

## FEATURE – FSE

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### Reaction to Fire: A quick guide to European Standards

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All fire legislation is ultimately to prevent loss of life. Fire safety requirements are stated in the Building Regulations, and European fire test evidence is listed alongside British Standard test evidence as a method of demonstrating compliance. Guidance on how to comply, in England and Wales, is covered by Approved Document B; in Scotland by Technical Handbooks Domestic and Non-Domestic; in Northern Ireland by Technical Booklet E; and in the Republic of Ireland by Technical Guidance Document B.

Adherence to the requirements is enforced by Local Authority Building Control Officers, Approved Inspectors or district surveyors.

Two key aspects to fire testing are Fire Resistance and Reaction to Fire and there is often confusion between them. **Fire resistance** is the measurement of the ability of a material or system to resist, and ideally prevent, the passage of fire from one distinct area to another. **Reaction to fire** is the measurement of how a material or system will contribute to the fire development and spread, particularly in the very early stages of a fire when evacuation is crucial.

The requirements for reaction to fire performance depend upon whether the product is used externally or internally, or is to be used in a location requiring a specific performance such as an escape route. Approved Document B uses the term 'areas of enhanced performance'. The requirement will typically stipulate a minimum European classification or British class for the product or system to be used.

Externally - performance requirement is based on several factors including distance from an adjacent property, height and design of the building and end use of the building. For example, the requirements are more demanding for buildings used for assembly or recreation, or where there is less than 1000mm between buildings.

Internally - performance requirements for lining materials are based on type, size and purpose of the room, or whether it is a communal area, such as a landing, in which a

product is used. Products covered include walls and ceilings, roof lights and light diffusers. Specifically excluded, however, are doors, door and window frames in which glass is fitted, architraves/ mouldings, fireplace surrounds, mantle shelves and fitted furniture.

**Example of requirements taken from Table 10 Classification of linings in Approved Document B for England Volume 2 – Buildings other than dwellinghouses**

Location	European class	National class
Small rooms of area not more than: a. 4m <sup>2</sup> in residential accommodation b. 30m <sup>2</sup> in non-residential accommodation	D-s3, d2	3
Other rooms (including garages)	C-s3, d2	1
Circulation spaces within dwellings		
Other circulation spaces, including the common areas of blocks of flats	B-s3, d2	0

In the UK a reaction to fire classification is currently determined by using either recognised BS or EN test standards, as set out in the table below. European harmonisation is provisionally set for 2011, and once this happens, all new testing will be required to be based on European methods.

Reaction to fire testing can be conducted on products with very different performance. Products that do not easily combust will not produce observable results in a test designed to challenge a product that ignites and burns easily. For this reason a range of European tests is used to cover the different classifications, just as there is a range of tests for British test standards.

**Table of different test standards used to achieve European and National classifications**

Classification system	Test standard	Relevant classes
European standards	BS EN ISO 1716 BS EN ISO 1182	A1 – A2 A1 – A2
	----- BS EN 13823 BS EN ISO 11925-2 No performance determined	----- A2 – D B – E F
National standards	BS 476: Part 4 BS 476: Part 11	Non-combustible Limited combustibility
	----- BS 476: Part 6 BS 476: Part 7	----- Class 0 Class 1 - 3

**Table of the main tests used to establish European reaction to fire classifications (commonly used names for these tests are in italics)**

BS EN ISO 1182:2002	Reaction to fire tests for building products – Non-combustibility test
BS EN ISO 1716:2002	Reaction to fire tests for building products – Determination of the heat of combustion <i>(Bomb calorimeter)</i>
BS EN 13823:2002	Reaction to fire tests for building products – Building products excluding floorings exposed to the thermal attack by a single burning item <i>(SBI)</i>
BS EN ISO 11925-2:2002	Reaction to fire tests – Ignitability of building products subjected to direct impingement of flame – Part 2: Single-flame source test <i>(SFI)</i>

The bomb calorimeter and non-combustibility tests tend to be limited to products for specialised applications where low or no combustibility is essential, such as fire-escape stairs.

The SFI test uses a small cigarette lighter sized flame to determine how easy it is to ignite a product. This represents the ignition stage of a fire. The SBI test uses a controlled burner similar in size to a waste paper bin fire to measure the rate of fire growth and its spread in a test specimen. The specimen used for the SBI test is representative of the finished product and includes details such as any air gap when a product is installed and any joints used in construction of the product.

Test results for a product can vary depending on material properties such as density, colour and thickness. The fixing of the product into a building in its end use can also

affect the results. So that it is not required to test every conceivable variation in a product range, the classification of product families is allowed using a matrix of tests. A manufacturer would discuss and agree with the testing laboratory the matrices for testing to keep the number of tests and costs to a minimum, whilst ensuring every parameter is covered.

The UK government in 2000 used testing to establish equivalents by funding the Radar 2 project. Testing to both European and BS standards of 64 commonly used products on the market was carried out. Products included wood panels, mineral wool, paints, cellular plastics, wall coverings, board and sheet materials and plastics. The results did not allow for direct comparisons, but became instead a tool for transposition, as set out in the table below.

**Transposition table of reaction to fire classification showing European and British standards**

<b>Euro-class EN 13501-1</b>	<b>England, Wales, Northern Ireland</b>	<b>Scotland</b>
A1	Non-combustible	Non-combustible
A2 (or better)	Limited combustibility	
B -s3, d2 (or better)	0	Low risk (0)
C -s3, d2 (or better)	1	Medium risk (1)
D -s3, d2 (or better)	3	High risk (2 & 3)
E -s3, d2 (or better)	4	Very high risk
F -s3, d2 (or better)	Unclassifiable	

The national class cannot be assumed to equate to the new European class. While European classification is recognised in the UK, the converse is not true - national class is not accepted in Europe and hence European test evidence must be obtained if a product is to be used in mainland Europe.

The European standards also pave the way for CE marking. The CE mark along with supporting documentation is a legal declaration by the manufacturer that the product is fit for an intended construction purpose.

The coexistence of British standards with European standards could be as little as 3 years, or as long as 10 years. To move to European standards now offers advantages of future proofing to specifiers and manufacturers. The test results have potentially greater application to fire engineering and will allow products to be placed in the market throughout Europe.

- Chiltern International Fire is accredited by the United Kingdom Accreditation Service (UKAS) to carry out reaction to fire testing to current European Standards and its sister company BM TRADA Certification is a Notified Body for CE Marking. For further information telephone 01494 569800 or email [firebehaviour@chilternfire.co.uk](mailto:firebehaviour@chilternfire.co.uk)

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