



## **Position paper on sprinkler protection of façades**

**February 2024**

## Introduction

For decades little attention was given by regulators to the fire safety of façades. That changed with the disastrous Grenfell Tower fire on 14 June 2017 in London, which claimed 72 lives when combustible cladding led to the spread of what should have been a routine, inconsequential refrigerator fire to the entire external surface of the building. Grenfell Tower was not protected with sprinklers. Had it been new, it would have been sprinklered. There has been much debate about what contribution sprinklers could have made that night. We know that combustible cladding fires in sprinklered buildings have not led to any deaths, with sprinklers preventing fire from spreading from the cladding into the building. Nevertheless, the damage was significant. Sprinklers cannot prevent a cladding fire from spreading, potentially to so many storeys that the sprinkler system could be overwhelmed. Authorities are also concerned about the risks of external fire spread from balconies, because they or the façade are of combustible construction and there are new ignition sources from e-bikes, often kept on the balcony. CEN has just approved the revision of EN 16925, the European residential sprinkler system design and installation standard, to include design guidance for the extension of protection to balconies. To be clear,

**The EFSN does not suggest that combustible cladding is acceptable with sprinklers.**

Aside from combustible cladding, there are other combustible materials being fitted on the outside of buildings, such as timber, photo-voltaic panels and vertical gardens. Photo-voltaic panels contain sufficient plastic in their panels and connecting wiring to sustain a façade fire. Water from exposure protection sprinkler systems would not reach these materials.

This paper summarises what is known about the use of sprinklers to protect buildings from external fire and how this is codified in Europe.

## National codes

Some national fire safety building codes accept sprinklers as an alternative to non-combustible balconies or spandrels (short walls) to protect against vertical external fire spread from one floor to another. In the national summaries below are some examples.

### Austria

Austria permits sprinklers to be used as a means to prevent the spread of fire from one storey to another above, as an alternative to non-combustible construction.

### Belgium

Belgian requirements are reproduced here in detail, in unofficial translation. Similar requirements exist in other countries.

Royal Decree of 7 July 1994 Fixing the basic standards of fire and explosion protection that buildings must meet, states the following:

#### 3.5 Façades

##### 3.5.1 Single wall facades

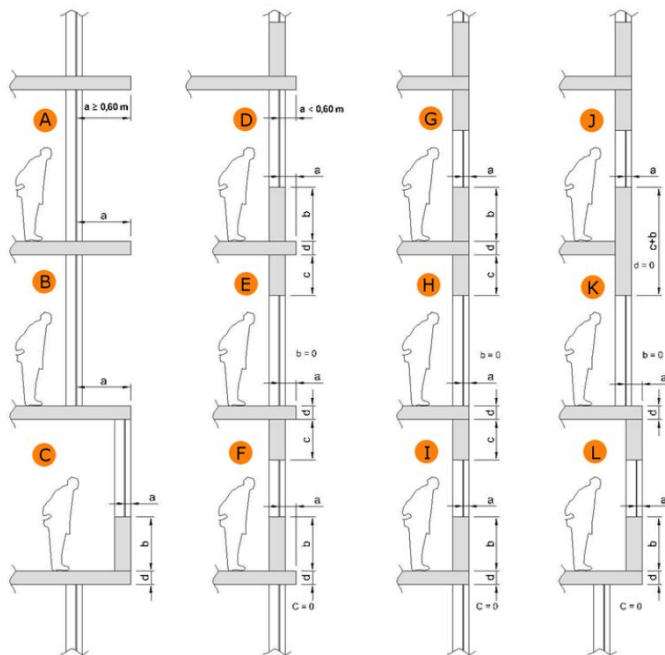
##### 3.5.1.1 Separation between compartments

The uprights constituting the facade frame are fixed to the building frame at each level. With the exception of buildings equipped with an automatic extinguishing installation, these fixings must present R 60 considering a fire in the adjoining or lower compartment.

The junction of the compartment walls and the facade has at least EI 60 or EI 60 (i→o). To limit the risk of fire spreading between compartments along the facade, on a horizontal or vertical plane, one of the following requirements must be met:

(1) either the facade is equipped with a fire-resistant construction element at the junction between the facade and the compartment wall (horizontally or vertically).

The illustrations on Figure 4.3 show how this construction element is made in the case of a horizontal compartment wall.

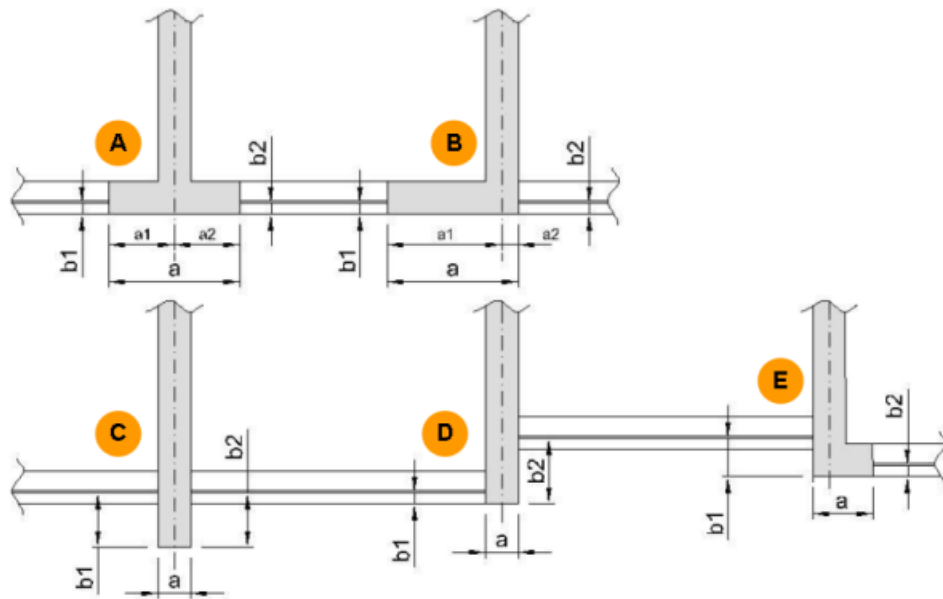


It includes:

- either a horizontal projection having at least E 60 of width "a", equal to or greater than 0.60 m, connected to the floor (Figure 4.3, illustrations A and B);
- either an element consisting of:
  - a horizontal projection having at least E 60, of width "a", connected to the floor;
  - at the upper level, a spandrel which has at least E 60 - (o→i), of height "b";
  - at the lower level, a lintel which has at least E 60 (i→o), of height "c".

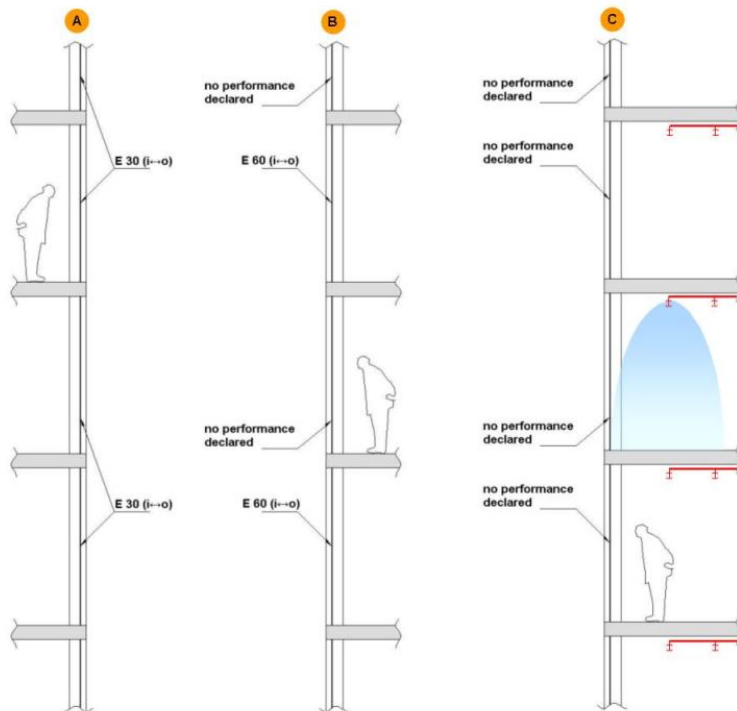
The sum of dimensions a, b, c and d (thickness of the floor) is equal to or greater than 1 m, each of the values a, b or c possibly being zero (Figure 4.3, illustrations C to L).

The illustrations in Figure 4.4 show how this construction element is made in the case of a vertical compartment wall



It includes:

- either an element located in the extension of the facade and which presents at least E 60 (i↔o); the width of this element ( $b_1+b_2+a$ ) (Figure 4.4, illustration A and B) is 1 m at least; the parts of this element located to the left and right of the axis of the party wall have a width of at least 0.50 m, if they are two separate buildings; ( $a_1 \geq 0.50$  m and  $a_2 \geq 0.50$  m);
- or a vertical projection, in the axis of the wall separating the two buildings or compartments and which has at least E 60 (o→i) (Plate 4.4, figure C) or E 60 (i→o) (Plate 4.4, figure D); the length of this element ( $b_1+b_2+a$ ) is at least 1 m;
- either a combination of the preceding elements in such a way that the sum of the lengths is at least 1 m (Figure 4.4, illustration E)



(2) or the facade has at least E 30 (i↔o) over the entire height of the building (Figure 4.5, illustration A), or E 60 (i↔o) at every other level (Figure 4.5, illustration B).

(3) or the compartments located along the facades are equipped with an automatic sprinkler system appropriate to the risks present (Figure 4.5, illustration C).

A Belgian colleague comments that, 'In principle it only the façades or nearby that must be protected, but on conducting a risk analysis one soon realises such a system would not comply with EN 12845 since that would require compartmentation between the protected and unprotected areas, which is impossible to achieve and thus protection has to be extended to the rest of the building.'

### France

To prevent external fire spread from glass facades France, also requires the fire to travel over non-combustible materials, specifically a combined horizontal and vertical distance:

≥ 1.2 m if the façade fire load is ≤ 80 MJ/m<sup>2</sup>

≥ 1.5 m if the façade fire load is ≤ 130 MJ/m<sup>2</sup>

### Germany

In Germany, building law is a matter for the federal states. This means that each State can enact its own regulations. There is a model high-rise guideline. However, this has not been introduced in all States and has been adopted in a modified form in some States. Some States do not have a high-rise guideline at all. It is therefore always necessary to check which regulation applies in the State in question when designing a building.

The following text refers to the model high-rise code and an official explanation of it (from 2005).

Germany requires sprinklers to prevent external fire spread in buildings higher than 60 m, which are anyway required to be fitted with sprinklers. Buildings from 22-60 m in height can avoid the sprinkler requirement if they are divided into compartments of not more than 200 m<sup>2</sup> and there is a fire resistant external spandrel of 1 m height or a 1 m protrusion (e.g. a balcony).

If the building is sprinklered you need either

- a fire resistant external spandrel of 1 m height or protrusion or
- to "include the facade area in the area to be protected by the automatic fire extinguishing system"

The second bullet point is controversial. Some fire safety designers space sprinklers more closely directly on the inside of the facade. The position of VdS is that a sprinkler system designed according to the current state of the art also protects the area of the façade (inside), so that no special measures are required.

In Germany there is much discussion about wooden construction, with the recent publication of State regulations <sup>1</sup> based on the model wooden building code. These documents do not mention sprinklers but do require layers of non-combustible materials inside and outside to encapsulate

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<sup>1</sup> <https://www.mhkbd.nrw/presse-und-medien/pressemitteilungen/fuer-mehr-bauen-mit-holz-bauministerkonferenz-macht-den-weg-fuer-einfacheres-bauen-mit-holz-frei>

the wood. Some fire protection consultants who must produce a fire safety concept for the buildings are requiring additional façade protection. However, there is no consensual guidance for the design of external protection systems.

### Norway

In Bergen there are several areas where wooden houses were built long ago with very little distance between them. This represents a major risk for catastrophic fires so some of the buildings have been protected both inside and outside with sprinklers. For external protection a deluge system is combined with a heat detecting cable, which can be pneumatic or electric. Pneumatic cable is easy to install and quite cheap but the electric heat detecting cable will last longer. Not much water is needed for these designs, typically 2 l/m<sup>2</sup>/min at the top with 40% less at lower levels since water runs down from the nozzles above.

Research recently conducted by RISE in Norway<sup>2</sup> showed that sprinklers and high pressure mist could protect combustible façades from damage caused by a fire escaping from a window to attack the façade above. The researchers used a pendent spray sprinkler and pendent water mist nozzle, stating that both the sprinkler and water mist selections and placements could be optimised for performance.

### UK

The UK does not have regulatory guidance for the use of sprinklers to prevent external fire spread. There are several publications available addressing best practice for design and maintenance of green walls<sup>3</sup>. The carriers for the growing media in green walls are often plastic and the issue of irrigation is regularly raised. There have been a number of wall solutions proposed but generally they will need to be bespoke based on materials of construction and design detailing.

### US

In NFPA 13 façade protection is considered as exposure protection and is covered by section 8.7 “Outside Sprinklers for Protection Against Exposure Fires (Exposure Protection Sprinkler Systems)”<sup>4</sup>. Most sprinkler manufacturers have special open nozzles for this application. These are typically deluge systems with dry pilot actuation. Additionally, most sprinkler manufacturers have specially listed window sprinklers that have been investigated by a special evaluation service of the US Building Codes to provide a two-hour equivalency to fire-rated glass. There is also government guidance for the use of exterior sprinklers to protect homes from wildfires<sup>5</sup>.

## **Summary**

Sprinkler systems cannot be assumed to be able to prevent the spread of a fire in combustible materials on the outside of a building. They can help prevent ingress of such fires but that should not be a reason to permit façade designs that are vulnerable to fire. In some jurisdictions

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<sup>2</sup> Experimental Investigation of Water-Based Fire Suppression Systems on External Façade Fires, C. Meraner, E.S. Skilbred & K. Arsava, RISE Fire Research, Trondheim, Norway, Fire Technology, 2024

<sup>3</sup> [Fire Performance of Green Roofs and Walls \(publishing.service.gov.uk\)](https://publishing.service.gov.uk)

<sup>4</sup> [Outside Sprinklers for Protection Against Exposure Fires \(Exposure Protection Sprinkler Systems\) | UpCodes](#)

<sup>5</sup> [fema\\_p\\_737\\_fs\\_15.pdf \(firesafemarin.org\)](#)

sprinklers are accepted as a means to prevent a fire inside the building from breaking through a window and spreading to the storey above. In others this is not explicitly stated because such buildings are anyway required to be protected with sprinklers. Exposure protection sprinkler systems have been used to protect the outside of old wooden buildings from external fire spread, while balconies could also be protected to prevent spread of fire from e-bikes, barbecues and combustible materials stored on balconies. A bespoke sprinkler system could also be used to protect green walls but there is no standardised sprinkler design to protect photo-voltaic walls.