



## **EUROCLASSES**

**A guide to the European harmonised system for  
the classification of construction products and  
building elements for reaction to fire performance**

## Euroclasses

This guide provides background on the new Euroclasses and the European harmonised classification system for Reaction to Fire, as detailed in BS EN 13501-1: 2002, which uses test data from a new suite of European reaction to fire tests. The overall aims are to permit free trade across national boundaries within the European Community based on harmonised tests that better evaluate the reaction of building products to fire.

Fire is a major killer, and in addition to causing around 4,000 casualties in Europe, also results in costs amounting to 1% of GDP each year. Improving and coordinating fire safety legislation is therefore a Government priority.

Whether a domestic house, supermarket, office, factory, hospital or school, the risk of fire can be reduced through the selection of appropriate construction materials. It is therefore vital that everyone involved in the design or use of buildings is aware of the likely reaction to fire of the materials that are used in their construction.

The development of a fire within a building depends on many factors, including where and how the fire starts, whether there are fire protection systems and what combustible matter is available to feed the fire. The actual study of the performance of materials in a fire is divided into two distinct areas:

### **Resistance to fire performance:**

How materials resist the spread of a fully developed post-flashover fire from the room of origin to an adjacent space. Data may also consider the resistance to collapse of structural elements.

### **Reaction to fire performance**

How materials behave in the early stages of a fire, from ignition to flashover, which involves the entire contents in the room of origin. It considers combustibility, energy available for release, fire growth rates, spread of flame, generation of smoke and the formation of burning droplets or particles.

One of the most important issues studied under reaction to fire performance is the potential for *flashover* to occur – the spontaneous ignition of hot smoke and gases - which can lead to a fire spreading uncontrollably. If flashover occurs the



Photograph courtesy of Rockwool Limited

death rate can increase by up to 300% and flashover can turn a small fire into a major disaster. The Euroclasses classification system is based on the tendency of materials to avoid or promote flashover when tested in the Room Corner Reference test.

Reaction to fire has traditionally been assessed using at least 30 different national standards, many of which give different answers to the question "is this product safe to use in this building?". To resolve this difference of approach between European countries and provide a harmonised assessment method, new fire test classification procedures, called *Euroclasses*, were developed in conjunction with new CEN (The European Standardisation body) fire test methods. One advantage of fire Euroclasses and the associated harmonised standard tests is the rationalisation of the existing complex system providing a single, uniform standard that is the same throughout the European Community.

There is a further advantage of the harmonised testing system. In the past some small scale fire tests failed to differentiate between materials that gave widely different results in large scale tests. The new system is designed to represent real life fires more closely by insuring that data arising from the new small scale fire test can be correlated to full scale reference tests.

Although existing national standards will co-exist for some years, the result of all this work is that Euroclasses should predict the performance of building materials in a real fire more accurately than existing national classification systems.

## Euroclasses

Under the Euroclass system insulation products will be tested and categorised into one of seven classes for reaction to fire. For floor coverings the Euroclass is denoted by a subscript  $_{fl}$ , ie  $B_{fl}$ .

The Euroclass system examines each component of a building product for potential energy release, including facings, adhesive layers and entrained components.

However, a guide to common building materials and their likely Euroclass classification, based on the results of the government sponsored Radar 2 project, is shown in Table 1. Adding facings to plain products may lower the classification compared to the unfaced product.

## Regulatory Background

The introduction of Euroclasses is a direct result of the adoption of CE marking, itself a consequence of the Construction Product Directive, or CPD.

The CPD is one of a number of new directives, which aim to break down technical barriers to trade in construction products between Member States in Europe. To achieve this the CPD involves agreeing a harmonised system of tests and testing bodies and the CE marking of products.

## Harmonised Specifications

The reference case around which the harmonised reaction to fire technical standards have been developed is based on a fire initiated in a small room growing to the point of flashover.

In order to model performance, and be consistent with national standards, it was necessary to design a range of tests to evaluate combustibility, ignitability, fire growth rate, flame spread, smoke production and formation of burning droplets.

As a general principle, the larger the test, the better it will reflect real life fires. For this reason the defining parameters of the classification system are based on the larger Room Corner Test, which evaluates the time to flashover.

**Table 1 Common materials and likely Euroclass**

Euroclass	Flashover Potential	Example Materials
A1	No	Concrete Brick Most rock and glass mineral wool
A2	No	Plasterboard Cement particle board Some rock and glass mineral wool (foil faced)
B	No	Painted gypsum board Some fire resistant MDF Some birch plywood
C	Yes 10-20 minutes	Most fire resistant MDF Some European plywoods Phenolic foam (foil faced)
D	Yes 2-10 minutes	Expanded polystyrene type A Polyisocyanurate foam (foil faced) Extruded polystyrene Vinyl wall covering (gravure print)
E	Yes < 2 minutes	Polyurethane foam (lamineate faced) Polyisocyanurate foam (sprayed) Wood fibre board (vacuum pressed)
F	Yes Early failure or no data	Expanded polystyrene type N Untested or fails Euroclass E

Check with individual product manufacturers for specific product specifications.

However, because of the cost and complexity of this test, a new medium scale Single Burning Item (SBI) test has been developed as BS EN 13823: 2002 .

The SBI test is the key test for Euroclasses A2 to D, with the Room Corner Test used as the reference or "gold standard" for the entire Euroclass system, and used within an appeal system where reliance on the smaller scale tests is not considered appropriate.

For some building products which are described as "difficult to test", there is currently no generally accepted guidance on the appropriate procedure for testing and classification in accordance with the harmonised European fire tests. Until such a time that the appropriate European test and classification methods are published, for these building products, classification may only be possible using existing national test methods.

The existing BS tests and the full list of the standards covering reaction to fire, which will

eventually be implemented as British Standards, are as set out in Tables 2 and 3:

**Table 2 Existing BS system**

Test	Designation
BS 476: Part 4: 1970	Non-combustibility test for building materials
BS 476: Part 6: 1989	Method of test for fire propagation of products
BS 476: Part 7: 1997	Method for classification of the surface spread of flame products
BS 476: Part 11: 1982	Method for assessing the heat emission from building materials

**Table 3 Euroclass test framework**

Test	Designation
EN 14390	Full scale room test for surface products.
BS EN ISO 1182: 2002	Non-combustibility test
BS EN ISO 1716: 2002	Determination of the heat of combustion.
BS EN ISO 13823: 2002	Building products excluding floorings exposed to thermal attack by a Single Burning Item
BS EN ISO 11925-2: 2002	Ignitability when subjected to direct impingement of flame

Considerable research has been undertaken to compare classifications under the existing BS systems and new EN systems (for example see Radar 2 data at [www.wfrc.co.uk](http://www.wfrc.co.uk)). This has resulted in an Amendment 2002 to Approved Document B (Fire safety) covering transposition from BS to Euroclasses as shown in Table 4.

**Table 4 Transposition for reaction to fire performance**

British Standard	Euroclass
Non-combustible	A1
Limited combustibility	A2
0	B
1	C
3	D
Unclassifiable or no performance determined	F

See Amendments 2002 to Approved Document B for full details

However, Scottish Technical Standards have also introduced corresponding risk categories, see Table 5.

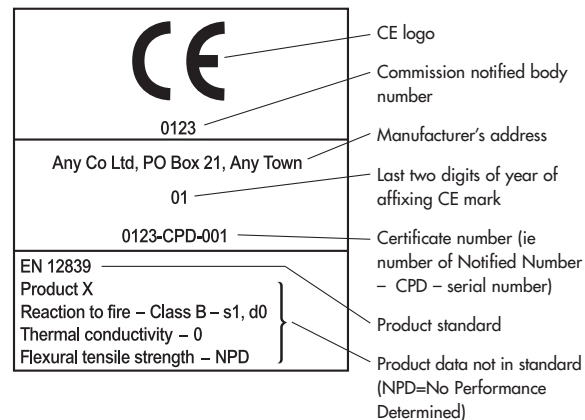
**Table 5 Transposition for Scottish risk categories**

Risk Category	British Standard	Euroclass
Non-combustible	BS 476: Part 4 or BS 476: Part 11	A1 or A2
Low	Class 0	B
Medium	Class 1 spread of flame	C
High	Class 2 or 3 spread of flame	D
Very High	Worse than Class 3 or unclassified	E or F

In order to address the other hazards found in real life fires and for risk assessment, two additional classifications are also available for smoke emissions (s1, s2 or s3) and the production of flaming droplets/particles (d0, d1 or d2).

## CE Marking

CE marking demonstrates that products are tested in conformity with the European test methods. CE marking became available for some construction products as early as 1997, but by 2007 there will be over 600 products covered.



One of the most important aspects of the CE mark is that it includes technical information in the form of declared values, including the important reaction to fire classification, and effectively represents a harmonised technical data sheet.

The CE mark therefore provides the information needed by specifiers and regulators to judge whether the product complies with all the regulations necessary for it to be placed on the market in a particular country.

# Euroclasses

## UK Building Regulations

Approved Document B (Fire safety) 2000 Edition refers to, and utilises within its guidance, a large number of British Standards in relation to Codes of Practice and fire test methods (typically the BS 476 series of documents). In order to facilitate harmonisation and the use of the new technical specifications and their supporting European test standards, new guidance in the form of Amendments 2002 to Approved Document B has now been issued for England and Wales and comes into effect from March 1<sup>st</sup> 2003. Scottish Technical Standards have already been amended.

## Risk Assessment

Consideration of fire risk does not stop once a building has been designed and constructed. In addition to compliance with the Building Regulation, building owners, designers and employers must be concerned with the potential risks associated with the materials in their buildings, and most employers must undertake a risk assessment of the workplace to identify all the potential hazards and associated risks.

For example, Government guidance on the statutory requirements contained in the Workplace Directive can be found in the publication *Fire Safety – an Employers guide*. As part of any risk assessment all potential fire hazards must be identified, whether these are contained within, or are part of the fabric of, the building.

Increasingly insurance underwriters are also becoming aware of the implications that the choice of construction materials may have, and may be unwilling to provide cover on buildings that include materials not listed as Approved Products.



## Advantages of Mineral Wool

Climate change is a major issue, and buildings contribute around 40% of the UK's emissions of greenhouse gases. Improved levels of thermal insulation are therefore central to the Governments strategy to meet and exceed the UK's Kyoto obligations, and this is reflected in steadily increasing requirements for the thermal performance of buildings.

The Building Regulations 2001 Approved Document E also lays down improved standards of acoustic performance for new buildings.

As a result a typical building now includes greater quantities of insulation in external walls, party walls, roofs, lofts and partitions, some of which may be combustible. The overall fire safety of a building therefore increasingly depends on the choice of insulant. In certain applications only Euroclass A1 or Euroclass A2 materials may be used, but in others the requirements may be lower, or even unspecified.

The new Euroclasses provide the opportunity for architects and builders to contribute to fire safety by having, for the first time, clear guidance backed by robust testing which covers not only the historical requirements of combustibility, but also incorporates additional criteria such as the risk of flashover and fire load.

Additionally, the introduction of CE marking means that information on the performance of materials in relation to reaction to fire, including smoke emission and the production of flaming droplets, will be readily accessible to users throughout the European Community.

Mineral wool is non-combustible, and mineral wool insulation is therefore capable of achieving the highest reaction to fire rating of A1, and is not susceptible to flashover. For this reason it is important in relation to resistance to fire and specified where supreme fire protection is required.

Information on specific mineral wool solutions can be obtained from the individual manufacturers, but all mineral wool products remain the safe choice for ensuring the fire safety of buildings.



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