

Automatic sprinkler systems are widely accepted as providing a highly efficient and effective means for protecting life and property. Sprinklers are now installed in an increasingly wide range of properties and occupancies and have an outstanding record of successful operation for over a century. Whilst their use is recommended and encouraged by all UK Fire and Rescue Services, sprinklers are not used as widely in the healthcare environment as they are in other areas such as the retail sector.

The demand on hospitals and healthcare premises in the UK is growing. The NHS deals with over 1 million patients every 36 hours, In England alone there were 15.892m total hospital admissions in 2014/15, 31 per cent more than a decade earlier (12.102m).¹

The impact on UK hospitals and healthcare premises from fire is significant. 2015 saw 3,648 fires, an average of approximately 10 per day in hospitals, and healthcare premises resulting in 412 casualties, including 4 fatalities, it is estimated that approximately 4% or 196 of these fires were set deliberately.²



A patient at Glasgow's Queen Elizabeth University Hospital has been charged by police after a fire resulted in the evacuation of an 11th floor ward.

Fire crews were called to the £842m building at about 02:10 following reports of a room on fire.

The blaze was extinguished by the in-house sprinkler system.

1 Source 'Key statistics on the NHS'
<http://www.nhsconfed.org/resources/key-statistics-on-the-nhs>

2 Source CFOA UK Business Safety Week 2015 Statistics
<http://www.cfoa.org.uk/19972>

Progressive Horizontal Evacuation

A major concern in hospitals in particular is the impact of a fire on dependent and 'very high dependency' patients who cannot easily be evacuated - particularly those undergoing surgical procedures or in intensive or critical care units.

Many healthcare premises use progressive horizontal evacuation (PHE), to initially evacuate patients to an adjoining fire compartment or sub-compartment, providing an extended evacuation period. The installation of sprinklers can increase the time available for evacuation still further and reduce the numbers who require evacuation

The use of PHE requires the building to be designed to accommodate the evacuated patients and the beds and equipment required for their care. In buildings over 12 m high where no hospital street is provided, at least four compartments should be provided each having a minimum floor area of 500m². In sprinklered buildings the minimum floor area of each compartment required by paragraph 3.13 above may be reduced to 350m².

Building Standards

Sprinkler systems are widely referenced in the guidance to the Building Regulations, Scottish Building Standards, and Health Technical Memoranda. (The guidance in Health Technical Memoranda satisfies all the requirements of Part B – 'Fire Safety' of the Building Regulations 2010). (for more details see BIF 12: Sprinklers and the Building Regulations). In Wales buildings in purpose groups 1a, 1b, 1c, 2a and 2b, (where Regulation 37a of the Building Regulations applies) which may include group homes and nursing homes, it is recommended that advice is sought from the appropriate building control body before commencing any work within premises of this type.

Firecode; Health Services' Technical Memoranda 05-02 & HTM 88, SHTM 82

There are no statutory requirements for sprinklers to be provided in hospitals with the exception of high rise buildings (in excess of 30m) and in certain commercial enterprises contained within hospitals, however hospital designers are expected by HTM 05 02 'to consider the advantages that might be gained by installing life-safety sprinklers throughout the building or to specific areas.'

Sprinklers may be used in all or specific parts of the building, where partial protection is provided. Firecode and BS EN 12845, require sprinkler protected areas to be separated from non-sprinkler protected areas by at least 60



Food courts and shopping areas are becoming common in healthcare premises

minute fire resisting construction. This does not apply in small areas such as en-suite facilities in patient rooms.

Where sprinklers are used there are often design freedoms or compensations available which can offset the cost of the sprinkler system and allow for greater flexibility in design, increased use of open spatial planning and extended travel distances.

In addition to the design freedoms and flexibility discussed above, a number of specific derogations are allowed in the Firecode where sprinklers are installed, they include:

- In fully sprinklered healthcare buildings the fire resistance of compartment walls on floors up to 12m above ground can be reduced from 60-minutes to 30-minutes (integrity and insulation).
- In some locations thermally activated dampers may be provided instead of fire and smoke dampers linked to the fire alarm and detection system.
- The maximum size limits on un-insulated glazing located in sub-compartment walls is not applicable where

sprinklers are provided, this can offer a significant cost saving and greater design flexibility.

- Where full sprinkler protection is provided periods of fire resistance to elements of structure can be reduced by 30 minutes compared to a non-sprinklered building.
- Identified fire hazard rooms should be enclosed in 30 minute fire-resistant construction, unless sprinklers are provided, in which case the need to enclose fire hazard rooms in fire-resistant construction should be risk assessed.
- External fire spread space separation distances required between buildings or facing compartments can be halved if sprinklers are provided. In addition, external envelope protection requirements for re-entrant angle protection (i.e. 1m storey height fire resistant banding and 3m fire resistant protection to low level roof abutments) can be relaxed if sprinklers are provided.
- The number and location of fire-fighting shafts required may be reduced, subject to the height above ground, the number and location of fire-fighting shafts is determined by the floor area and maximum hose layout distances e.g. where 1 shaft is required for every 1000m² or part thereof. this ratio increases to 1:1500m² if sprinklers are provided effectively reducing the number of fire fighting shafts required.
- Mechanical smoke extracts are allowed in basements where sprinkler protection is provided.

The above list is indicative only and further details should be sought from the relevant Firecode document.



Noah's Ark Children's Hospital for Wales



Sprinkler System Operation

Sprinkler systems offer a way of automatically applying water quickly and directly to the seat of a fire. All sprinkler protected parts of the building are covered by a pipework grid with sprinkler heads fitted at regular intervals. Water is fed to the sprinkler heads from a dedicated water supply, either from a dedicated tank/s and pumps or from the service (towns') main. (See BIF No 13)

Sprinkler heads open independently when their operating temperature is reached and water is sprayed on to the fire. **Only the sprinklers in the direct vicinity of the fire open, the others remain closed.** This limits the water damage to areas where there is a fire and reduces the amount of water used. **It is a myth that all sprinkler heads will operate simultaneously throughout the premises.**

Sprinkler heads are generally located near the ceiling and spaced so that there is always a sufficient flow of water to combat fire in the likely area of operation. The flow is carefully calculated so that each head delivers enough water to control a fire, taking into account the size and construction of the building, its use and nature of the contents stored in it.

As the water from the sprinkler heads is applied in small droplets, in a finely divided stream, there is little danger of electrical conduction via the sprinkler water. It is equally safe to use sprinklers in kitchens or where hot oil is being used as boil over will not follow sprinkler activation.

In most premises, if a sprinkler opens and water flows through the control valve it also actuates a mechanical alarm outside the building. This feature provides a local alarm without the need for electrical connections. At the same time, most modern systems, are usually fitted with a flow switch which can be connected to the building's fire control panel and provide a local and remote alarm – this will provide a signal to call fire and rescue service. The sprinkler flow alarm signal can be 'piggy-backed' on any fire or security detection system using a connection to an alarm receiving station.

Types of Systems

There are several types of installation (see BIF 15) but the one most commonly used in healthcare premises is the wet type, where the installation is permanently filled with water.

Standards

There are two main standards for sprinkler systems within the United Kingdom:

BS EN 12845:2015 Fixed firefighting systems. Automatic sprinkler systems. Design installation and maintenance.

This standard refers to commercial industrial premises as applied to buildings such as Shopping Complexes, Warehousing, Hospitals and Schools. Supplemented in the UK by the LPC Technical Bulletins

BS 9251:2014 Fire sprinkler systems for domestic and residential occupancies. Code of practice

This is a domestic and residential standard which may be applied in some Residential Care Premises, certain HMO's and domestic dwellings.

Environmental Issues

There are a good number of environmental reasons for reducing the size and frequency of fires. Any reduction will minimise the volume of toxic gases released to the atmosphere. Even in a minor fire, the products of combustion, including CO₂ will pollute the atmosphere and contaminate the fire fighting water. This contaminated water is very difficult to contain and often finds its way into water courses and drainage systems.

A report commissioned by the Business Sprinkler Alliance Bureau Veritas (2011) identified the following environmental benefits from using sprinklers

The use of a sprinkler system reduces dramatically the size of the fire by attacking the fire in its early stages therefore reducing smoke production and the amount of water required to control the fire. Many fires are actually extinguished by sprinkler systems leaving little for the Fire and Rescue Service to do on their arrival.

Sustainability Issue	The potential contribution of fire sprinklers to achieving sustainability
Environment	<ul style="list-style-type: none"> • Reduced negative impact to water, land and air environments • Reduced requirement for hazardous waste disposal • Reduced carbon emissions • Reduced contribution to UK carbon footprint • Reduced water wastage

Business Sprinkler Alliance Assessing the role for fire sprinklers 2011

Presented by:

