

# SPANISH FIRE REGULATIONS RELATED TO LIFTS

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## ABSTRACT

In this paper, we will analyze the Spanish Regulations about Fire Protection in buildings in the aspects related to lifts and their effects on the projects. These Regulations are based on two basic elements, the compartmentation and the evacuation, which aims to avoid the uncontrolled propagation of the fire and providing to the occupants with means of leaving the building safely. This philosophy is translated to several requirements related to lift layout, shaft enclosures, lift lobbies, lift doors, machine rooms, necessity of a firefighting lift in particular situations, etc.

## 1 FIRE REGULATIONS IN SPAIN

The fire regulations in Spain have got three main sources: the national regulations, the autonomic regulations and the municipal regulations. The national fire code in force is the "Norma Básica de la Edificación Condiciones de Protección contra Incendios en los Edificios, in the 1991 edition, NBE-CPI-91 (Building Basic Code, Conditions of Fire Protection in Buildings). This code, which is mandatory in all parts of the national territory, has been revised and a new edition is coming out in a few months (NBE-CPI-96). The fire municipal codes are the "Ordenanzas de Incendios" (Fire Ordinances), that change remarkably from some towns to others. In this paper we will make some references to the ordinances of Barcelona, Madrid and Zaragoza but we will not discuss in detail their content. There are also, as it has been said, dispositions promulgated by some of the Spanish autonomous communities.

Besides the specific fire regulations mentioned before, the dispositions of the Lift Code and Low Tension Code directed at avoiding the causes that can originate a fire must be logically fulfilled.

## 2 COMPARTMENTATION AND EVACUATION

The main aim of the NBE-CPI is to establish the conditions that must be fulfilled by the buildings to warrant the security of their occupants in case of a fire of non intentional origin.

There are two basic principles deeply related to each other, and around them the code is developed:

1. Compartmentation of the building in zones (fire-compartments).
2. Establishment of safe evacuation routes.

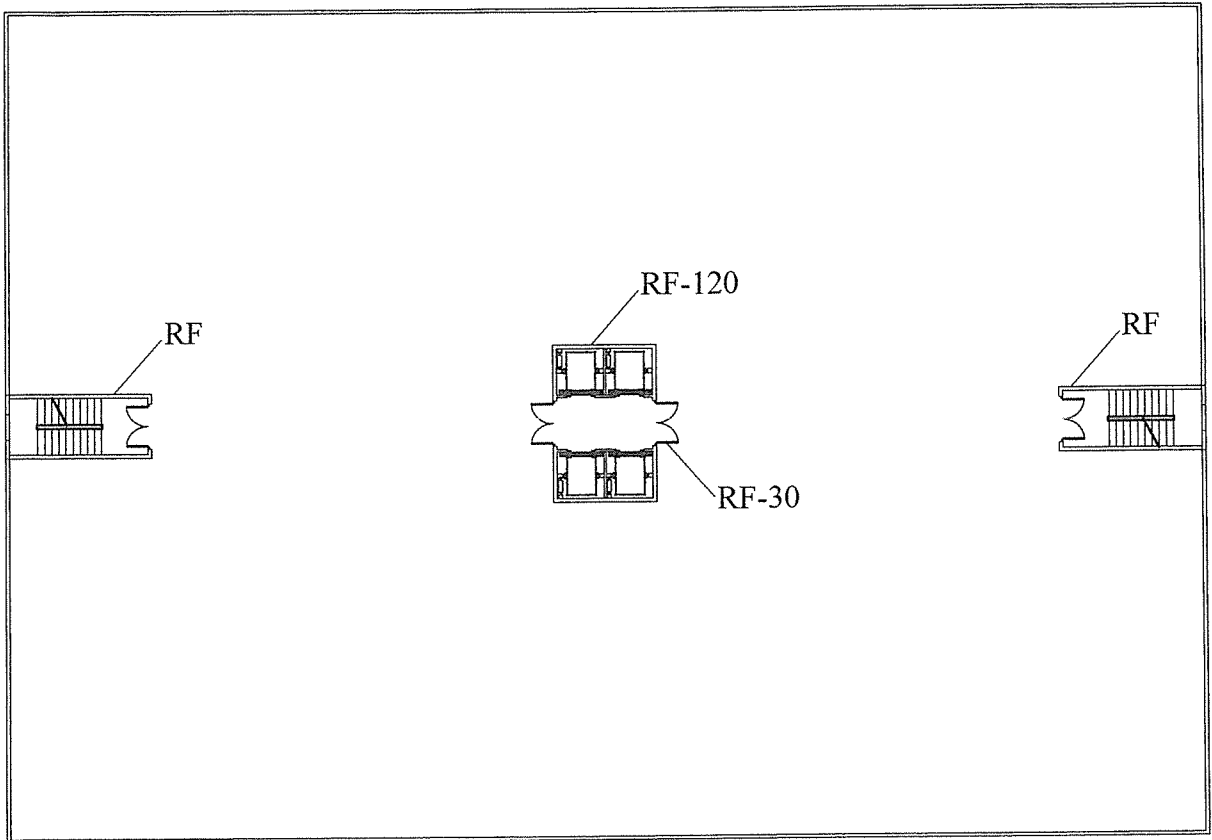


Figure 1. Horizontal compartmentation

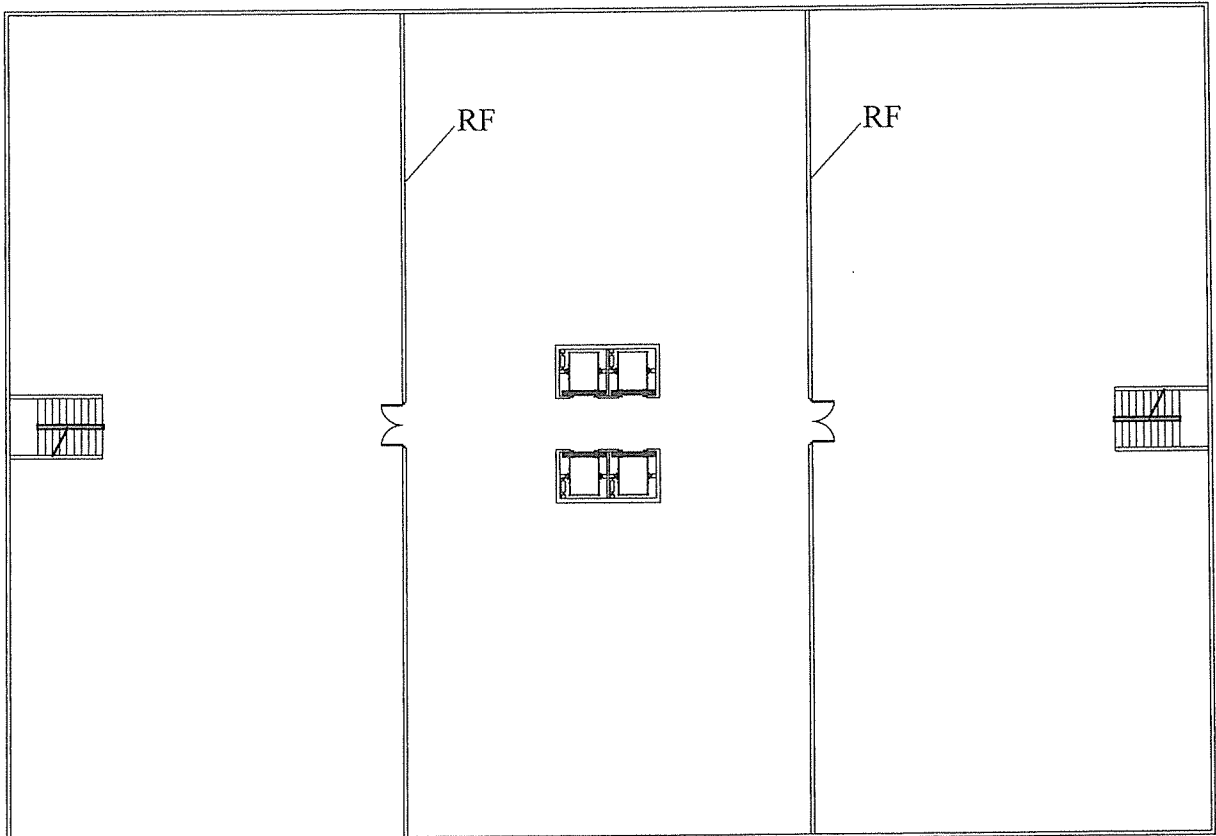


Figure 2. Vertical compartmentation

## 2.1 Compartmentation

Compartmentalizing a building is to divide it in zones (fire-compartments) delimited by fire-resistant elements\* with the aim that the severity and location of the fire remain limited. In this way it is expected to guarantee the control of the fire and the evacuation of the occupants. The maximum area that the code fixes for these compartments is in general 2.500 m<sup>2</sup> (5.000 m<sup>2</sup> with sprinklers), but depend mainly on the use that the building is destined to, since this determines the foreseeable fire-load.

The code let freedom in the concrete way of making the compartmentation although there are essentially two possibilities: horizontal compartmentation and vertical compartmentation. The first one consists in defining each floor like a fire-compartment (Figure 1). It forces the provision of fire-resistant performance to any vertical nucleus of the building. Such is the case of the stairs, fittings wells and, of course, lifts, whose layout in this case we will analyze in another posterior section. The vertical compartmentation consists in defining vertical fire-compartments comprising all the floors of the building and remaining delimited these compartments with fire-resistant walls that divide the floors (Figure 2)

## 2.2 Evacuation

The code considers as evacuation elements, the corridors, stairs and ramps. The main characteristics of them will be determined by the use and height of the building, and the number of people to who they serve. Besides, the code establishes several precepts related to the number and layout of exits, the characteristics of doors and system of signals. The lifts and escalators cannot be considered part of the evacuation system. However the passengers conveyors can be considered if they have got an automatic stop system connected to a detection and alarm system. The new NBE-CPI-96 will require besides that trolleys are not used in the building for the transportation of goods, such as the case of the hypermarkets.

The NBE-CPI-91 define four types of evacuation stairs:

1. *Open regular stairs.* This type of stairs has no particular characteristics of compartmentation (Figure 3.1).
2. *Stairs in its own well.* The stairwell must be exclusive to the stairs, although without fire-resistant features. Only lifts and toilets can have access to this stairwell (Figure 3.2). This type of stairs swill disappear in the new NBE-CPI-96.
3. *Protected stairs.* The stairwell must be fire-resistant (RF-120)\* and must have ventilation. The access to the stairs must be through a fire-resistant door. Only lifts and toilets can have access to the stairwell. (Figure 3.3).
4. *Specially protected stairs.* The stairwell must be fire-resistant (RF-120) and must have ventilation. The access to the stairs must be through a previous lobby with the same features as the stairwell. The access door to the previous lobby from the general circulation zones must be fire resistant (in general, RF-

\* Look at section 6 for definitions of fire-resistant elements.

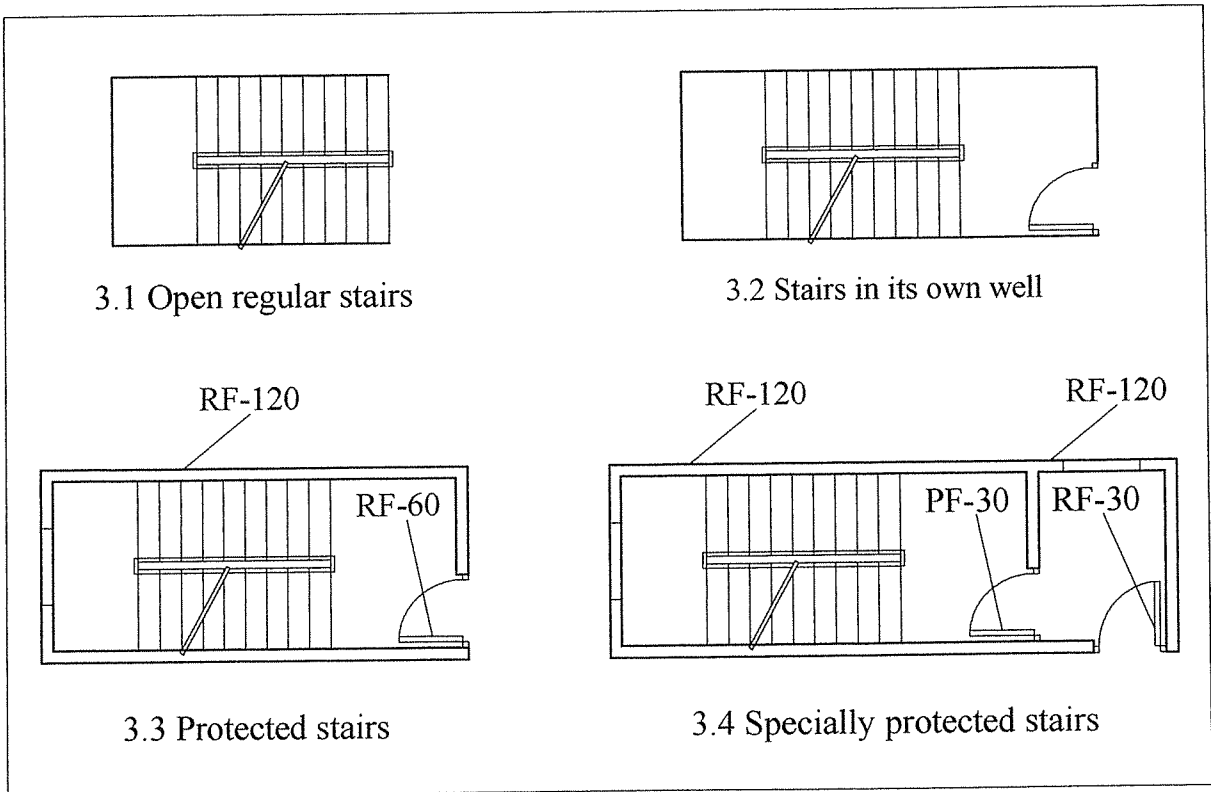


Figure 3. Stair types

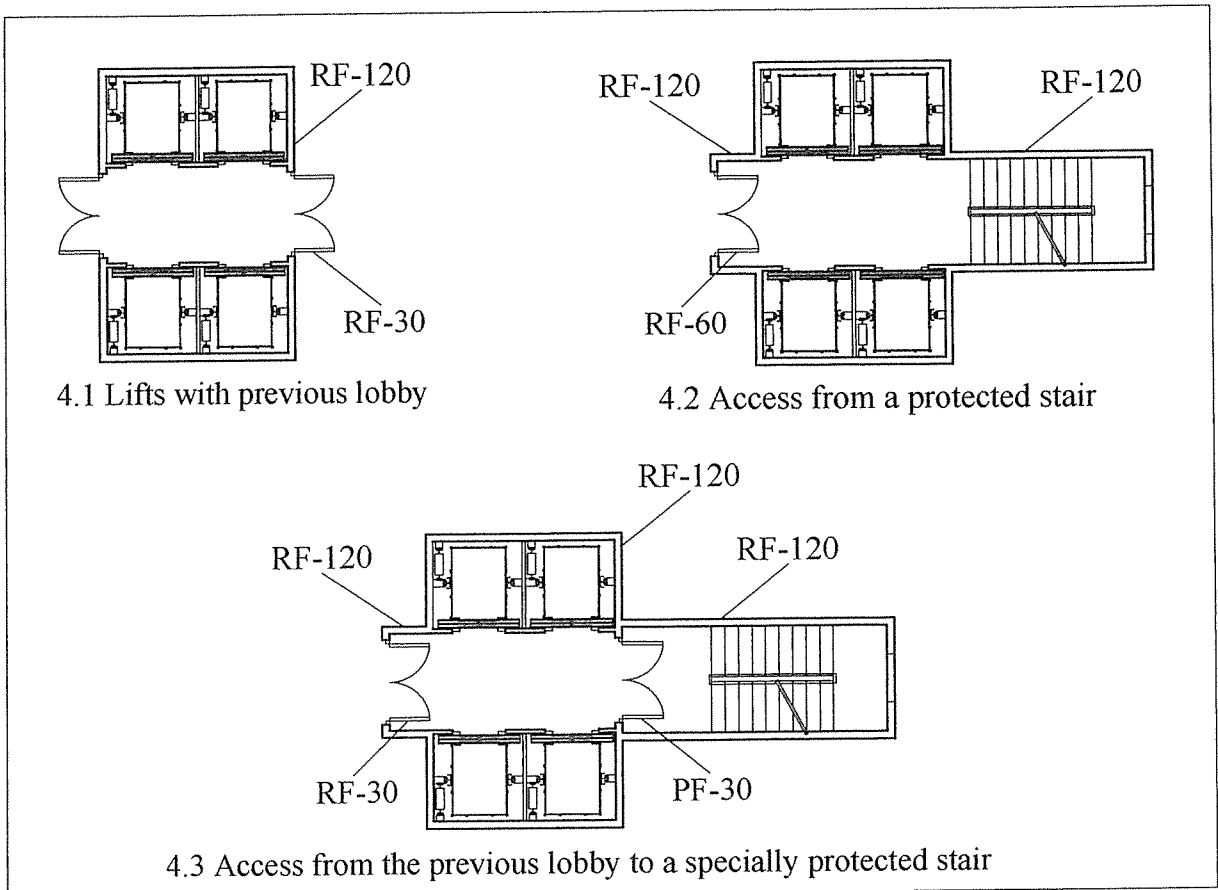


Figure 4. Lifts layout

30) and the access door to the stairs, pare-flames (in general, PF-30) (Figure 3.4). Only toilets and lifts can have access to this lobby .

The requirement of one or another type of stairs depends on the use of the building and the evacuation height and subsidiarily of the compartmentation imposed, since if for the height protected stairs are not required , it can be as a consequence of the division of the building in horizontal fire-compartments.

### 3 THE LAYOUT OF LIFTS IN THE BUILDING

As we have seen, in accordance to the NBE-CPI buildings must be compartmentalized in fire-compartments. We have also seen that depending on how we make this compartmentation, it will affect more or less the vertical nucleus of the building, among them the lifts.

In the case of vertical compartmentation or, in general, when lifts do not cross superposed compartments, these ones can be disposed freely on the building (Figure 2), that is, the fire-resistance of the lift shafts is not required. The only prescription is that the walls of the shaft have to be incombustible in accordance to the Spanish Lift Code (ITC MIE-AEM-1 (EN 81-1) y UNE 58-717 (EN 81-2)).

In the case of horizontal compartmentation or, in general, when lifts cross superposed fire-compartments, the NBE-CPI-91 require that the access to every compartment but the upper one is from a previous lobby with RF-120 walls and RF-30 doors (Figure 1). In the same way the lift shafts must have a fire-resistance RF-120. To fulfill with the requirement of a previous lobby there are fundamentally three possibilities:

1. Lifts with a previous lobby of its own (Figure 4.1).
2. Access to lifts from the case of protected stairs (Figure 4.2).
3. Access to lifts from the previous lobby of specially protected stairs (Figure 4.3).

In spite of the aforementioned remarks, the new NBE-CPI-96 is going to include an important modification in this respect. Since the moment of going in force, the previous lobby will be unnecessary provided that the lift doors has a fire-resistant PF-30. We have to mention here that this requirement is in any case obligatory in accordance to the Spanish Lift Code (ITC MIE-AEM-1 (EN 81-1) y UNE 58-717 (EN 81-2)).

### 4 THE MACHINE ROOM

The NBE-CPI does not establish special conditions related to the rooms regulated by specific codes such us the machine rooms of lifts. What happens is that the Spanish Lift Code does not establish fire protection criteria in these rooms. Nevertheless, several municipal councils, being aware of the risk of initiation of a fire in the machine rooms, have dictated specific orders in their respective Ordinances.

That is the case of Barcelona Ordinance in which the machine rooms are qualified as “special risk rooms”. That is why all the dispositions established for this type of rooms in the NBE-CPI are applicable. Among these dispositions are the next:

- Evacuation distances lower than 15 meters.
- Fire-resistant walls and ceilings (in general, RF-90).
- Fire-stable structural elements (in general, EF-90).
- Non-inflammable walls and ceilings coatings (M1 according to UNE 23-727).
- Moderate-inflammable floor coatings (M2 according to UNE 23-727).
- Fire-resistant doors (in general, RF-60).
- Fire extinguisher outside the room and others inside, so that the distance to any of them is less than 15 meters.
- Emergency lighting.

On the other hand, in Madrid and Barcelona, the machine rooms are considered independent fire-compartments, that is why the enclosure and doors must be fire-resistant. In Madrid, the degree of fire-resistance depends on the use of the building and in Zaragoza is RF-120 for the enclosure and RF-60 for the doors.

## 5 THE FIREFIGHTING LIFT

The requirement of firefighting lifts arises, in tall buildings, as a consequence of the need of transportation of the firemen and their equipment to the origin of the fire. They are also necessary for the evacuation of disabled people whose evacuation by the stairs could be very difficult.

The NBE-CPI-91 requires that one lift from each group fulfills the conditions of a firefighting lift when the evacuation height is higher than 50 m in apartment buildings or 28 m in another use. The future NBE-CPI-96 will require a firefighting lift in heights above 35 m in any use. In any case, in hospital buildings, the hospitalizing intensive treatment zones with height above 15 m will be provided with a firefighting lift in each group.

The minimum features that the NBE-CPI require for a firefighting lift are the following:

Rated load:	630 Kg.
Area of the car:	1,40 m <sup>2</sup> . In hospitals the minimum dimensions must be 1,20m x 2,10m in anticipation of evacuating patients with stretchers.
Doors wide:	800 mm
Contract speed:	Able to cover the full travel in less than 60 seconds.

The firefighting lifts must be provided with a push-button on the access floor that forces the lift to return immediately to this floor, allowing only the operation from the car. In the event of loss of the normal power, the supplying must pass to a secondary source with one hour of autonomy. There are not regulations related to more specific electrical and mechanical considerations.

Some municipal ordinances demand additional requirements about the number and features of the firefighter lifts. For instance, in Madrid it is required firefighting lifts in buildings higher

than 28 m. In Barcelona, on the other hand, it is required in particular cases the supply of protected lifts destined to the evacuation of disable people.

## 6 FIRE BEHAVIOUR OF BUILDING COMPONENTS AND MATERIALS

### 6.1 Meaning of the required fire-resistance values

In the previous sections we have talked about fire-resistance requirements in building elements such as enclosures and doors.

The NBE-CPI-91 defines fire behavior as the time in which the considered component keeps the following conditions in accordance with a normalized test in conformity with UNE 23-093 (ISO 834) for construction components, UNE 23-801 for glazed components y UNE 23-802 (ISO 3008) for doors:

- a) *Mechanical stability or load-bearing capacity.*
- b) *Absence of emission of inflammable gases in the non exposed side.*
- c) *Tightness to flames or hot gases.*
- d) *Thermic isolation.*

In accordance to the aforementioned, the components which fulfill only the a) condition are *fire-stable* (EF), the components which fulfill the conditions a), b) and c) are *pare-flames* (PF), and the components which fulfill all the conditions are *fire-resistant* (RF). So, for instance, if we required a RF-60 door, we are requiring a door which fulfills the criteria of mechanical stability, absence of emission of inflammable gases, tightness to flames or hot gases and thermic isolation during a period of 60 minutes under the normalized test of UNE 23-802.

With respect to the Lift Code, in which it is required that the landing doors are in any case PF-30, is applicable in the same way the test of the standard UNE 23-802, performed only on the access side in the floor. There is not a specific standard for lifts doors but the requirements are the same for a lift door than for any other type of door.

### 6.2 Accreditation of the fire-behavior

The NBE-CPI requires that the accreditation of the fire-behavior of the building components be done by one of these methods:

- a) Document in which the contrast with the values of the tables displayed in the NBE-CPI for structural and constructive components is shown.
- b) Certificate of the test in accordance to the aforementioned standards. In this respect, we should remark that only the certificates emitted by the laboratories accredited in Spain by the appropriate organisms of the Administration for doing this type of fire-tests are valid .
- c) Document in which the application of a theoretic-experimental calculus is shown.

With reference to the accreditation of the fire-behavior of the lift doors only the b) method is applicable.

The products imported from other countries must pass in the same way the mentioned test in accordance with the European Directive of building products. It is admitted that tests are made in an authorized laboratory of other member states of the European Community provided that the tests are performed in accordance to the mentioned standards or recognized equivalents in Spain. In this case it is compulsory that the Spanish Administration emit an acceptance document, prior individualized request for each product.

## **7 REGULATIONS AND STANDARDS MENTIONED**

- NBE-CPI-91. Norma Básica de la Edificación, Condiciones de protección contra incendios en los edificios. Real Decreto 279/1991, de 1 de marzo.
- Ordenanza de prevención de incendios de 28 de junio de 1993. Ayuntamiento de Madrid.
- Ordenanza de condiciones de protección contra incendios en los edificios de 26 de junio de 1992. Ayuntamiento de Barcelona.
- Ordenanza municipal de protección contra incendios de 25 de mayo de 1995. Ayuntamiento de Zaragoza.
- ITC-MIE-AEM-1 (EN 81-1). Instrucción Técnica Complementaria MIE-AEM-1. Normas de seguridad para la construcción e instalación de los ascensores electromecánicos. Orden del M° de Industria y Energía de 23 de septiembre de 1987.
- Real Decreto 1630/1992, de 29 de diciembre, por el que se dictan disposiciones para la libre circulación de productos de construcción, en aplicación de la Directiva 89/106/CEE.
- UNE 23-093-81 (ISO 834). Ensayo de la resistencia al fuego de las estructuras y elementos de la construcción.
- UNE 23-801-79 (ISO 3008). Ensayo de resistencia al fuego de elementos de construcción vidriados.
- UNE 23-802-79 (ISO 3008). Ensayos de resistencia al fuego de puertas y otros elementos de cierre de huecos.
- UNE 23-727-90. Ensayos de reacción al fuego de los materiales de construcción. Clasificación de los materiales utilizados en la construcción.
- UNE 58-717-89 (EN 81-2). Ascensores hidráulicos. Reglas de seguridad para la construcción e instalación de ascensores y montacargas. Ascensores hidráulicos.

## **8 AUTHOR BIOGRAPHICAL DETAILS**

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