

AUTOMATIC FIRE SPRINKLERS INSTALLED FOR LIFE SAFETY AND / OR PROPERTY PROTECTION



3rd June 2026

British Automatic Fire Sprinkler Association

bafsa

Automatic Fire Sprinkler Systems

Joe Mc Cafferty

Please be aware that considerable efforts have been made to ensure the accuracy of the information contained within this article at the time of publication, however any legislative (or other) changes that come into effect after this may render the information out of date until it is reviewed and updated as part of the Bafsa's content review cycle.

www.bafsa.org.uk

info@bafsa.org.uk

1

My Name is Joe Mc Cafferty

My role is mainly doing sprinkler technical support for BAFSA.

I respond to technical enquiries that are sent to the BAFSA website.

Enquires to the site are very varied i.e. Sprinkles installed for Domestic, Residential and Commercial properties.

Also get a lot of enquiries about Wet and Dry Risers.

Enquiries come from UK, European Countries and Worldwide.

British Automatic Fire Sprinkler Association
bafsa

2

Sprinklers they all go off at once !!!



NO, THEY DON'T

Many Hollywood Films show sprinklers going off all at the same time.
Only the sprinklers heads in the area where the fire is will operate.

3

Sprinkler systems have been around for about 150 years

History of Sprinklers

1812- Theatre royal deluge system using perforated pipes that were activated manually

1874 First Automatic Sprinkler System

Henry S. Parmalee Invented and installed the first commercially successful automatic sprinkler.

It used solder that melted in heat to release water.

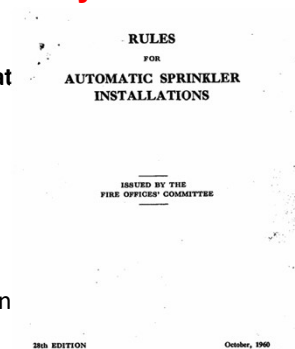
Widely regarded as the true beginning of modern automatic sprin

Sprinkler rules/standards were formed by the following:

1868 Fires offices committee formed (F.O.C.)
Formed by UK fire insurance companies
(May have been as early as 1861)

1985 Loss Prevention Council Formed (L.P.C.)

1990- L.P.C. Issued rules benefits of Life Safety recognised



4

BS 9251 History

Current version is:
BS 9251:2021 Fire sprinkler systems for domestic and residential occupancies Code of practice.

Previous versions were:
BS 9251: 2014
BS 9251: 2005
DD 251

The old DD 251:2000 was used as a basis for the new range of BS 9251 Standards

The European standard BS EN 16925:
This standard covers the same area as sprinklers in residential premises. However, it has been agreed that BSI will co-publish BS9251 for continued use in the UK and not withdraw the standard.
So, in the UK we use BS 9251 NOT BS EN 16925

This is an example of what the BSI committee says about BS EN 16925:
The committee also has concerns about a number of other aspects of EN 16925:2018, including system design and application, where the committee believes, based on experience, **that existing UK practice is more robust than the requirements in EN 16925:2018.**

BSI Standards Publication
Fire sprinkler systems for domestic and residential occupancies. Code of practice

bsi. *...making excellence a habit*
BS 9251:2021 Fire sprinkler systems for domestic and residential occupancies. Code of practice

DRAFT FOR DEVELOPMENT
DD 251:2000
Sprinkler systems for residential and domestic occupancies — Code of practice

BAFSA 03-06-2026

5

Category of system	Description of building/occupancy
1	Single family dwellings such as: • dwelling house; • individual flat⁽⁴⁾; • individual maisonette, and • transportable home. Houses of multiple occupation (HMOs) ⁽⁴⁾ Bed and breakfast accommodation ⁽⁴⁾ Boarding houses ⁽⁴⁾
2	Blocks of flats ^{(3), (4)} Small residential care premises with 10 residents or fewer ⁽⁴⁾ Sheltered and extra care housing ^{(3), (4)}
3	Residential care premises with more than 10 residents ^{(4), (5), (7)} Student accommodation ^{(3), (7)} Dormitories (e.g. attached to educational establishments) ^{(4), (5)} Hostels ^{(4), (5)}
4 ⁽⁷⁾	All residential buildings 18 m or higher

BS 9251:2021
Fire sprinkler systems for domestic and residential occupancies (the primary UK residential sprinkler standard; updated in 2024)
This standard sets out the design, installation, commissioning and maintenance for:

Residential care
Blocks of flats
Transportable home

**DON'T FORGET TO CHECK THESE IMPORTANT NOTES
THEY COULD CHANGE THE CATEGORY OF THE SPRINKLER DESIGN**

⁽⁴⁾ Where the majority of flats are to be sprinkler protected, the whole building is to be treated as at least category 2. Any building of a height greater than 18 m is to be treated as category 4.

⁽⁵⁾ Buildings with more than two floors and five or more lettable bedrooms are to be treated as Category 3 throughout. Any building of a height greater than 18 m is to be treated as category 4.

⁽⁷⁾ Any non-fire sterile communal building parts should be protected as category 3.

⁽⁴⁾ Any building of a height greater than 18 m is to be treated as category 4.

⁽⁵⁾ See also Approved Document B, Volume 2, para 2.46. 2019 edn. [1].

⁽⁷⁾ See 5.12.5.

BAFSA 03-06-2026

6

BS EN 12845:2015+A1:2019

Fixed firefighting systems. Automatic sprinkler systems. Design, installation and maintenance
This standard sets out the design, installation, commissioning and maintenance for:

Designing a sprinkler system
using

BS EN 12845 is more complex
than systems designed to
BS 9251.

There are much more things to
consider.

Its not just the building but what is
it being used for, what's in it.

Can be any of the following

Offices,
Retail shops,
High rise buildings over 45m
Hazardous processes,
Storage of materials
Flammable Storage
High storage racks



7

BS EN 12845:2015+A1:2019

If we have storage in what is classified as an **ORDINARY HAZARD BUILDING** the products stored can have a serious impact on the fire load. This table shows the limits of the Category of goods that can be stored on the premises. Higher category (higher fire load) = Lower storage height allowance.

Table 1 — Maximum storage heights for OH3 protection

Storage Category	Maximum storage height ^a	
	m	
	Free standing or block storage (ST1 – see 6.3.2)	Storage configurations (ST2 to ST6 ^b see 6.3.2)
Category I	4,0	3,5
Category II	3,0	2,6
Category III	2,1	1,7
Category IV	1,2	1,2

6.3.2 Storage Configuration

The storage configuration shall be classified as follows:

- ST1: free standing or block stacking;
- ST2: post pallets in single rows, with aisles not less than 2,4 m wide;
- ST3: post pallets in multiple (including double) rows;
- ST4: palletized rack (beam pallet racking);
- ST5: solid or slatted shelves 1 m or less wide;
- ST6: solid or slatted shelves over 1 m and no more than 6 m wide;

8

BS EN 12845:2015+A1:2019

Defining the Category of storage is done by using flow charts in BS EN 12845 and these guide us to the correct Category definition and the correct sprinkler system design for the premises.

6.3 Storage**6.3.1 General**

The overall fire hazard of stored goods is a function of the combustibility of the materials being stored, including their packaging, and of the storage configuration.

To determine the required design criteria when stored goods are involved, the procedure shown in Figure 2 shall be followed.

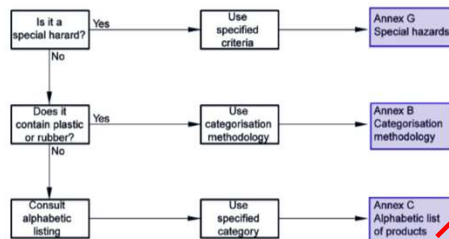


Figure 2 — Flow chart for determining the class required for storage

Table C.1 — Stored products and categories

Product	Category	Comments
Adhesives	III	With flammable solvents special protection required
Adhesives	I	Without solvent
Asphalt paper	II	In horizontal rolls
Asphalt paper	III	In vertical rolls
Batteries, dry cell	I	—
Batteries, wet cell	II	Empty plastic accumulators require special protection
Beer	I	—
Beer	II	Containers in wooden crates
Books	II	—
Candles	III	—
Canvas, tar-impregnated	III	—

Higher categories usually means much higher water densities and much bigger assumed areas of a possible fire, also known as AMAO Assumed Maximum area of operation

9

BS EN 12845:2015+A1:2019.

Table 3 — Design criteria for LH, OH and HHP

Hazard Class	Design Density mm/min	Area of Operation m ²	
		Wet or pre-action	Dry or alternate
LH	2,25	84	Not allowed Use OH1
OH1	5,0	72	90
OH2	5,0	144	180
OH3	5,0	216	270

Getting the design criteria right is critical to ensuring that the system will operate effectively and control/extinguish a fire.

The volume of water discharge per minute varies considerably i.e.

For an Ordinary Hazard System (shop/office) the volume per minute can be 5 L/min/m² x say 216 m² = 1080 Litres/min

But for more hazardous storage with high stacking heights in a warehouse the volume per minute can be 30 L/min/m² x say 300 m² = 9000 Litres/min

3.19 design density

minimum density of discharge, in millimetres per minute of water, for which a sprinkler installation is designed, determined from the discharge of a specified group of sprinklers, in litres per minute, divided by the area covered, in square metres

Table G.7 — Non-woven synthetic fabric – design criteria with roof or ceiling protection only

Storage Configuration	Maximum permitted storage height (see NOTE 1) m	Minimum design density mm/min	Area of operation (wet or pre-action system) (see NOTE 2) m ²
ST1 Free standing or block stacking	1,6	10,0	260
	2,0	12,5	
	2,3	15,0	
	2,7	17,5	
	3,0	20,0	
	3,3	22,5	300
	3,6	25,0	
	3,9	27,5	
	4,2	30,0	
	4,5	32,5	

rinkler deflectors, minus 1 m, or the highest led.

10

SOME STORAGE ARRANGEMENTS ARE OUTSIDE THE SCOPE OF BS EN 12845 SO WE MUST USE OTHER STANDARDS LIKE:

- NFPA 15: Standard for Water Spray Fixed Systems for Fire Protection.
- API RP 2030: Application of Fixed Water Spray Systems for Fire Protection in the Petroleum and Petrochemical Industries.
- IP MODEL CODE P19, By Energy Institute – Fire Precautions at Petroleum Refineries and Bulk Storage Installations.
- HSE Guidance Offshore Information Sheet No. 1/2010 'Water deluge systems: Testing and performance measurement'.
- ISO 13702 'Petroleum and natural gas industries – Control and mitigation of fires and explosions on offshore production installations – Requirements and guidelines'



- **A GOOD INFORMATIVE DOCUMENT ABOUT THIS TYPE OF PROTECTION IS AVAILABLE FREE FROM THE FPA WEBSITE**



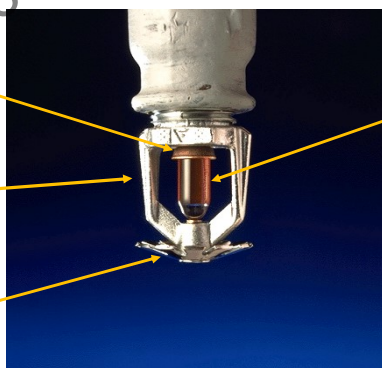
11

THE PARTS OF A SPRINKLER HEAD

Brass seating holding back the water

Sprinkler frame

Water deflector plate which sprays water over a predefined area



Quartzoid bulb which fractures at a preset temperature.

68°C (red bulb) is the most commonly used temperature .

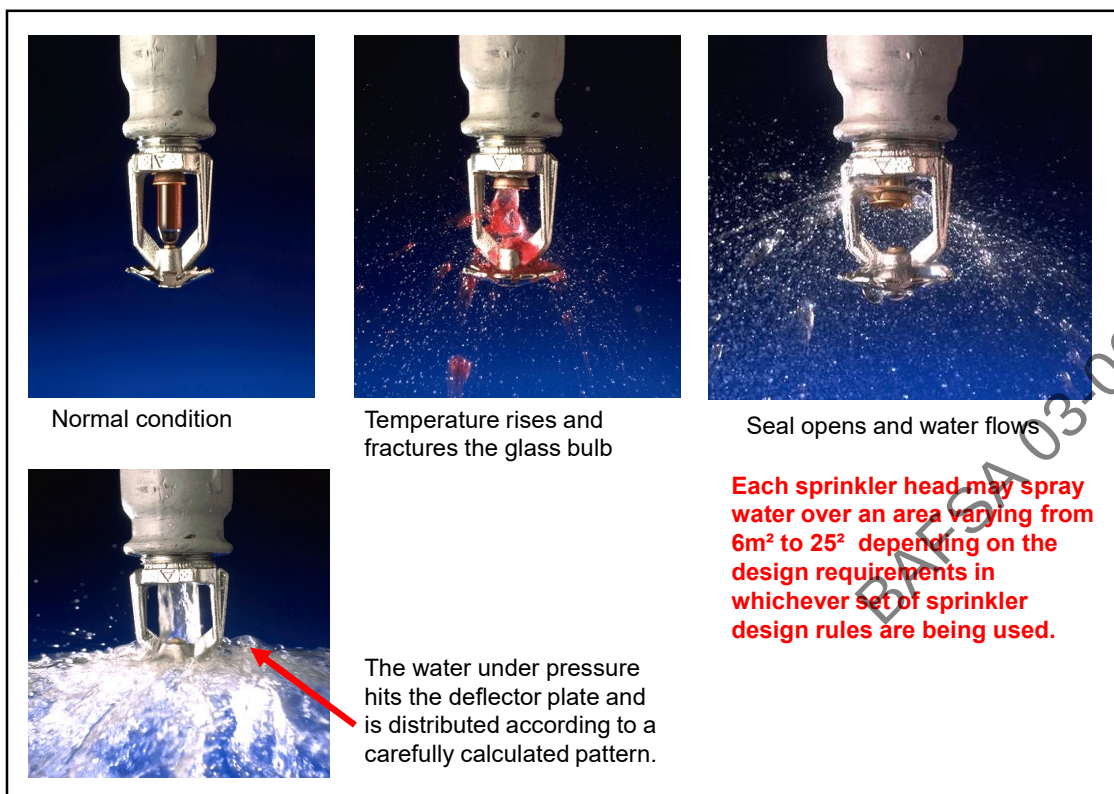
Temperature selection will be approx. 20° – 30° C **above** the **AMBIENT** temperature of the room.

Ambient vs. Room Temperature

Ambient temperature is the variable measurement of the air in any given environment. The 'measured' ambient temperature can vary within a room i.e. may be cooler in middle of room but much higher where a sprinkler is exposed to direct sunlight or another heat source. Sprinkler head temperature must be selected based on the measured/expected temperature of the location where it is installed.

In contrast, "room temperature" refers to a standardized range defined for human comfort or the stability of materials. For scientific purposes, "controlled room temperature" is often defined as between 20°C and 25°C

12



13

Glass bulb sprinklers and the Temperatures they operate at.

57°C 68°C 79°C 93°C 141°C 182°C



The frangible quartzoid bulb operates simply: comprising a small glass bulb containing a liquid that will expand rapidly when exposed to rising temperatures, bursting the bulb at an accurately pre-determined temperature, thereby activating the sprinkler.

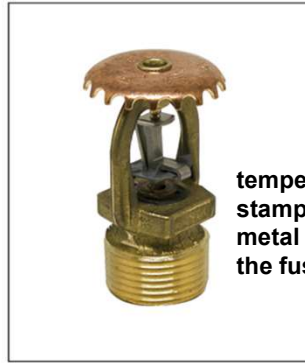


14

Fusible Link sprinklers and the Temperatures they operate at.



Model KFR80 Pendant



Model KFR80 Upright

temperature is stamped on the metal parts of the fusible link



The Fusible link sprinkler has metal parts that react to temperature rise, when solder melts the link releases and water flows.

Sprinkler heads now use lead free solder.

15

14.4 Sprinkler temperature ratings

Sprinklers shall be chosen with a temperature rating close to but no lower than 30 °C above the highest anticipated ambient temperature.

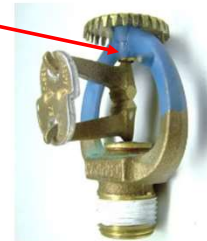
In unventilated concealed spaces, under skylights or glass roofs etc., it might be necessary to install sprinklers with a higher operating temperature, up to 93 °C or 100 °C. Special consideration shall be given to the rating of sprinklers in the vicinity of drying ovens, heaters and other equipment, which gives off radiant heat.

NOTE 1 Under normal conditions in temperate climates a rating of 68 °C or 74 °C is suitable.

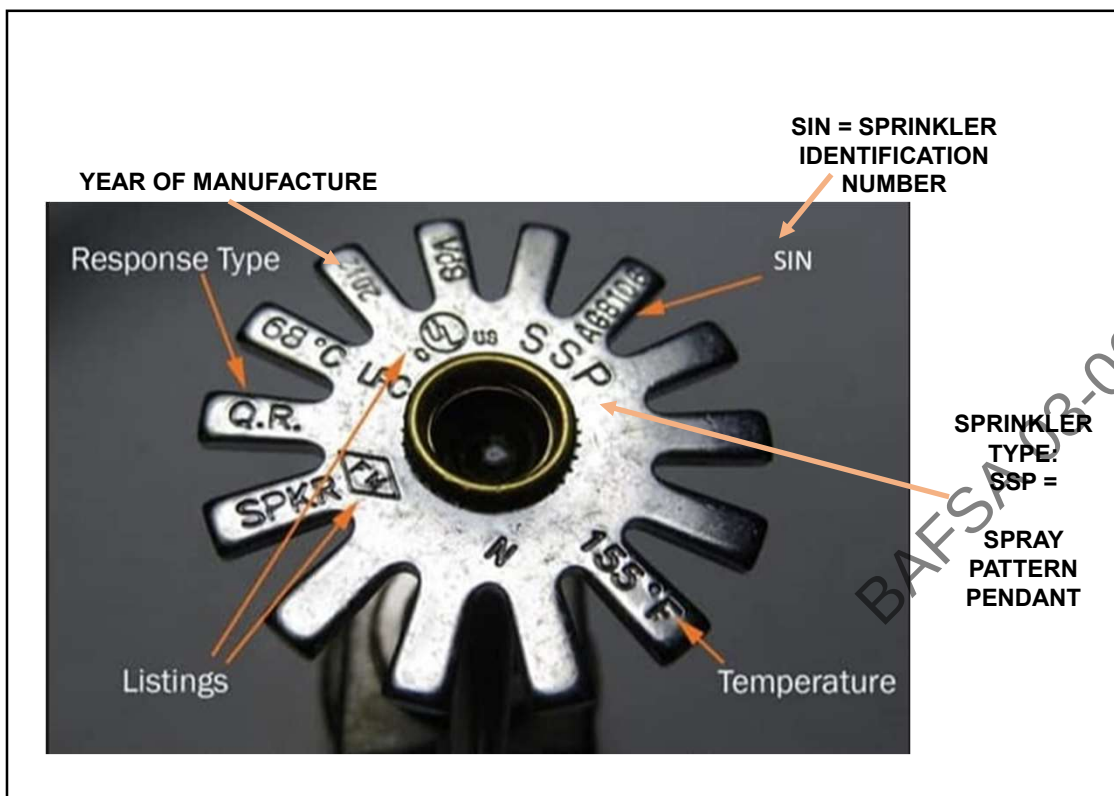
NOTE 2 Sprinklers are colour coded in accordance with EN 12259-1 to indicate their temperature rating as specified in Table 37b.

Table 37b — colour code for sprinklers

Glass bulb sprinklers		Fusible link sprinklers	
Nominal operating temperature	Liquid colour code	Nominal operating temperature within range	Yoke arms colour code
° C		° C	
57	orange	57 to 77	uncoloured
68	red	80 to 107	white
79	yellow	121 to 149	blue
93	green	163 to 191	red
100	green	204 to 246	green
121	blue	260 to 302	orange
141	blue	320 to 343	black



16



17

The sprinkler deflector plate looks like a simple disc with varying serrated edges but there is a lot of complex science used to get the exact shape for the most effective water distribution.

It's not just a disc with a few random slots. It is the result of many many experiments and multiple formulae scientific calculations

Flat spray, vertical spray

Slot Stream

The spray pattern, spray volume and water droplet sizes are studied in minute detail to ensure a reliable/efficient pattern is produced.

Sprinkler water spray can be a vertical and flat orientation during sprinkler operation

18



Definitions and RTI Thresholds

Fast /Quick Response: Sprinklers with an RTI of **50 or less (m·s)^{1/2}**. These activate quickly to suppress the fire, reducing the risk of flashover and prioritizing life safety.

Special Response: Sprinklers with an RTI between **50 and 80 (m·s)^{1/2}**, offering a moderate activation speed that combines aspects of both Standard and Fast Response sprinklers.

Standard Response: Sprinklers with an RTI of **80 or more (m·s)^{1/2}**. These are designed to pre-wet materials near the fire and control its spread, focusing primarily on property protection

THINNER BULBS OPERATE FASTER 'QUICK RESPONSE' THAN THE THICKER BULBS.

BULBS OF THE SAME COLOUR OPERATE AT THE SAME TEMPERATURE BUT AS THE THICKER ONES CONTAIN MORE LIQUID THEY TAKE LONGER TO HEAT UP AND BREAK THE GLASS.

RTI = Response Time Index

19

SPRINKLER HEAD ORIENTATION

Pendent Sprinkler: A sprinkler designed to be installed in such a way that the water stream is directed downward against the deflector

Upright Sprinkler: Upright sprinklers have a spray pattern that appears similar to that of a pendent sprinkler. The difference is that upright sprinklers are mounted to the top of sprinkler pipes or risers and installed in such a way that the water spray is directed upwards against the deflector

Sidewall Sprinkler: Sidewall sprinklers typically are installed along a wall and discharge water away from the wall into the room or space.

Recessed Sprinkler: A sprinkler in which all or part of the body is mounted within a recessed housing. Some recessed sprinklers are installed partially recessed into a wall or ceiling.

Concealed Sprinkler: A recessed sprinkler with cover plate. The cover plate is typically soldered to the frame that screws or pushes into the sprinkler assembly. The solder is designed to melt at a lower temperature than the sprinkler activation temperature. When the solder melts, the cover plate falls off allowing the sprinkler head deflector to drop below the ceiling height and distribute water after the sprinkler activates.



20

VARIOUS TYPES OF SPRINKLER HEADS

Residential Sprinkler: Residential sprinklers are designed to prevent flashover, so the spray pattern throws water much higher. Residential sprinklers are required to pass wall wetting tests in addition to floor distribution.

Dry Sprinkler: Sometimes referred to as dry barrel sprinklers, dry sprinklers are used in areas where the sprinklers and piping are subject to near-freezing temperatures such as freezers or balconies.

Open Sprinklers: Open sprinklers are used in deluge systems. They are not activated by individual thermal elements, instead the system water supply is held back by a deluge valve that is automatically opened (most often by activation of a heat detection system).

Institutional Sprinkler: Installing sprinklers in a correctional or institutional facility need to be tamper-proof. Institutional sprinklers are specially designed to prevent people from attaching anything to it that could inflict harm on themselves or others. They are also made with components that cannot be easily converted into makeshift weapons.

Corrosion Resistant Sprinkler: A sprinkler fabricated with corrosion-resistant material, or with special coatings, to be used in an atmosphere that would normally corrode sprinklers.



21

PIPE AND FITTINGS USED IN SPRINKLER SYSTEMS

Residential and Domestic sprinkler systems designed using BS 9251 commonly use CPVC pipe and fittings.

CPVC conforming to ASTM F442



Sprinkler systems may use Copper pipe and fittings, but this is a more expensive option

BS EN 1057:2006+A1, half-hard, R250 designation



Commercial sprinkler systems commonly use steel pipe black or galvanized

BS EN 10255, Medium series



22

How do you comply with the Building Regulations?

Building work must meet all relevant requirements of the Building Regulations. To comply with the Building Regulations, it is necessary both to follow the correct procedures and meet technical performance requirements.

The approved documents set out what, in ordinary circumstances, may be accepted as one way to comply with the Building Regulations. Note, however, that:

- Complying with the guidance in the approved documents does not guarantee that *building work* complies with the requirements of the regulations – the approved documents cannot cover all circumstances. Those responsible for *building work* must consider whether following the guidance in the approved documents is likely to meet the requirements in the particular circumstances of their case.
- There may be other ways to comply with the requirements than those described in an approved document. If those responsible for meeting the requirements prefer to meet a requirement in some other way than described in an approved document, they should seek to agree this with the relevant building control body at an early stage.

JOES NOTE:

Complying with Building regulations is the best way to provide fire safety in a building.

Deviating from the recommendations of building regulations **must** be justified by **sound engineering reasons** for doing so.

Deviations based solely on decorative/architecture concerns, cost saving or any trivial reasons is **unlikely to get the approval of building control bodies**.

23

UK Building Standards (England, Wales and Northern Ireland)

England, Wales and Northern Ireland use a form of Approved document B

They change slightly to suit each country's building requirements

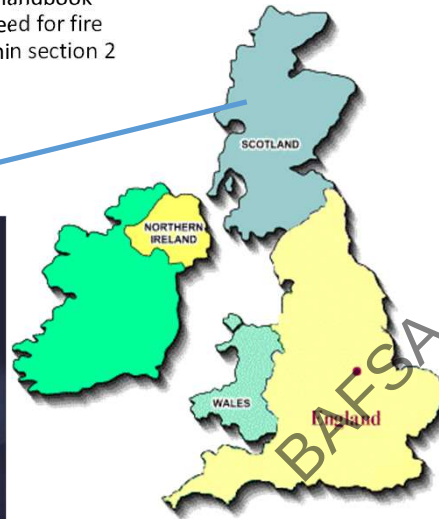


24

Scottish Building standards



Section 2 of the domestic and non-domestic handbook highlight the need for fire protection within section 2



25

Sample of fire resistance requirements from Approved Document B

Note its for both unsprinklered and sprinklered buildings

Very important to check the notes after these tables

Table 4.2 NEW Minimum periods of fire resistance

Purpose group of building	Minimum period (minutes) for elements of structure and other components of the building forming part of							
	Basement storeys including floor over		Ground or upper storeys					
	Depth (m) of basement (1)	Height (m) of top floor above ground in building or separated part of building (1)	More than 10	Not more than 10	Not more than 5	More than 5 not more than 11	More than 11 not more than 18	More than 18 not more than 30
1 Residential (dwelling) –								
(a) flat	90	60	30*	60**	Permitted	Not (4)	Permitted	Not (4)
(b) not sprinklered (2)	90	60	30*	60**	60**	90**	120**	
(c) sprinklered (2)	Not relevant	30*	30*	60*	60*	Not relevant	Not relevant	
2 Residential –								
(a) institutional (3)	90	60	30**	60	60	90	120*	
(b) other	90	60	30*	60	60	90	120*	

Notes:

- The floor over a basement (or if there is more than one basement, the floor over the topmost basement) should meet the provisions for the ground and upper storeys if that period is higher.
- Increased to a minimum of 60 minutes for compartment walls separating buildings.
- Reduced to 30 minutes for any floor within a flat with more than one storey, but not if the floor contributes to the support of the building as a whole.
- Reduced to 30 minutes for a dwellinghouse having not more than three storeys and for the wall or floor separating a dwellinghouse from an attached or integral garage.
- Multi-storey hospitals designed in accordance with the HTM 05 suite of documents should have a minimum of 60 minutes.
- Increased to a minimum of 30 minutes for elements protecting the means of escape.
- Reduced to 90 minutes for elements not forming part of the structural frame.
- (1) A single storey building or a single storey separated part of a building should be subject to the period given under the heading "Not more than 5" and where it has a basement storey or storeys they should be subject to the period appropriate to their depth.
- Reduced to 30 minutes where an existing building of not more than three storeys is being converted.
- "Sprinklered" means that the building is fitted throughout with an automatic sprinkler system in accordance with Section 8.
- Buildings containing flats with a top storey more than 11 m above ground level should be fitted with a sprinkler system in accordance with Section 8.
- Residential care premises should be fitted with a sprinkler system in accordance with Section 8.
- Purpose built student accommodation with a top storey of more than 11 m above ground level should be fitted with a sprinkler system in accordance with Section 8.
- Car parks which comply with paragraphs 4.49 and 4.50.
- For the purposes of this technical handbook the following types of steel elements are deemed to have satisfied the minimum period of fire resistance:
 - Structural steelwork.
 - Wind bracing and
 - Guidance is also available in BS 5951-1:2000.

CHECK THE NOTES CAREFULLY

Some may have only 1 note
Some 2 notes
but others like car parks will have 3 notes.

Height (m) of top floor above ground in building or separated part of a building

Up to 18

5 Up to 11

15 min†(8)

26

- In the previous slide there is the mention of areas that are FIRE STERILE !
- What does that mean?

Sprinklers

7.4 Blocks of flats with a top storey more than 11m above ground level (see Diagram D6) should be fitted with a sprinkler system throughout the building in accordance with Appendix E.

NOTE: Sprinklers should be provided within the individual flats, they do not need to be provided in the common areas such as stairs, corridors or landings when these areas are fire sterile.

Some examples of **what should not** be in a fire sterile area:

- Portable heaters or gas cylinders
- Cooking appliances
- Significant quantities of stored goods or combustible materials
- Large quantities of furniture or soft furnishings
- Large plastic decorative plants
- Charging of scooters or the like.

Some examples of **what may be allowed** in a fire sterile area:

- Non-combustible lockers
- Small items of electrical equipment (e.g., a photocopier)
- Vending machines
- Small coat racks

I have had this question asked quite a few times on the BAFSA technical support
My BAFSA colleague Richie O'Connell has produced an excellent document titled
'Fire sterile areas' in multi occupied residential buildings
If you want a copy email BAFSA and I can send you a copy.

27

- In BS 9251 there are areas where sprinklers **can be omitted** provided certain conditions are met:

Note
Fire Strategy /risk assessment may override the sprinkler omission allowance in BS 9251.

Note
Generally, if there are the electrical goods in the area it is very likely that sprinklers CAN NOT be omitted.

Note
Comment about direct access to the house is not permitted if sprinklers are not installed.

5.4 Extent of sprinkler protection

COMMENTARY ON 5.4

BS 5306-0:2020, Clause 15 gives guidance on the use of sprinkler protection in the presence of electrical equipment and concludes it is generally safe to do so.

Sprinkler protection should be provided in all parts of the premises, however, sprinkler protection may be omitted from the following areas unless it is required by a fire strategy or risk assessment:

NOTE Where a risk assessment is carried out, it needs to take into account presence of fuel load (e.g. linen), presence of potential ignition sources (e.g. immersion heater) and consequence (e.g. impact upon fire protection to the building or escape routes).

- bathrooms and shower rooms with a floor area less than 5 m², with linings in accordance with BS EN 13501-1:2018, Class A1, A2-s3, d2 and B-s3, d2, and which are not prepared for white goods, such as washing machines, dryers, electric showers or water heaters;
- enclosed staircases containing only materials in accordance with BS EN 13501-1:2018, Class B-s3 or better for construction materials and B(f) or better for flooring, including sub categories such as d0, d1, d2 for construction materials and s1 and s2 for flooring, surface spread of flame and constructed as a fire-resistant separation;
- ceiling voids;
- enclosed vertical shafts (e.g. lifts or service shafts) containing only materials in accordance with BS EN 13501-1:2018, Class B-s3 or better for construction materials and B(f) or better for flooring (including sub categories such as d0, d1, d2 for construction materials and s1 and s2 for flooring), surface spread of flame and constructed as a fire-resistant separation;
- cupboards and pantries with a floor area of less than 2 m² or where the least dimension does not exceed 1 m which are not prepared for consumer units or electrical equipment (excluding a single light);
- uninhabited loft/roof voids;
- water closet (WC) with a floor area less than 5 m², with linings in accordance with BS EN 13501-1:2018, Class A1, A2-s3, d2 and B-s3, d2, and which are not prepared for white goods, such as washing machines, dryers, electric showers or water heaters;
- attached buildings, such as garages and plant rooms without direct access from within the protected building;
- crawl spaces; and
- external balconies permanently open to the outside.

28

5.5 Classification of residential and non-residential occupancies

In some parts of the building, residential sprinklers might not provide adequate protection. Therefore, the nature of occupancies needs to be determined, and the type of sprinkler system selected accordingly. This process could determine that some areas can be adequately protected with residential sprinklers (i.e. sprinkler heads to BS EN 12259-14) and others will require protection by so-called "commercial and industrial" sprinkler heads (i.e. sprinkler heads to BS EN 12259-1).

Any commercial areas as listed in BS9251 Table 4 that cover an area over 100M² shall be installed with a full commercial sprinkler system in accordance with BSEN12845.

Table 4 — Examples of classification of areas and design criteria for areas to be protected with BS EN 12259-1 sprinkler heads

Occupancy	Minimum density mm/min	Area of operation ^{A)}
Car parking ^{B)} within or beneath a block of flats	5.00	100 m ²
Bin store ^{B)} within or beneath the flats		72 m ²
Limited office areas (e.g. concierge or site management) ^{B)}		72 m ²
Residents' storage sheds/tenant stores ^{B)}		4 heads
PTSN/CCTV/electrical rooms		72 m ²
Plant rooms		100 m ²
Laundry (with storage and processing of linen, e.g. institutional, care home)		100 m ²
Laundry (communal facility)		72 m ²
Hairdressing room		72 m ²
Retail (e.g. shop)		100 m ²
Bar/restaurant/cafe		72 m ²
Kitchens in student hub accommodation (e.g. self-catering)		72 m ²
Kitchens ^{B)} in residential care or similar premises (e.g. care home) ≤ 50 m ²		72 m ²
Kitchens ^{B)} in residential care or similar premises (e.g. care home) > 50 m ²		72 m ²

^{A)} If the compartment (fire) area is less than 50 m², a maximum of four heads is required as the area of operation. Where greater than 50 m², refer to area of operation or compartment (fire) area, whichever is the lesser.

^{B)} Attention is drawn to the need to consider protection from frost damage.

^{C)} On the basis of the bin store building or compartment being of at least a minimum of 1 h fire resisting construction from the rest of the buildings.

^{D)} See also Table 3. Conduct a hazard evaluation to determine which option is most appropriate.

^{E)} Kitchens with deep oil cookers should be fitted with an appropriate local application system in addition to the sprinkler protection identified in this table (e.g. LPS1223, see BS 5306-0).

29

Mechanical smoke extract

16.11 If basement storeys are fitted with a sprinkler system in accordance with Appendix E, a mechanical smoke extraction system may be provided as an alternative to natural venting. Sprinklers do not need to be installed on the other storeys unless needed for other reasons.

Car parks are not normally expected to be fitted with sprinklers (see Section 11 of Approved Document B Volume 2).

Meanwhile, to prevent smoke ventilation systems impeding the activity of sprinkler systems, **FM Approvals recommends** that in buildings where both systems are installed the SHEV system should either be manually controlled – allowing firefighters to activate it when they arrive at the building – or only automatically triggered when temperatures at the relevant sensor reach **182oC (360 oF)** and that quick-response sprinklers be located directly below vents.

TB234.4.18 Ventilation – smoke vents

Where installed, smoke vents shall be implemented in a way such that they do not adversely impact upon the capability of the sprinkler system.

COMMENTARY AND RECOMMENDATIONS ON TB234.4.18

Experience has shown this can be best achieved by either:

- manual control of smoke vent operation (for activation by Fire and Rescue Service); or
- where systems are automatic, an appropriate activation time delay triggered by the sprinkler system operation (where this option is exercised careful consideration needs to be given to the life safety implications – there will be an uncertain time delay from ignition to sprinkler activation in addition to any time delay between sprinkler activation and smoke vent opening). The authority should be consulted.

TB234.4.19 Ventilation – forced and HVLS (high volume low speed)

Forced ventilation shall be shut down immediately upon sprinkler or fire alarm detection which has caused fire. The effect of shutting down forced ventilation systems shall be considered by means of a risk assessment process (for example, upon accumulation of toxic gases, dust, accumulation of explosive materials, availability of oxygen, etc.).

HVLS fans should be centred between four sprinkler heads.

COMMENTARY AND RECOMMENDATIONS ON TB234.4.19

Forced ventilation systems can have a detrimental effect upon fire protection from sprinkler systems in a number of ways, for example: by moving hot gases, encouraging horizontal fire spread, ventilating a fire, and adversely affecting sprinkler distribution patterns.

Where a risk assessment reveals that there could be life safety implications arising from deactivating such systems, agreement of the system implementation should be sought from insurers and any other relevant authorities.

30

Design of sprinkler systems

- E3** Where required, sprinkler systems should be provided throughout the building or separated part, unless acting as a compensatory feature to address a specific risk. They should be designed and installed in accordance with the following.
- For residential buildings, the requirements of **BS 9251**.
 - For non-residential buildings, or residential buildings outside the scope of **BS 9251**, the requirements of **BS EN 12845**, including the relevant hazard classification together with additional measures to improve system reliability and availability as described in Annex F of the standard.

NOTE: Any sprinkler system installed to satisfy the requirements of Part B of the Building Regulations should be provided with additional measures to improve system reliability and availability and is therefore to be regarded as a life safety system. However, there may be some circumstances in which additional measures to improve system reliability and availability specified in Annex F of **BS EN 12845** are inappropriate or unnecessary.

- E4** If the provisions in a building vary from those in this document, sprinkler protection can also sometimes be used as a compensatory feature.

BS 9251 makes additional recommendations when sprinklers are proposed as compensatory features.

See next slide

31

**IT IS RECOMMENDED THAT ANY COMPENSATORY FEATURES ALLOWED
WHEN INSTALLING SPRINKLER SYSTEMS SHOULD BE DISCUSSED WITH AHJ'S
AS EARLY AS POSSIBLE IN THE CONTRACT.
THIS WILL AVOID DEBATE / DISSAGREEMENT / REFUSAL OF APPROVAL
WHEN THE SYSTEM IS INSTALLED AND HANDED OVER.**

BS 9251:2021

BRITISH STANDARD

NOTE 4: There are occasions when a sprinkler system can be proposed as part of a fire strategy to compensate for, or overcome, circumstances where a building is unable to follow guidance issued in support of building regulations (see 4.2.3).

There are also occasions when a sprinkler system can be proposed as part of a fire strategy to mitigate risks in existing buildings of the Regulatory Reform (Fire Safety) Order [13], e.g.:

- an older building where the existing construction cannot achieve the recommended fire resistance appropriate to the use of the premises;
- a building that cannot meet the recommendations for fire appliance access;
- loft conversions where it is either not practical or not possible to secure adequate means of escape;
- any building where there is doubt about adequacy of fire protection and safety provisions, or concerns over design of building in relation to fire safety, e.g. stay-put policy, single staircase, combustible materials of construction, etc.; and
- any circumstances in which sprinkler protection is provided as a compensatory feature or departures from other Standards or national guidance, e.g. **BS 9991** permits certain forms of open plan dwelling provided the dwelling is sprinkler protected.

As previously stated, it would be impractical for this British Standard to cover all circumstances. It is therefore essential that consultation take place, and where deemed appropriate to the circumstances, there might be a need to increase the category of system, the design density and/or the resilience of the system. It is not implied that in all cases there is necessarily a need to upgrade the category or increase resilience. It would be beneficial to justify any proposals by means of a fire safety strategy in such cases to support the proposals for the specific case. See also **BS 9991**, **BS 9999**, **BS 7974**.

32

Legislation

The legal requirements for fire sprinkler systems differs throughout the UK and you should refer to the local Building Regulations for the current requirements.

	Houses	Flats	Care Homes	Schools	Warehousing
England	No	Yes (a)	Yes	No	Yes (1)
Northern Ireland	No	Yes (a)	Yes	No	Yes (2)
Scotland	Yes	Yes	Yes	Yes	Yes (3)
Wales	Yes	Yes	Yes	Yes	Yes (1)
Ireland	No	Yes (B)	No	No	Yes (2)

- (1) Sprinklers required in warehousing over 20,000 m²
- (2) Sprinklers required in warehousing over under 18 m in height with a floor area of 20,000 m²
Sprinklers required in warehousing over 18 m in height with a floor area of 4,000 m²
- (3) Sprinklers required in Cat 1 warehousing over 1,000 m² up to a maximum of 2000 m²
Sprinklers required in Cat 2 and above warehousing over 14,000 m²
- (a) Flats over 11 meters and over 3 stories
- (b) Flats / mixed use Buildings over 13 meters

Read the notes – It can make a big difference

33

WAREHOUSE SIZES(AREA) WHERE SPRINKLERS ARE MANDATORY

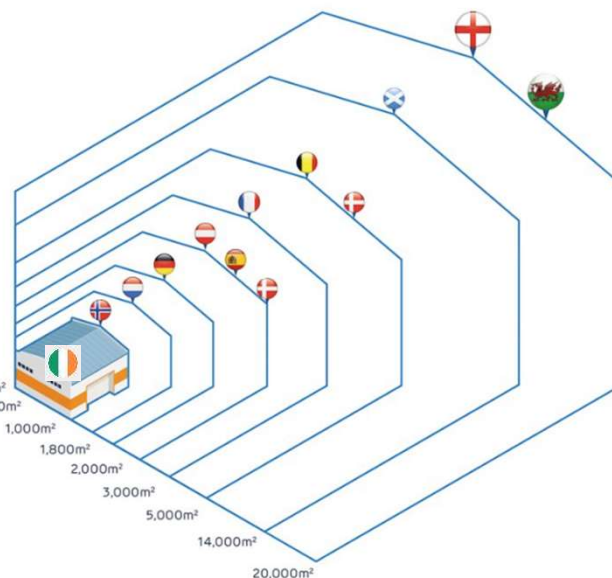
THIS PICTURE SHOWS THE
COMPARISON BETWEEN THE
TRIGGER AREA OF A
WAREHOUSE IN THE UK
COMPARED TO OTHER
EUROPEAN COUNTRIES.

In Norway the maximum area of a warehouse **without** sprinkler is about **1/7th** of a premier league football pitch.

In England and Wales, the maximum area of a warehouse **without** sprinklers is almost **3** premier leagues football pitches

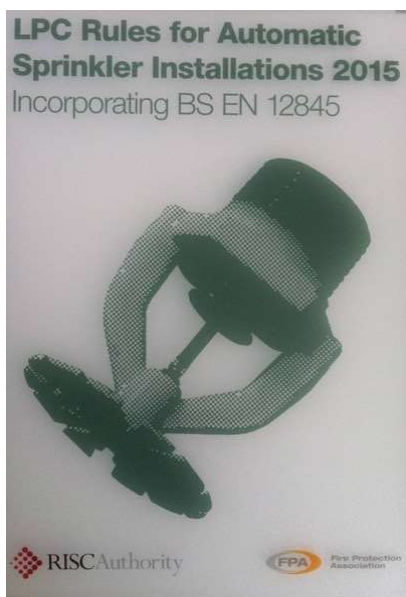
Quite a difference!!!

premier leagues football pitches 105m x 68m = 7,140m²



Fire safety guidance in EU warehouses with respect to installation of fire sprinklers. Images supplied by Author / Contributor

34



The Fire Offices Committee Rules for sprinkler installations were first issued in 1886 and were in use until 1986 when the 29th edition of the Rules was superseded by an early BS 5306 Part 2.

This in turn was replaced in 2003 by a European standard published in the UK as BS EN12845. The current standard is BS EN 12845 Part 1 dated 2019.

The LPC Rules include the full text of BS EN 12845-1 as well as a series of Technical Bulletins which can be imposed by the insurance companies.

Note : the Scottish technical handbook requires Non-Domestic Buildings to be installed with The LPC Rules

35

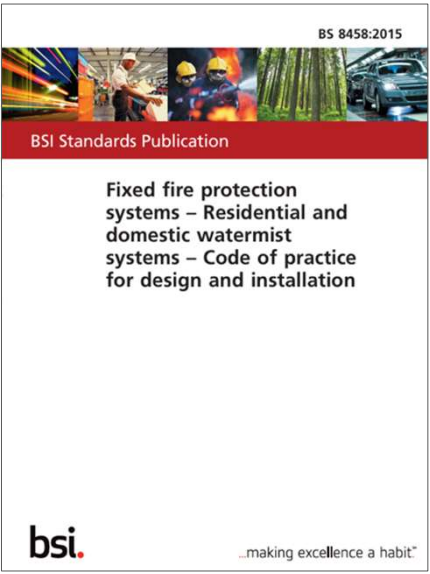


A Code of Practice for sprinklers in domestic and residential premises which was first introduced as a technical Bulletin attached to BS5306 Pt 2 in the 1990's

Then in 2000 as DD 251 and became a full standard as BS 9251 : 2014

This document was considerably revised and re-issued as BS 9251 : 2021

36



BS 8458:2015

BSI Standards Publication

Fixed fire protection systems – Residential and domestic watermist systems – Code of practice for design and installation

bsi. ...making excellence a habit™

Until the release of BS8458 and BS8489 water mist systems were used and proven to work through live fire tests in different scenarios.

These tests were mainly sponsored by Ultrafog and Marioff. These companies had been working on these since the 1970's.

With the development of the residential market there have been some steps forward to utilise water mist systems in domestic properties.

The basis of the British Standards that were issued in 2015 was the systems (and their components) must be tested, approved and certificated.

Each watermist company has its own design guidelines and must follow their bespoke DIOM manual (Design, Installation, Operation and Maintenance manual).

Therefore, the standard is wholly reliant on each individual nozzle which is the key system component.

Due to the release of BSEN14972 series these standards are in the process of being withdrawn

37

<https://www.bafsa.org.uk/bafsa/basfa-resources>

LOTS OF GREAT SPRINKLER INFORMATION AVAILABLE

FOR FREE ON THE BAFSA WEBSITE



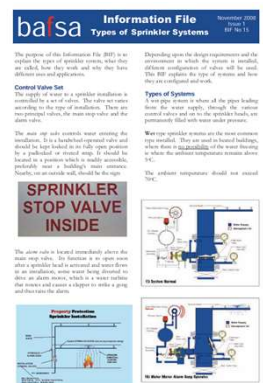
#6a

General Sprinkler FAQ's



#14

Fire sprinkler systems in care homes



Information File

Types of Sprinkler Systems

TYPE BAFSA

CLICK BAFSA TAB

CLICK BAFSA RESOURCES

38

For Sprinkler Equipment

Red Book Live (www.redbooklive.com)

The screenshot shows the Red Book Live website interface. At the top, there is a red banner with the text "A mark of trust" and the LPCB logo. Below this is a search bar with the text "Search All" and a magnifying glass icon. To the right of the search bar, there is a link that says "Click on Fixed Fire Fighting Systems". Below the search bar, there is a section titled "How it works" with three steps: 01 Search for a product, service or company; 02 Check a certificate; and 03 Contact a supplier. Below this, there is a section titled "Featured Categories" with four images: Fire detection systems, Passive fire protection, Security protection products, and Fixed fire fighting systems. The URL <https://www.redbooklive.com/> is displayed at the bottom right.

39

BS 9251 System – Tank and Pump/s

APPROXIMATE Tank sizes for:

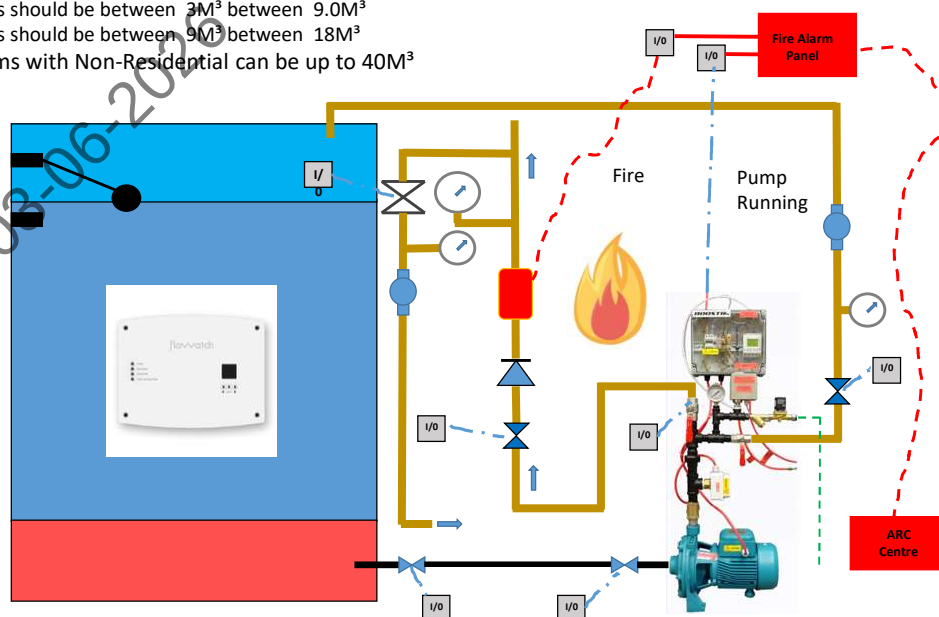
Cat 1 systems should be between 1M³ between 1.2M³

Cat 2 systems should be between 3M³ between 3.3M³

Cat 3 systems should be between 3M³ between 9.0M³

Cat 4 systems should be between 9M³ between 18M³

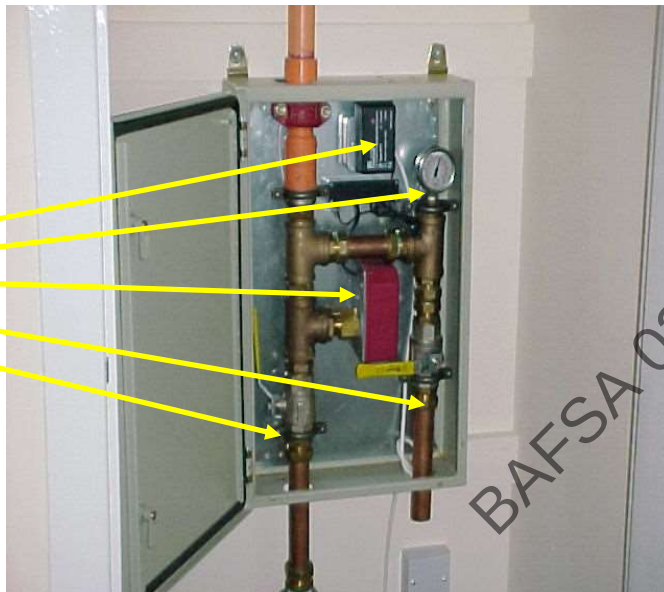
Cat 4 systems with Non-Residential can be up to 40M³



40

Domestic sprinkler system water supply control unit

Alarm signalling device
pressure gauge
flow switch
test pipe
stop valves,



41

Third Party Accreditation Sprinkler Schemes

Third Party Certification in the UK is a voluntary process through which reputable companies choose to demonstrate their competence and abilities to their clients.

The independent third party, the certification body, is confirming that the certificated company/organization is competent and capable of undertaking specified work within recognized scheme parameters.

Companies that are part of a Third-Party Certification scheme are subject to regular audits.

Insurers, builders, clients look for piece of mind so look for Third Party Accreditation

All BAFSA installer members are Third Party Accredited New BAFSA applications will either be accredited or in the process of doing so.

42

Sprinkler system **Certificates of Compliance** issued by the sprinkler installer to the property owner.

Most sprinkler systems will have a Certificate of Compliance that the installer issues which guarantees that the system is in full compliance with the design standard i.e. BS EN 12845, BS 9251 etc. Its **continued validity** has conditions attached!!!

On One third party accrediting scheme their Certificate of Compliance states the following:

For this certificate to remain valid, it is necessary for the complete sprinkler installation to be serviced and maintained fully in accordance with the requirements of the applicable installation standard. **Servicing and maintenance work must be carried out by an LPCB Approved Sprinkler Contractor** that has servicing included in it's ISO 9001 certification scope. All extensions and alterations must be carried out by an LPS 1048 Approved Sprinkler Contractor approved at the appropriate level. For Approved Sprinkler Contractors check on the LPCB's web site www.redbooklive.com. Works must be designed and installed in accordance with the requirements of the original installation standard. Any changes made to storage and the user should consult the installing company.

NOTE:

There is a difference between a **Completion Certificate** and a **Certificate of Compliance**.

- **The Completion Certificate** is issued by the installer when the system is commissioned and handed over stating they have done the work they were employed to do i.e. installed the sprinkler system.
- **The Certificate of Compliance** is a statement that the sprinkler system has been designed and installed to whatever standard required i.e. BS 9251, BS EN 12845 etc. If there are any deviations from the standard the installer must list them on this certificate.

43

ANY QUESTIONS?



44