

Reaction to fire and Resistance to fire

When it comes to the ability of any construction material to withstand fire, two key factors are the material's reaction to fire and its resistance to fire. The terms can be a bit confusing, so if you want to learn the difference between them, read on.

If you are working with fire safety it's crucial to understand the difference between them.



wood planks burnt with a gas burner (Illustration only)

In short resistance to fire is a systems ability to resist penetration of flames and to prevent temperature rise between exposed and unexposed side in a fully developed fire. Reaction to fire evaluates how materials is contributing to the spread of fire.



The Euroclass system is the standard of fire safety across Europe



Reaction to fire

Reaction to fire focuses on the behaviour of the materials when exposed to fire or heat and compares ignitability, flame spread, heat release, smoke production and tendency for producing flaming droplets, etc.

Reaction to fire testing evaluates a construction materials contribution to fire, predominantly in the early stages of a fire starting.

The Euroclass system is the standard of fire safety across Europe and is accepted by all European Union States.

It includes seven classification levels, from A1 to F, where products achieving A1 and A2 classification are defined as non-combustible.

It also have additions for smoke production (the letter S) and flaming droplets (the letter D).

For products for which the reaction to fire has not been evaluated, the letters 'NPD' (no performance determined) are used.

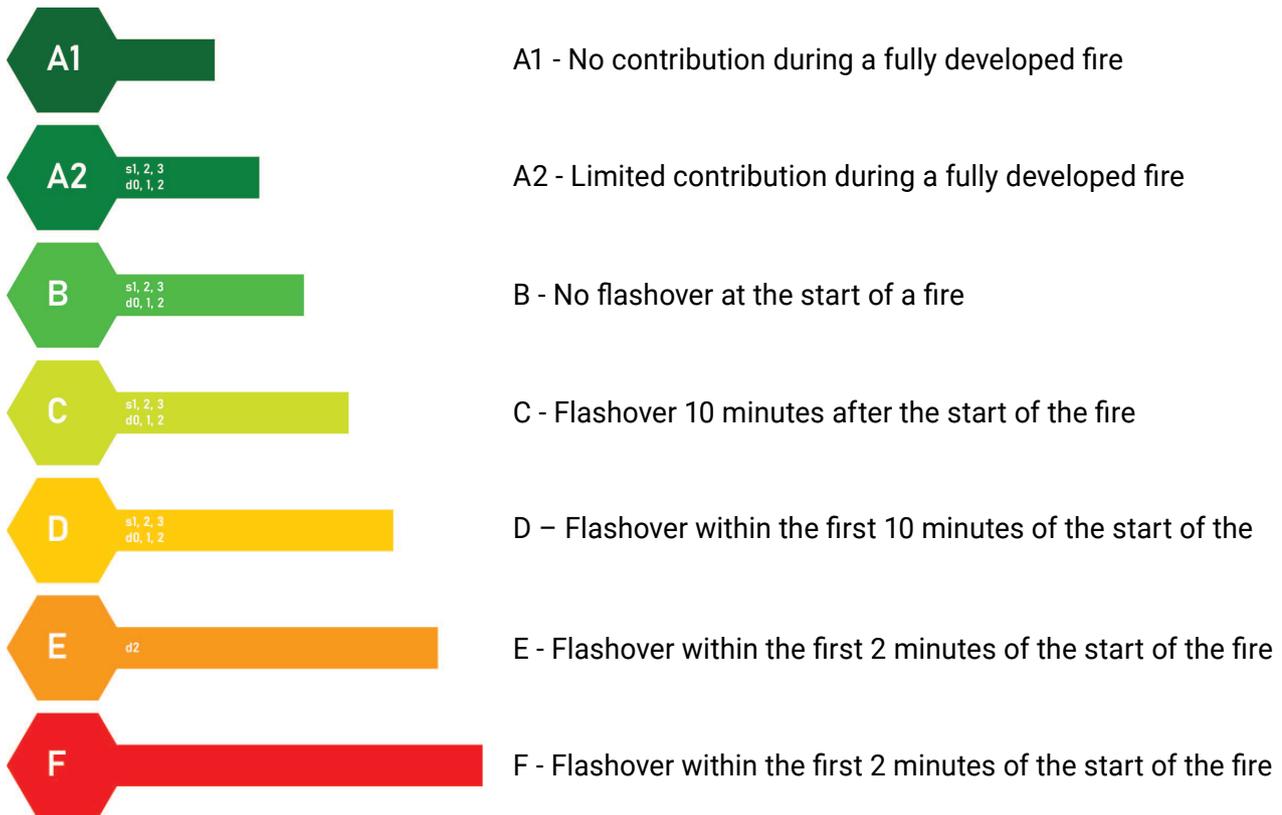
Products belong to one of the seven primary classes according to their level of combustibility, as well as possibly belonging to additional classes according to the amount of smoke developed and the amount of burning droplets or particles.

The Euro class system

Includes seven classification levels, from A1 to F

The first letter indicates a classification based on combustibility and contribution to fire:

A1 and A2 are non-combustible, B till D go from very limited to medium contribution to fire and E and F go from high contribution to easily flammable.



The 's' part relates to the total smoke propagation/emission level. The values range from 1 (absent/weak) to 3 (high).

The 'd' part indicates the 'flaming droplets and particles' during the first 10 minutes of exposure. The index is:

SMOKE

s1 = a little or no smoke
s2 = quite a lot of smoke
s3 = substantial smoke

FLAMING DROPLETS

d0 = none
d1 = some
d2 = quite a lot

Resistance to fire

A products resistance to fire measures how well it performs in containing the fire, preventing it from spreading elsewhere. Whilst reaction to fire properties are critical in the early stages of a fire breaking out, resistance to fire rating become critical once the fire has grown and fully developed.

At this stage the products are required to contain the fire within the specified locations or compartments.

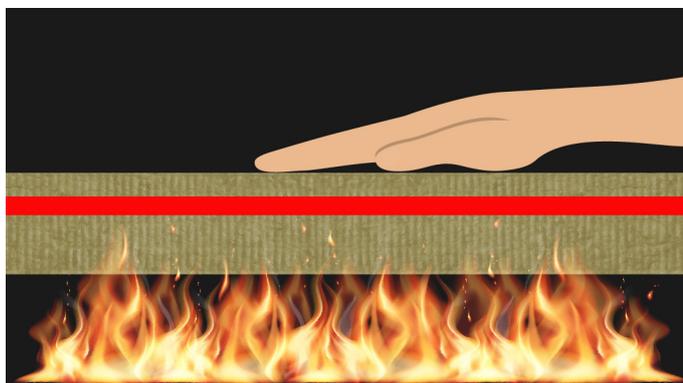
The resistance to fire is then the ability of a construction element to maintain its fire stability, integrity and thermal insulation for a certain period of time.

Supporting capacity (R) is the capacity of the constructive element to resist mechanically, without losing its structural properties.

Fire integrity (E) is the ability of a construction element with a separating function, that is exposed to fire on one side only, to prevent the transmission of fire to the unexposed side as a result of the passage of flames and hot gases.

Thermal insulation (I) is the ability of a construction element with a separating function to withstand fire exposure on one side only, without the transmission of fire as a result of a significant transfer of heat from the exposed side to the unexposed side.

The resistance to fire of a product are indicated as a time duration. It assesses if the product can resist fire and prevent it from spreading to the opposing side for 30, 60, 90, 120 or 240 minutes.



Integrity E:

No flames passing to unexposed side during the certified period.

Insulation I:

Temperature shall never increase more than 140°C on average at unexposed side during the certified period

For non-load-bearing products, only integrity and insulation are measured.

EI60 means that a product should maintain integrity and insulation for at least 60 minutes

Construction product directive and regulations

In the EU, the fire testing and classification standards for construction products have been harmonised for more than a decade under the Construction Products Directive, and subsequently the Construction Products Regulation. These standards have been implemented in all EU Member States



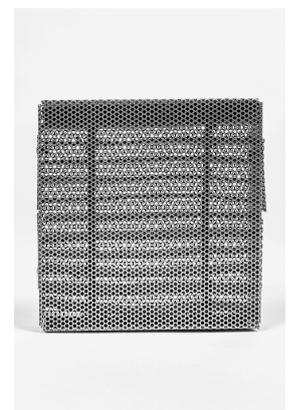
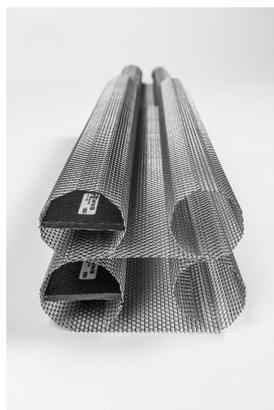
However, whilst fire testing and classification methods for individual products are harmonised in the EU, building regulations for an overall structure - including fire safety requirements – are the responsibility of each individual EU Member State. In other words, Member States determine their own fire safety level and use a mix of products that – used together – correspond to that level.

Member States determine their safety level and some countries have no requirements for individual products used in the façade system, focusing only on the performance of the entire system. However, they do not have a fire-safety test for façades based on real-life, large-scale situations. Some countries allow the use of products not fulfilling the product requirement if the entire system passes a national large-scale test. The other countries have strict requirements for the combustibility of the products used in the façade, from limited combustibility (B s3, d0) to Non-combustible (A2s1, d0).

Source: Fire Safe Europe



All Firebreather products are tested and certified for resistance to fire



By Tronn Røtvoll
Sales Manager - Securo AS