B.I.O. framework factsheet: SPRINKLERS

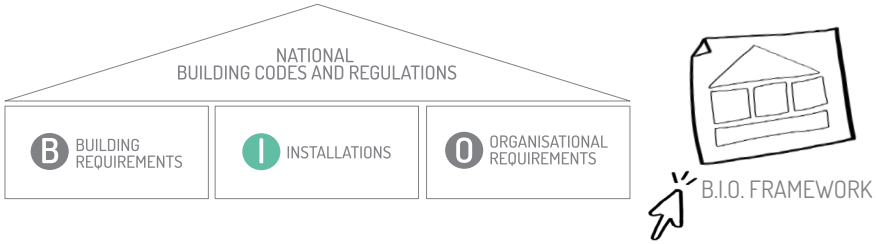
EUROPEAN FIRE SPRINKLER NETWORK

MODERN BUILDING ALLIANCE
Safe and sustainable construction with plastics

This factsheet, developed in collaboration with the European Fire Sprinkler Network, focuses on one the element of the B.I.O. framework for fire safety in buildings: Sprinklers.

It aims to illustrate why sprinklers are key components of an efficient fire safety strategy and how this technology works.

EUROPEAN FIRE SPRINKLER NETWORK



What is a fire sprinkler system?

A fire sprinkler system is an automatic extinguishing system that detects, controls and, in some cases, extinguishes a fire in its initial stage. The elements included in a sprinkler system are:

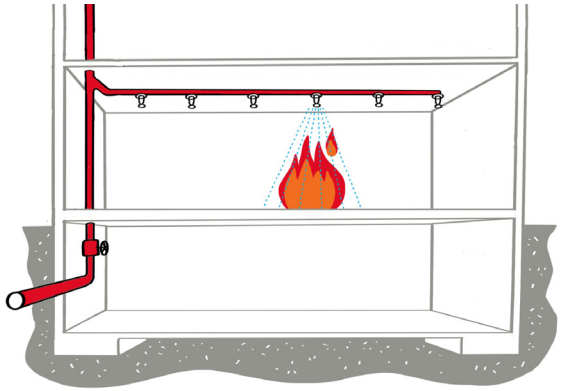
- Sprinklers
- Alarm valve
- Riser
- Mainline
- Branch lines
- Water supply

Types of fire sprinkler systems

There are various types of sprinklers that are adapted for a wide range of applications to protect various risks. They can be installed effectively and safely in residential buildings, public buildings, industries and homes.

In general, sprinkler systems can be differentiated by the type of discharge, activation temperature, installation position, response time and protection type.

How does a fire sprinkler system work?



If a fire occurs in a room, the temperature will rise due to the heat released from the fire source. When the temperature reaches the operating temperature of the sprinkler, the fluid contained in the glass bulb expands breaking the bulb, causing the water seal to open and water to spray over the fire below. In most cases the sprinkler operates when it reaches 68°C but other operating temperatures are available to suit all ambient temperatures.

The table below shows the associated colour of the fluid in the glass bulb for each activation temperature.

Colour of fluid inside the bulb	Activation temperature in °C
	57
	68
	79
	93
	141
	182
	204/260

The coverage area of the sprinkler is determined by the shape of the deflector.

Myths about fire sprinklers

Sprinklers can activate without a fire

The glass bulb will only break when the fluid inside reaches the operating temperature. When that happens, the water seal falls away causing the water to spray. Only heat can activate a sprinkler.

All sprinklers activate together

According to a UK study, in 72% of home fires, only a single sprinkler was activated. Two sprinklers activated in 18% of home fires. For non-residential building fires, a single sprinkler activated in 62% of cases and two sprinklers in 19%.

Smoke kills, sprinklers do not help

In the case of a fire, a sprinkler system can reduce the temperature of the room where the fire originated as well as the volume of toxic gases released by the fire. When sprinkler systems are not available, the temperature increase will be much greater and the fire spreads to other items, leading to a greater release of smoke.

Sprinklers are unreliable

According to reports published by various European countries, sprinkler systems are highly effective in the case of a fire.

Country	Reliability (%)	Source
Denmark	97	Reliability of Automatic Water Sprinkler Systems (AWS) DBI Report 2008:02
France	97-100	Facteurs d'influence sur la capacité d'une installation sprinkleur à fonctionner correctement
Germany	98	Schadenspiegel - Special feature issue risk factor of fire
Sweden	99	Tilförlitlighet för automatiska vattensprinkler-anläggningar
UK	94	Efficiency and effectiveness of sprinkler systems in the United Kingdom: An analysis from fire service data

Facts demonstrating the effectiveness of sprinklers systems in the case of a fire

- In 99% of cases, sprinklers are successful in containing, controlling or extinguishing a fire.
- Sprinklers release less water than fire service hoses, resulting in less water damage to the building and its contents.
- Sprinkler systems reduce greenhouse gas emissions from fires by 98%, reduce fire damage by up to 97%, reduce water usage in suppressing home fires by as much as 91% and reduce water pollution.

The use of fire sprinkler systems in Europe

The minimum requirements for compulsory installation vary from country to country. Some of the criteria considered are the area of the rooms, the height of the buildings, the number of people and the building's use.

In light of the benefits from installing fire sprinkler systems, their use should be more widespread in residential buildings. Indeed, sprinklers in Wales are required in all new houses and apartments, from next year in all new apartments and social housing in Scotland and later this month in all new apartments higher than 11 m in England; in Norway they are required in all new apartments, hospitals, hotels and care homes. All the Nordic countries, as well as Scotland and Wales require sprinklers in new care homes.

Portugal similarly boasts another regulation that promotes the use of sprinklers, where it is mandatory if a hotel exceeds 9m, has a capacity of more than 100 people and 50 beds.

European regulations often incentivise the use of sprinklers, for example by allowing evacuation routes to be longer than normal and the fire resistance of individual compartments to be reduced, implicitly highlighting the benefits of sprinkler systems to ensure evacuation can be carried out safely.

EUROPEAN FIRE SPRINKLER NETWORK

MODERN BUILDING ALLIANCE
Safe and sustainable construction with plastics

Focus on new residential buildings: What are the legislative requirements for the use of sprinklers across the EU?

Sweden
>16 storeys (approx. 45m high*)
Below 16 storeys, the use of sprinklers allows performance based design

Norway
All new dwellings with more than 2 storeys (approx. 5,60m high*)

Finland
>56m high

Czech Republic
>8 storeys (approx. 22m high*)
>4 storeys (approx. 11m high*) & >50 apartments semi-combustible structure
>5 storeys (approx. 14m high*) & >30 apartments combustible structure
>3 storeys (approx. 8m high*) & >20 apartments

Estonia
>16 storeys

Lithuania
>75m high

Poland
>55m high

Austria
>32m high
Between 22m and 32m the use of sprinkler allows to reduce fire resistance requirements

The Netherlands
>70m high
Below 70m the use of sprinklers allows to reduce other requirements (fire resistance, travel distance, compartment size, number of hydrants)

Ireland
Open-plan apartments, Timber-framed houses >3 storeys (approx. 8m high*)

Slovakia
>500 residents

Hungary
>30m high

UK
Wales: all housing
Scotland: apartments and social housing
England: >2 storey house with open-plan ground floor. >3 storey house without 2nd staircase.

Serbia
>30m high

Greece
>28m high

Spain
Top floor>80m high

Luxembourg
>60m high
Youth accommodation >3 storeys (approx. 8m high*) with rubbish stored in building

Germany
>60m high

Slovenia
>32m high

No requirement for residential buildings
Belgium, Croatia, Denmark, France, Italy, Portugal, Romania

* when the regulation only specifies the number of storeys, we approximated the height by considering 2.8m per storey for the sake of comparisons.

Information gathered on the EFSN website in October 2020 - legislations may change, please consult EFSN website for up-to-date information. (https://www.eurosprinkler.org/law/)

To know more

1. EU Fire Safety Guide, https://www.modernbuildingalliance.eu/EU-fire-safety-guide#earlysuppanchor
2. https://www.eurosprinkler.org/

References

1. Efficiency and Effectiveness of Sprinkler Systems in the United Kingdom: An Analysis from Fire Service Data, Optimal Economics, May 2017
2. Information consulted on the website of European Fire Sprinkler Network EFSN, October 2020
3. Information consulted on the website of Homefiresprinkler.org, August 2020
4. Environmental Impact of Automatic Fire Sprinklers, FM Global, March 2010.
5. Presentation of EFSN during the European Fire Safety Week 2019, https://www.modernbuildingalliance.eu/assets/uploads/2019/07/EFSW2019_-Alan-Brinson_pres.pdf, consulted in August 2020

Last modification: October 2020