

GUIDELINES FOR THE SUPPLY OF WATER TO AUTOMATIC FIRE SPRINKLER SYSTEMS

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British Automatic Fire Sprinkler Association

bafsa



EUROPEAN FIRE
SPRINKLER NETWORK



NFSN
National Fire
Sprinkler Network



Residential Sprinkler Association



WATER REGULATIONS ADVISORY SCHEME

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FOREWORD

Automatic fire sprinkler systems have a valuable role to play in the protection of both life and property from fire and in the reduction of environmental damage such fires can cause. This document reflects the commitment of the participants to maintain and develop the goodwill that currently exists. The guidelines refer to all types of automatic fire sprinkler systems supplied directly or indirectly by mains water in accordance with statutory obligations placed upon water undertakers.

These guidelines have been developed to reflect the legislative framework at the time of writing. Proposed amendments to Section 57 the Water Industry Act 1991 re-defining the scope of water for fire fighting to include fire sprinkler connections, are supported by water undertakers and by the fire sprinkler industry. Amendments to the legislation would deliver benefits but legislative change takes time and strong guidelines can, in the meantime, be used as the basis for discussions at a strategic level.

These guidelines have been prepared by the following participants;

- British Automatic Fire Sprinkler Association
- European Fire Sprinkler Network
- National Fire Sprinkler Network
- Residential Sprinkler Association
- Water UK
- Water Regulations Advisory Scheme

Iain Cox, Chair, National Fire Sprinkler Network Water Liaison Group

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AGREED PRINCIPLES

Subject to any legal requirements placed upon water undertakers regarding the proper supply and use of public water, the participants agree that they will encourage, insofar as they are able, the adoption of the following principles in policy documents which should be published clearly on corporate websites and available on request:

Principles

It is agreed that:

- water undertakers should have a policy for domestic and residential fixed fire protection systems¹, and
- each water undertaker should identify a lead contact(s) for automatic fire sprinkler issues to promote good communication between all parties, and
- there is recognition by all parties that early communication is essential and beneficial. Installers, in particular, should ensure water undertakers are notified of any proposed sprinkler installation, and
- there is provision of clear and transparent methods of working (policies, guidelines etc.) between all parties, at national and local level, these should be readily accessible, eg on the websites of the appropriate parties, and
- the provision of water supplies and the installation of automatic fire sprinkler systems must be done in a competent manner, in accordance with relevant legislation and regulations, British, European or internationally recognised standards, and
- where, for a specific installation, a deviation from such standards affects the interests of the water supplier, then that deviation shall be agreed in writing locally with the parties concerned, and
- all parties must make every attempt to resolve any dispute concerning the interpretation or application of these guidelines locally with the water undertaker, at the appropriate level, as swiftly as possible, and
- all parties must take all reasonable precautions to prevent the misappropriation of water, or the commission of a related offence, and
- installers shall notify all installations to the relevant water undertaker to allow records to be kept and proper information to be shared, and
- the National Fire Sprinkler Network Water Liaison Group provides a route for open and constructive discussion.

This document will be reviewed, as a minimum, every 5 years or when any material change to legislation, regulation, standards or guidance. Any amendments to this document shall only be made with the consent, in writing, of all the Parties, or their successors, following a joint review.

¹ Fixed fire protection systems include automatic fire sprinklers or fixed misting systems.

SCOPE

The document is aimed at all parties (water suppliers, fixed fire protection system designers, installers, users and maintainers) involved in the installation of fixed fire protection systems and is not intended to preclude the use of other automated water based fire suppression systems provided they meet the appropriate standards.

It provides guidelines for all to enable them to work together in a spirit of co-operation and so ensure good working relationships and outlines a set of principles that should form the basis of local policies and agreements. The participants recognise that by so doing they not only will reduce fire casualties, and property and environmental damage, but also maintain the quality of water supplied and minimise potential disruptions within the public water supply system.

INTRODUCTION

This document outlines how water supplied by water undertakers may be used for the suppression of fires by fixed fire protection systems, and establishes agreed guidelines of how these systems may be supplied. It is understood that water undertakers should produce their own policy, procedures and technical guidance documents based upon these principles and guidelines to reflect their own specific situation.

In many thousands of buildings throughout the UK, permanently installed automatic fire sprinkler systems are used as a preventative measure to control fires, for both life safety and property protection. Some systems are fed directly from the water mains; others via a storage cistern and pump or pressure vessel arrangement.

For operational reasons, including the minimising of leakage, the reduction of disruption from burst mains, and the reduction of power usage, water suppliers actively manage water pressures in the mains network. In doing so it is the water

undertakers' responsibility to manage water pressure to a level commensurate with providing an adequate supply to domestic customers, whilst meeting levels of service indicators (for example DG2 standards in England and Wales). Water pressures may also be affected by a growth in demand and the natural variations during the day caused by local demands.

The participants acknowledge that there is no guarantee of any specific pressure over and above the regulatory obligation. Pressure levels that may have been available in the past may not be available in the future. Water undertakers will however; provide information to the best of their ability on the prevailing mains pressure and any significant seasonal variations of which they are aware, at the time of consultation, to enable automatic fire sprinkler system design to be optimised.

It should also be understood that the fire service may have based its emergency rescue and fire control tactics on an assumption of effective fire sprinkler actuation and the availability of adequate water supplies for conventional fire-fighting.

Similarly, fire safety requirements made under the Building Regulations in England, Wales and Northern Ireland, and the Building Standards in Scotland, relating to fire safety measures to be incorporated into the design and construction of buildings may have been relaxed in favour of the fitting of an automatic fire sprinkler system.

Because of the importance of automatic fire sprinkler systems as an efficient means of detecting, controlling and/or extinguishing fires, before they become a significant threat to life, property and the environment, coupled with economic use of water, it is important that all the participants concerned co-ordinate their efforts in dealing with water supply issues, both for maintaining the effectiveness of existing systems and for ensuring that new systems are installed and maintained correctly.

WATER POLICY GUIDELINES

1. The Benefits of Sprinklers

1.1 Automatic fire sprinkler systems have been in use for nearly 150 years. More recently systems have been introduced that are intended for the protection of life in domestic and residential property. These include systems which are designed to British Standards BS 9251: 2014 Fire sprinkler systems for domestic and residential occupancies – Code of practice or BS 8458: 2015 Fixed fire protection systems.

Residential and domestic watermist systems. Code of practice for design and installation. Relevant standards relating to fire protection are provided in Annex C.

1.2 An automatic fire sprinkler system is designed to:

- detect a fire within a protected building, and
- release water in the fire-affected area via the sprinkler heads, which contain heat sensitive elements designed to operate automatically at a pre-determined temperature, [NB. Only those sprinklers in the vicinity of the fire operate], and
- initiate a water flow-activated, audible, local alarm when a sprinkler head operates, and
- transmit a signal to an approved alarm-receiving centre, if required.

1.3 Records show that by this means of providing detection, alarm and localized water application, fire sprinkler systems are very effective in preventing the development of major fires. Apart from explosions there have never been multiple fatalities in a fully sprinklered building in the UK.

1.4 In 2016 the National Fire Sprinkler Network and Chief Fire Officers Association (now the National Fire Chiefs Council) tasked Optimal Economics of Edinburgh to undertake a study of the efficiency and effectiveness of automatic fire sprinkler systems in the UK. (*Efficiency and Effectiveness of Sprinklers in the United Kingdom: An Analysis from Fire Service Data* April 2017). This was the first detailed analysis of sprinkler activations carried out in

the UK using Fire & Rescue Service data as submitted through the Incident Recording System (IRS). The research revealed that:

- Across all building types, the performance effectiveness of sprinkler systems was assessed as 99% in situations where sprinklers could have been expected to have operated; and
- The operational reliability of the systems was 94% across all building types where sprinklers could have been expected to have operated

1.5 Furthermore, useful information was also gleaned as to the number of sprinkler heads that activate in fires:

- Of the 144 fires in dwellings studied, the average number of heads that activated was 1.5.
- Of the 315 fires in non-residential buildings studied, the average number of heads that activated was 3.3.

1.6 The volume of water used by a properly designed and installed automatic fire sprinkler system to control a fire will be significantly less than that used by the fire service to control and extinguish the same fire. In many cases this will be less than one tenth that which the Fire & Rescue Service would have used.

1.7 In environmental terms automatic fire sprinkler systems make a valuable contribution by:

- reducing the size and severity of fires;
- using water in the most effective and economical way to control fire;
- minimising the problems of contaminated fire fighting water run-off;
- minimising the potential disruption to water supplies for water undertakers' customers; and
- minimising any adverse effect on water quality.

1.8 Standards for fixed fire misting systems have recently been introduced. As this is an emerging technology there is currently insufficient data to demonstrate their degree of effectiveness.

2. Sprinkler installations and their water supply needs

2.1 Fire sprinkler systems are designed to apply water at various rates depending on the classification of the fire hazard. To obtain the design flow of water from the sprinkler heads, water supply requirements are calculated for the pressure and flow to the system in accordance with the relevant standards or guidelines being employed. (See Annex C)

2.2 Reliable water supplies are essential, the most common forms are:

- a direct connection to a water supplier's main;
- a stored and pumped water supply:
 - large cisterns, with sufficient capacity to supply design flow for the specified time, or
 - small cisterns, with reduced capacity and dependent on the appropriate inflow from a water service pipe;
- a pressurised vessel
- acceptable recycled water, e.g. rainwater recovery systems;
- in-line booster pumps- provided there is no risk of creating a detrimental effect on the quality or pressure (e.g. transient pressures) of water in water mains; or
- a gravity supply from a storage cistern.

2.3 Except in circumstances where supply arrangements dictate otherwise, for domestic and residential fire sprinkler systems water undertakers will consider direct mains connection as the method of supply. See 5.1 regarding the requirements for advanced notification.

2.4 Domestic and residential premises include dwellings, residential care facilities, houses in multiple occupancy (HMO), hostels and the like, may be protected by automatic fire sprinkler systems directly supplied with mains water and designed and installed in accordance with the relevant standards and guidelines.

2.5 Commercial premises such as shops, schools, offices, warehouses and manufacturing facilities may also be protected by sprinkler systems directly supplied with mains water

2.6 For automatic fire sprinkler systems designed for life safety protection continuity and reliability of water supplies are of particular importance. However, it should be noted that mains water supplies may be interrupted for maintenance work or because of a failure in the supply system. Such circumstances may on occasion be due to events beyond the water supplier's control. Designers should bear such possibilities in mind when designing automatic fire sprinkler systems.

2.7 It is essential that automatic fire sprinkler systems are properly maintained to ensure correct operation when required. All participants recognise the importance of proper maintenance and testing of fire sprinkler systems in accordance with the relevant standards and guidelines and this should be brought to the attention of the system owner or user.

2.8 If isolating the water supply or shutting off the system for any length of time, alternative precautions need to be instituted, as prescribed by the relevant standards or as dictated by a risk assessment.

3 Retail competition

3.1 In April 2017, non-household (NHH) customers in England were able to join Scottish NHH customers in choosing their water services from a competitive water retailer. Retailers buy water and wastewater services wholesale from the established water wholesalers (water undertakers) and manage the billing and customer interface aspects of service provision. Some may use the market to offer additional or bespoke services. A small number of NHH customers have taken up a self-supply licence.

3.2 This change to the market does not affect the guidance given in this document

and, currently, does not affect provisions for domestic properties.

3.3 Installers or designers of sprinkler systems can access more information from the Ofwat or Open Water websites.

4. Key relevant legislation

4.1 The principal legislation on which water is supplied is detailed in Annex A, below:

4.2 For new buildings or those undergoing significant alteration or refurbishment, Approved Documents accompanying the Building Regulations in England and Wales make specific reference to the use of sprinklers (so, too, do Regulations for Scotland and Northern Ireland although they differ slightly). The guidance not only recognises the use of sprinklers for life safety but it is apparent that future legislation is likely to call for the increased use of sprinklers particularly, following the 2017 Grenfell Tower tragedy, in residential buildings.

4.3 The Welsh Assembly passed The Domestic Fire Safety (Wales) Measure 2011 and a ‘Commencement Order’ was issued in October 2013. The Measure requires the provision of automatic fire suppression systems (such as a fire sprinkler system) compulsory in all new and converted ‘residential’ properties. The legislation came into effect in two phases:

- 30 April 2014:
for care homes (as defined in the Care Standards Act 2000), children’s residential homes, hospices, halls of residence, boarding houses and hostels other than hostels intended for temporary accommodation for leisure purposes.
- 1 January 2016:
for houses and flats (including sheltered houses and sheltered flats).

4.4 For existing buildings the Regulatory Reform (Fire Safety) Order 2005 which replaced most existing fire legislation in England and Wales requires employers and

others (the Responsible Person in the Order) to consider whether the duties imposed by the Order could be better discharged by fitting fixed fire suppression systems.

4.5 In Scotland and Northern Ireland, similar legislation exists; and automatic fire-fighting systems are increasingly being utilised as part of the fire risk assessment requirements throughout the UK to discharge legal obligations in the protection of both life and property.

5. Conditions of Supply

5.1 The principal requirements which water undertakers place upon customers are to ensure that installations are designed and installed to avoid waste, undue consumption, misuse, contamination and erroneous measurement of water, and to ensure compliance with the regulations throughout their useful life. In particular:

- all materials and fittings used in systems that are supplied with water for the water undertaker’s mains must comply with the requirements of the Water Fittings Regulations and Byelaws³, and
- all below and above ground water pipes on private ground used solely for an automatic fire sprinkler system must be readily identifiable from all other pipework.
- the Water Fittings Regulations and Byelaws³ requires proposed fire protection installations to be notified to the water undertaker. This applies to both new and existing properties and is independent of any requirement regarding a new or upgraded water supply.

5.2 Water for automatic fire sprinkler systems may be supplied independently of domestic or industrial supplies. It may be metered dependent upon adequate safeguards against leakage and fraud being provided. In accordance with Water Industry Act², no charge may be made for water used for fire fighting or testing fire fighting equipment.

5.3 An isolating valve must be fitted between the mains supply and the sprinkler installation. Any such device should have minimal effect on pressure or flow.

5.4 An appropriate backflow prevention device must be fitted between the water supply provided for domestic purposes and the sprinkler installation. Water undertakers must be consulted for site specific requirements (see 5.1 regarding notification). Maintenance of this device is the sprinkler user's responsibility.

5.5 Dual connections to mains in **different** pressure zones are not permitted. Where there is no practical alternative means of supply the water undertaker should be consulted on what supply arrangements may be acceptable (see 5.1).

5.6 Dual connections to different mains in the **same** pressure zones may be acceptable by agreement with the water undertaker provided the pressures at the points of connection are similar. Backflow prevention would be particularly important in such scenarios.

5.7 Dual connection of treated water supplies and any other sources (such as rainwater harvesting systems) are not permitted without an appropriate backflow prevention device, in accordance with the Water Fittings Regulations and Byelaws³. Water undertakers must be consulted for specific advice (see 5.1).

5.8 Where the fire sprinkler system is supplied by pumping from a storage cistern, the inlet pipe to the storage cistern from the water suppliers' mains must have an automatic level control and an appropriate air gap, or an arrangement of fittings as prescribed in the Water Fittings Regulations and Byelaws³. The storage cistern should also be fitted with an overflow and warning pipe or level device to indicate if the cistern is overfilled.

5.9 Existing water undertaker policies may prohibit the direct connection of booster

pumps to the water supplier's mains. The booster pump should not have a detrimental effect on the quality or pressure (e.g. transient pressures such as inducing vacuums) within the upstream supply. With the availability of programmable smart pumps, and on the basis that the activation of an automatic fire sprinkler system is a rare but vital event, an exception should be made, subject to agreeing details and conditions of installation with the water supplier. Pumps which create flows in excess of 12 litres per minute are notifiable under Water Fittings Regulations and Byelaws³ (see 5.1).

5.10 In order to ensure the correct design and method of supply is chosen at the outset, it is essential that contact is made with the relevant water undertaker at the beginning of the design stage. The Water Fittings Regulations and Byelaws³ require advance notification (see 5.1).

ANNEX A - Summary of pertinent legislation

Water Legislation

- ² Water Industry Act
 - The Water Industry Act 1991 (England and Wales)
 - Water (Scotland) Act 1980, and The Water Industry (Scotland) Act 2002
 - The Water and Sewerage Services (Northern Ireland) Order 2006
- ³ Water Fittings Regulations
 - The Water Supply (Water Fittings) Regulations 1999 (England and Wales)
 - The Water Supply (Water Fittings) (Scotland) Byelaws 2014
 - The Water Supply (Water Fittings) Regulations (Northern Ireland) 2009

Fire Legislation

England & Wales

- The Domestic Fire Safety (Wales) Measure 2011
- The Regulatory Reform (Fire Safety) Order 2005

Scotland

- The Fire (Scotland) Act 2005

Northern Ireland

- The Fire Safety Regulations (Northern Ireland) 2010

Building Regulations

England & Wales

The Building Act 1984
The Building Regulations 2006 (Part B)

Supported by Approved Documents 1 & 2
(Note Wales now has different Approved Documents to England)

Scotland

The Building (Scotland) Act 2003

Supported by Technical Handbooks 'Domestic and 'Non Domestic'

Northern Ireland

The Building Regulations (Northern Ireland) 2012

Supported by Technical Booklet E 'Fire Safety'

ANNEX B - Glossary of Terms

Backflow: means a flow upstream, that is in a direction contrary to the intended normal direction of flow, within or from a water fitting.

Backflow Prevention Device: A device that is intended to prevent contamination of wholesome water by backflow or backpressure in a water supply system (such as check valves, or an air gap).

Booster pump: a pump intended to elevate the pressure of water within a system.

Check Meter: Meter installed by the Water Undertaker to monitor potential leakage and unauthorised usage, no standing or volumetric charge is made unless there is usage for purposes other than fire related.

Cistern: A storage vessel where fluids are stored at atmospheric pressure.

Communication Pipe: The section of service pipe owned and maintained by the Water Undertaker.

Direct system: a fire system providing water to the outlets which is under direct pressure from the incoming water supply.

Domestic Supply: Supply to points of demand within premises using water for domestic purposes, i.e. drinking, cooking, washing, bathing, sanitary purposes, central heating, food preparation. For a full definition refer to Water Industry Act 1991 Section 218.

Downstream: the side to which fluid flows under normal conditions; away from the source

Installation: a configuration of pipes and fittings which hydraulically connects the incoming water supply to the terminal points of use.

Non-return valve: a valve which allows flow in a single direction. Non return valves cannot be used for backflow protection purposes.

Priority Demand Valve: Device automatically operated by control system to isolate the flow to the domestic system in the event of a fire, thus ensuring all available pressure and flow is directed to the sprinkler system.

Pump and Tank Supply: A system of storage cistern and booster pump to provide adequate pressure and flow of water to meet sprinkler system requirements.

Revenue meter: A meter provided for the purpose of billing customers for the volume of water used.

Service Pipe: The branch from a water main to the premises first internal stop valve intended to provide a supply of water to a specific customer or group of customers.

Sprinkler Head: The outlet fitting from which water is discharged in a spray pattern to control fires.

Sprinkler System: The assembly of pipes fittings and valves to distribute water under pressure to sprinkler heads.

Stop Valve: Device to isolate the supply of water. Also referred to as a “stop tap.”

Supply Pipe: The Section of service pipe owned and maintained by the customer.

Transient pressure: is the generic term for a wave phenomenon that accompanies a rapid change of the velocity of the fluid in the pipeline

Upstream: the side from which fluid flows under normal conditions; towards the source

Water Main: Pipe belonging to the Water Undertaker (Water Company) installed with the purpose of providing a general supply of water.

Water retailer: licensed water retailers buy wholesale water services from the regional water undertakers and manage the billing and associated services.

Water wholesaler: see water undertaker.

Water undertaker: appointed companies that own and operate the network of pipes, mains and treatment works. They are responsible for the enforcement of the Water Fittings Regulations and Byelaws within their appointed area. They act as the wholesalers in the market, selling water and wastewater services to retail suppliers.

ANNEX C - Standards and typical design flow rates

Standards

BS9251:2014	Fire sprinkler systems for domestic and residential occupancies – Code of practice
BS 8458:2015	Fixed fire protection systems. Residential and domestic watermist systems. Code of practice for design and installation
BS 8489-7:2016	Fixed fire protection systems. Industrial and commercial watermist systems. Tests and requirements for watermist systems for the protection of low hazard occupancies
BS EN 12845:2015	Fixed firefighting systems. Automatic sprinkler systems. Design, installation and maintenance

Typical flow demands

Type of Property/hazard	Min Design Flow (L/min)	Max Design Flow (L/min)
BS 9251:		
Category 1	51	102
Category 2	70	140
Category 3	70	280
BSEN 12845:		
Light Hazard	109	225
Ordinary Hazard 1	375	540
Ordinary Hazard 2	725	1,000
Ordinary Hazard 3	1,100	1,350
Ordinary Hazard 4	1,800	2,100

- Category of system is defined in BS 9251: 2014
- Light Hazard, Ordinary Hazard 1, 2, 3 & 4 is defined by BSEN 12845 and LPC Sprinkler Rules for Automatic Sprinkler Installations.