



Materials at fire risk

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Topic: Educational Lighting Site

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Behaviour to fire of materials employed in the construction of premises used for public entertainment

Those premises with a capacity of at least 100 people are to be considered premises used for public entertainment subject to inspections by the Fire Brigade. In order to open and manage this kind of premises, specific authorization and monitoring procedures are imposed by the Bodies responsible for the inspection of working conditions. In this page we are going to examine the behavioural characteristics to fire that such normative laws require from the materials destined to be employed in the construction and the preparation of premises used for public entertainment.

Technical normative laws

Although both the legislation and the technical law regulations are in constant progress, as a consequence of the inevitable technical and scientific developments that involve fire prevention, it is nonetheless possible to outline quite a precise picture of the criteria that must be followed in the construction of structures destined to accommodate activities subject to inspections by the Fire Brigade, in particular, premises used for public entertainment. There is a substantial set of rules related to the behavioural characteristics of materials to fire; they involve both those aspects related to reaction to fire and those aspects related to resistance to fire. These are two different characteristics which are often confused; it is absolutely necessary to remember that the characteristics of reaction to fire are peculiar of materials and in particular of their degree of participation to combustion; characteristics of resistance to fire, on the contrary, are peculiar of structural elements and denote the capacity to maintain their integrity even when they are attacked by the fire. The main rules associated with the characteristics of reaction to fire and the methods used to determine them are as follows: UNI 8546, UNI 8547: "methods to determine reaction to fire of materials likely to be attacked on one or both sides".

- UNI 8068: "method to determine reaction to fire of plastic materials with cellular structure".
- UNI ISO 1182: "method to inspect the incombustibility of building materials".
- UNI 9174: "like UNI 8546 and UNI 8547 but in the presence of radiating heat".
- UNI 9177: "classification of reaction to fire of combustible materials".

The main rules associated with the determination of characteristics of resistance to fire are as follows:

- UNI 7678 and the subsequent FA 100-83: "determination of characteristics of

resistance to fire for structural elements".

- UNI 9723: "determination of characteristics of resistance to fire for doors".

Classification of materials

The assessment of the characteristics of reaction to fire of materials is carried out by means of unified testing procedures performed in laboratories accredited by the Ministry of the Interior, the parameters taken into consideration to determine the level of behaviour of materials are the following:

- Speed of flame propagation: it is measured in mm/min thanks to the optical back-sight placed on the surface of the materials;
- Damaged area: the area involved by the combustion where the material loses its nominal characteristics;
- Post-combustion time: the time during which the material keeps burning after the pilot flame has been put out;
- Post-incandescence time: the time of permanence of coals after the pilot flame has been put out;
- Dripping: the separation of drops or blazing parts.

For each of the above-listed parameters three reference levels are fixed; by multiplying such levels by their respective majority coefficients (which also depend on the modality of use and laying) and by summing them we can obtain a reference number which allows to assign the material being tested to a Category (not a Class) from 0 to 4. Each sample of the examined material is supplied with a test report that must contain all the experimental results with which the category was determined. The assignment of the Class of Reaction to Fire is done by following the indications included in the Law Regulation UNI 9177. Apart from Class 0, which comprises non combustible materials, there are 5 classes of reaction which identify materials with a growing degree of participation to combustion.

Classification of structural elements

While the classification of single materials serves to determine if and to what extent their presence may contribute to feed a fire, the classification of structural elements aims at determining the degree of mechanic and thermal insulation resistance of structures dividing rooms, an important parameter to estimate the containment of flames. In this case too, the accredited laboratories are able to perform the tests described by the Law regulations and to include the structural elements and the accessories (such as doors, for instance) in an index that qualifies their resistance time in the tested conditions. The parameters taken into consideration are: RE, dimensional stability and resistance to fire and to smoke; I, thermal insulation. An element (door) classified as REI 120 is capable of retaining its structural integrity and does not allow the fire, smoke and heat to pass through it for at least 120 minutes.

Legislation in force

Now that the classifications of materials and structural elements have been acquired, we are able to read and interpret those Law provisions whose observance is monitored by special Provincial Committees, As already mentioned, since 1951 (the year of the publication of Circular 16) the legislation has undergone various updatings especially up to 1983, the year in which the D. M. of 6th July 1983 "Rules on the behaviour to fire of structures and materials to be employed in the construction of theatres, cinemas and other premises destined to public entertainment in general" was published, it is currently enforced on the modified form which was included in 1995 (GU 05/07/1995). When planning of premises destined to public entertainment, it is first of all necessary to determine the fire load of the

different behaviours into which it can be divided by using the indications and the formulas established in the famous "Circular 91 of 1961"; the value of the fire load, in fact, represents the guide number used to fix the minimum characteristics of resistance to fire of structural elements and closing elements. With regard to the characteristics of reaction to fire of lining and furnishings, the decree-law establishes what follows: entrance halls, corridors, stairways and passages in general are Class 0 materials.

For all other rooms: floors capable of catching fire on both sides belong at least to Class 1. Stuffed armchairs and furniture to at least Class 1 IM (class including only stuffed items), while Class 1 comprises materials for external lining. Lining materials must stick to non combustible structural elements, the presence of hollow spaces is allowed only when they are filled with incombustible material. If contrivances and/or devices that can improve safety conditions on the premises and that differ from what is established in the D.M. 06/07/1983 and in Circular 16/1951 (such as, for instance, smoke and heat evacuators, fire detectors, automatic fire extinguishers and so on) are employed, it will be possible to use Class 1, 2 or 3 materials instead of Class 0, 1 and 2 ones, but the curtains will have to be Class 1 in any case. Eventual skylights will need glass equipped with a safety net or built with Class 1 materials; the stage can have a wooden floor, but elsewhere a similar floor can only be allowed if firmly fixed to a non combustible stand or lined with non combustible material. Coreographic and scenographic materials usually belong to Class 2, but, in the presence of safety improvements and the undertaking of responsibility on behalf of the manager, superior classes are allowed too.

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