

## Testing and classification of products

Fire testing methods are generally designed to simulate the different phases of the fire process. Consequently, tests on surface linings are conducted using fire sources representative of the incipient and growth phases of a fire. These test methods are referred to as "reaction to fire" tests and the purpose is to evaluate the contribution of products and materials to the early stages of a fire in terms of:

- Ignitability
- Flame spread
- Heat release
- Smoke production
- Occurrence of flaming droplets/particles

Normally reaction to fire tests are carried out in small or intermediate scale. Complete building elements (doors, floor structures, partitions etc.) which are used for separating fire compartments are tested for the case of a fully developed fire. These test methods are called "fire resistance" and are carried out in full scale. The temperature in the test furnace follows the so-called "standard fire curve" which is designed to represent a fully developed fire. The properties that are evaluated are:

- Insulation (ability to reduce the heat transfer)
- Integrity (ability to prevent leakage of flames and hot gases)
- Load bearing capacity

Building elements classified as "fire resistant" with respect to integrity and insulation are used as a means to prevent fire being spread between fire compartments.

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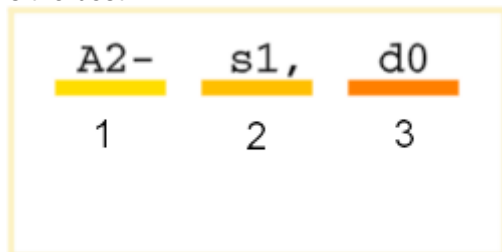
## The European system

UNE-EN 13501-1:2007 Fire classification of construction products and building elements

### Reaction to fire - Euroclass

The reaction to fire testing and classification system for linings and materials in Europe is called Euroclass. Altogether there are 39 classes divided into 7 main levels; A1, A2, B, C, D, E and F where A1 is the best and F are for products and materials not classified.

Most of the main classes also include an additional classification regarding smoke production and the occurrence of flaming droplets/particles. The classes for smoke are s1, s2 and s3, where s1 is the best. The classes for flaming droplets and particles are d0, d1 and d2, where d0 is the best.



1 = Main class

2= Smoke production

3 = Occurrence of flaming droplets/particles

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## Euroclasses fire table

Euroclasses
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A1		
A2-s1,d0	A2-s1,d1	A2-s1,d2
A2-s2,d0	A2-s2,d1	A2-s2,d2
A2-s3,d0	A2-s3,d1	A2-s3,d2
B-s1,d0	B-s1,d1	B-s1,d2
B-s2,d0	B-s2,d1	B-s2,d2
B-s3,d0	B-s3,d1	B-s3,d2
C-s1,d0	C-s1,d1	C-s1,d2
C-s2,d0	C-s2,d1	C-s2,d2
C-s3,d0	C-s3,d1	C-s3,d2
D-s1,d0	D-s1,d1	D-s1,d2
D-s2,d0	D-s2,d1	D-s2,d2
D-s3,d0	D-s3,d1	D-s3,d2
E		
E-d2		
F		

## The ASTM system

### Reaction to fire

In the US market products are tested and classified according to ASTM standards (American Society for Testing and Materials).

Flame spread and smoke production of surface linings, for example on ceilings, are tested and evaluated according to ASTM E 84 "Surface Burning Characteristics of Building Materials". A smoke production index and flame spread index is then derived from the measurements that are taken.

(The test apparatus consists of a 25 feet (7.6 m) long horizontal "tunnel furnace" with a cross sectional area of approximately 12'1/2 x 17'3/4 in (305 x 450 mm). The interior surfaces are covered with the test material and a burner is applied at one end of the tunnel. In the other end there is a fan creating a draft forcing the flames to propagate into the tunnel. The test lasts ten minutes.)

Acoustic ceiling products are classified according to ASTM E 1264. Three fire classes are defined; A, B and C. The classes are equivalent to classes I, II and III, respectively, of various building code authorities. Class A (I) is the best.

### Reaction to fire

ASTM fire classes. In addition, for class A ceiling products the material should not show evidence of continuous progressive combustion after the test flame has been extinguished.

	Max allowed index	
class	Flame spread	Smoke development
A	25	50
B	75	-
C	200	-