cost of an active system to protect the steelwork was considered best value, as compared to the costs of passive protection when the on costs associated with repair and maintenance of the passive provision as a result of fork lift truck impacts was included.

TYPE OF WATER SUPPRESSION SYSTEM

Automatic Water Fire Sprinklers

DESCRIPTION OF BUILDING

The premises is a large steel framed single storey building to provide accommodation for extensive multi level car manufacturing process

INSTALLATION DETAILS

System installed to BS 5306

CONTACT DETAILS

Oxfordshire County Council Fire and Rescue Service.

HERITAGE BUILDING

Compensatory feature for lack of structural fire protection

The system was installed to provide Heritage protection of a Scottish stately home. This home is in a rural location with limited fire service cover and has little structural fire protection.

TYPE OF WATER SUPPRESSION SYSTEM

Sprinklers to BS 5306 Part 2

DESCRIPTION OF BUILDING

It is a Baroque style mansion built between 1735 and 1754 by the Scottish architect William Adam. The building had lain disused for some 50 years before restoration was proposed as a joint project between Aberdeenshire Council, National Galleries of Scotland and Historic Scotland.

INSTALLATION DETAILS

The sympathetic installation of sprinklers has helped retain the original features, and use of concealed heads has been blended in with the décor as appropriate. Use has been made of careful design and installation to make full use of features such as void spaces to run pipe-work. Pipe-work in some areas is protected against low temperatures with thermo insulation and trace heating.

CONTACT DETAILS

Grampian Fire and Rescue Service.

VARIOUS COUNTY COUNCIL PREMISES

A decision by the council to fit sprinklers in all new builds and major refurbishments.

The buildings fitted with sprinklers include schools and residential care premises that are relatively high risk and in some cases subject to increased risk of arson attack.

TYPE OF WATER SUPPRESSION SYSTEM

Sprinklers to BS 5306

DESCRIPTION OF BUILDING

In excess of 20 new build or major refurbishments were fitted with a sprinkler system following an assessment of the risk by a seconded fire service officer. This resulted in appropriate application of sprinklers specified according to a thorough risk assessment of the building design and potential usage together with environmental factors such as arson risk.

This initiative was between Hampshire Fire and Rescue Service and Hampshire County Council and was formed as a result of a decision by the council to fit sprinklers in all new builds and major refurbishments. The service advised that this approach would in many cases lead to unnecessary over provision and suggested that the secondment of an office on a funded basis to work in the architects department would allow a more scientific risk based assessment of where non mandatory installations should be adopted – the cost savings would more than cover the secondment costs.

Such use of joint working initiatives with large organisations can result in cost effective and appropriate AWSS provision

CONTACT DETAILS

Hampshire Fire and Rescue Service

HERITAGE BUILDING

Asset protection

The premises is a small listed heritage building comprising of a Quakers Meeting House dating from about 1685, situated in Stourbridge, West Midlands.

It has been the subject of an arson attack and the premises has suffered vandalism on occasions. The system was fitted purely to increase the fire protection of this listed building on the part of the trustees.

TYPE OF WATER SUPPRESSION SYSTEM

Sprinkler System to BS 9251

DESCRIPTION OF BUILDING

The premises is a predominately brick built 17th Century Quakers Meeting House that dates from 1685. The building is significant, as it was built very soon after the Act of Parliament that granted freedom of religious expression to those outside the established church.

The historic part of the building measures about 15 metres x 5 metres and many of the original features are still extant. The sprinkler coverage extends to a later part which houses meeting room and kitchen facilities.

INSTALLATION DETAILS

Water supply from town's mains feeding a BS 9251 type sprinkler system. In addition to room protection, heads are also located in the roof spaces, which are formed of ancient 'queen post' beams

CONTACT DETAILS

West Midlands Fire and Rescue Service.

WAREHOUSE

Asset Protection- Successful Fire Stop

The system was provided as part of a fire engineered solution addressing the complex issues associated with a large single storey warehouse originally used to store car parts but now many varied items including a large number of high value goods. The scheme includes an automatic fire alarm and detection system, fire ventilation and compartmentation, and addresses extended means of escape travel distances and escape times. The scheme was recently reviewed using DD240: Part 1: 1997.

A fire in 2000 involving palletised goods in the high bay racking was controlled by the fire sprinklers and only required minimal action by the Fire and Rescue Service.

Without the fire sprinklers this would have been a major incident on a par with those that devastated the MOD Donnington Warehouse In the event, this fire did not even make headlines in the local news.

TYPE OF WATER SUPPRESSION SYSTEM

Automatic Water Fire Sprinklers

DESCRIPTION OF BUILDING

This is a single storey building, 287m by 274m and 13m high. Whilst the building has a cubic volume of approximately 1,022,000m^3, it is, however, divided into five compartments. Throughout, it includes a number of mezzanine floors, automated conveyor systems and extensive high bay storage racking.

INSTALLATION DETAILS

The fire sprinkler system has been installed for many years and includes both in rack sprinklers and ceiling sprinklers, but does not at present benefit from up to date developments in respect to sprinkler technology

CONTACT DETAILS

Oxfordshire County Council Fire and Rescue Service

FACTORY

Reduced Fire Damage at Factory Fire

A Sprinkler actuation prevented a small fire involving a gas leak from a portable gas cylinder, developing into a much larger fire and allowed time for the Fire and Rescue Service to arrive and deal with the incident, which was extinguished using a hose, reel. The factory was back in production within a few hours.

TYPE OF WATER SUPPRESSION SYSTEM

Automatic Water Fire Sprinkler System

DESCRIPTION OF BUILDING

This is a single storey factory approximately 30m x 40m used for plastic moulding process

INSTALLATION DETAILS

System installed to BS 5306

CONTACT DETAILS

Oxfordshire County Council Fire and Rescue Service,
ask for Community Safety Manager

FACTORY

Reduced fire damage and prevented job losses

The fire occurred when overheated materials from a thermal bonding machine were left on the shop floor and subsequently ignited cardboard packaging. The employees believed the material had cooled sufficiently and went for a break. The resulting fire was contained by the sprinkler system. Although the nearest heads were roughly 10 metres away, 3 actuated and contained the fire. There was no damage to the building or machinery and once the materials immediately involved were removed production in the area was safe to resume.

TYPE OF WATER SUPPRESSION SYSTEM

Automatic Water Fire Sprinkler system

DESCRIPTION OF BUILDING

This fire occurred in the early hours in a bedding textile manufactures in West Yorkshire.

INSTALLATION DETAILS

The system had been installed to BS 5306. The sprinkler system was extended in this area in 2000 and was fitted with red bulbs that activated at 68oC. On arrival the fire service was left with a small incident that was easily extinguished using one hose reel jet.

The damage to the packaging was estimated to be around £2500, had the fire not been contained to the building a potential loss of around £1m would have occurred plus loss of further production and probable staff loses

CONTACT DETAILS

West Yorkshire Fire and Rescue Service

APPENDIX 1

Commercial and Industrial Sprinkler systems – Additional requirements for life safety.

Where a sprinkler system is installed under the Building Regulations and/or the Fire Regulations (usually for means of escape purposes) the system must have fitted the additional requirements for life safety. These life safety requirements ensure the system has the necessary degree of reliability and responsiveness.

Fire Safety Officers are often consulted on commercial/industrial sprinkler submissions where it is proposed to have a reduction or absence of life-safety features. It must be remembered that such provisions are there to protect occupants and fire fighters, as well as provide a very high degree of building protection (this would also compliment business continuity). The specific requirements for life-safety have been built up over time taking account of experience and events. They have been formulated and scrutinised by a technical committee and have been adopted within Approved Documents. The life safety requirements are detailed below, together with reference to the appropriate section of the British Standard.

WATER SUPPLIES

BS EN 12845: 2004: Annex F;

"The system shall have at least one superior single water supply."

This provision ensures high levels of reliability. Where pumps are required, two or more must be provided (no more than one shall be driven by an electric motor).

WET PIPE INSTALLATION

BS EN 12845: 2004: Annex F;

"Sprinkler installations for life safety shall be of the wet pipe type and any subsidiary dry pipe or extension shall comply with 11.5."

This ensures fast application of water and early fire suppression.

Control Valve Arrangement

BS EN 12845: 2004: Annex F;

"During servicing and maintenance of the installation alarm valves, the sprinkler installation shall be fully operational in all aspects."

This provision is achieved by the use of duplicate installation control valve sets or a by-pass valve arrangement. This is a provision that enables servicing of the valve set whilst maintaining sprinkler protection to the building (and thereby allowing the building to function as normal). The by-pass arrangement is often chosen in preference to the duplicate valve set as this is the cheaper option.

Any deviation from this requirement would require robust evidence to justify such a departure. If it is proposed not to have the necessary valve arrangement on the basis that valve maintenance will only take place when the building is closed or unoccupied, the enforcing authority will need to be satisfied that a suitably robust and strict management control system is put in place (this will need to remain in place throughout the life of the building). In addition the fire strategy/fire risk assessment for the building would need to address the procedure to be followed if there was a fault within the valve arrangement or the planned maintenance inadvertently extends into trading/working hours. Such a situation is likely to result in the closure of the building whilst the sprinkler system is not active (due to non-compliance of Building/Fire Regulations). Enforcing authorities are advised to obtain a written undertaking to this effect, as this will ensure the building occupiers/owners are fully aware of the consequences of non-compliance with this requirement. Such an undertaking will also facilitate any subsequent enforcement action.

It is worth noting that compliance with this requirement is cost effective, as business continuity is maintained, occupant and fire-fighter safety is provided at all times and servicing/maintenance costs are greatly reduced (as premium labour rates for out of hours servicing are avoided).

SUBDIVISION INTO ZONES

BS EN 12845: 2004: Annex F;

"Installations shall be subdivided into zones, in accordance with annex D, with a maximum of 200 sprinklers per zone."

This provision enables isolation of small/specific areas of the installation and allows for life-safety system maintenance in accordance with the British Standard. It facilitates head replacement (following activation), system repair and alterations/extensions to the installation. It is a valuable aid to fire fighters (and others) in promptly identifying the area of sprinkler actuation (B5 Building Regulations: facilities to assist fire fighters).

Strict application of this requirement may be onerous in certain situations particularly for in-rack installations or where the building design may benefit from a more flexible approach. In such cases, consideration may be given for the design of the sprinkler zones to correspond with certain building features such as racking aisles, compartment walls, smoke reservoirs, fire alarm zones etc. In such situations a degree of flexibility should be applied with regard to the number of heads per zone. However, it should be ensured that the effectiveness of the system is not compromised and that the functional requirement/spirit of this recommendation is still complied with.

SPRINKLER TYPE AND SENSITIVITY

BS EN 12845: 2004: Annex F;

"Quick response sprinklers shall be used, except that standard 'A' and special response may be used in rooms less than 500mÇ in area or no less than 5m in height."

Quick response heads should be used as these have a faster response time compared with standard heads. A Response Time Index (RTI) is a measure of the sprinkler thermal sensitivity and for quick response heads the RTI must be <50. However, some applications may require different sensitivity ratings to ensure correct system activation. An example would be a high-bay warehouse with standard response roof sprinklers (often rated at a higher temperature: 141ºC) and with quick response 68ºC in-rack heads. This configuration ensures that the heads closest to the fire (those within the rack) will activate before the roof heads due to their greater thermal sensitivity and lower temperature rating (if the roof heads were to activate first these may wet/cool the in-rack heads and delay/prevent their operation).

SPRINKLER SYSTEM MONITORING AND TRANSMISSION OF ALARMS

BS EN 12845: 2004:

Annex H and I specifies requirements, which are additional to those elsewhere in the standard. They should be complied with whenever monitoring is specified.

Therefore this is not a specific life-safety requirement within the BS EN, although it would be deemed best practise and advisable on the vast majority of such systems. If there is a heavy reliance on the reliability and effectiveness of the sprinkler system and it forms an essential component of the fire strategy/fire engineered solution for the building, then such valve monitoring, tamper-proof switches and alarm transmission is likely to be necessary. This would therefore become a feature of the fire risk assessment and be necessary for compliance with the Fire Safety Order.

In contrast to the BS EN, BS 5306-2 (which can be used as an alternative to the BS EN up to its withdrawal scheduled for September 2007) does require such provision for life safety systems:

BS 5306: Part 2: 1990:

Clause 27.3.2 Life Safety Systems. All stop valves on the premises which control the flow of water to sprinklers, i.e. stop valves at any point in the water supply pipe work, whether part of the main installation control valve set, including the bypass valve or upstream or downstream from it, shall be fitted with a tamper-proof electric switch to indicate that the valve is in the correct operational mode.

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