BMTRADA

Technical information

Reaction to fire

Testing and classification

01 What is reaction to fire?

Reaction to fire performance relates to the combustibility and ignitability of a material i.e. its contribution to fire growth, rather than its ability to resist the passage of fire (which is proved by fire resistance testing). How a fire develops in the early stages is of crucial importance to ensure safe evacuation.

The tests tend to be smaller in scale than for fire resistance and are carried out on specific components or materials representative of end-use application, for example:

- Wall linings
- Ceiling linings
- External wall surfaces
- Fire retardant treatments
- Jointing systems

Reaction to fire tests are commonly called up in codes and regulations in both the building and transport sectors. Reaction to fire testing may also be required when CE marking a product to a harmonised technical specification document.

02 Requirements for buildings

In England and Wales, the fire requirements for buildings are dealt with by Approved Document Part B of the Building Regulations.

European reaction to fire evidence is recognised across Europe in the Building Regulations of member states.

03 Testing in support of CE marking

A process of European harmonisation is in progress throughout Europe in support of the Construction Products Regulation (CPR). The CPR aims to reduce barriers to trade

throughout Europe by using the CE Mark to ensure that products placed on the market in any member state have been tested and classified consistently. If your product has a published harmonised technical specification document it is likely that CE marking will be mandatory for your product.

We will need to know at the start of our work with you that you want the test evidence to be in support of CE marking as the construction of the specimen may be specified in the harmonised technical specification document. It may also be that sampling of the product is required.

You may be able to CE mark the product yourself or it may be that you need to employ the services of a Notified Body to CE mark your product. BM TRADA is a Notified Body under the CPR. Often if the product contains a fire retardant it is likely a Notified Body will need to be involved in the CE marking process.

04 European reaction to fire testing standards

4.1 BS EN ISO 11925-2: Single Flame Ignitability (SFI) test

The test simulates a cigarette lighter size flame being placed upon either the surface or the edge of the specimens for a short duration (15 or 30 seconds). The time to ignition and the time until the flames spread up and exceed 150mm above the flame application point are recorded. These results on their own are then used to determine classification to E or potentially F. This test is used in conjunction with the SBI test for classes B, C and D.

A minimum of eight specimens are usually required measuring 250mm x 90mm.

Single flame ignitability test apparatus.

4.2 BS EN 13823: Single Burning Item (SBI) test

This is the reaction to fire test method used as part of determining European classes A2, B, C and D. It is always conducted in addition to other European reaction to fire test methods.

The single burning item test was originally developed to simulate a wastepaper basket fire. It utilises a 30kW burner in the corner of a room that is lined by the material or product which is to be classified. External wall claddings can also be tested in the same way even though some buildings may not have such an 'internal' corner detail in reality.

The test method analyses the products of combustion. From this data, calculations are made to determine Total Heat Release (THR) and Fire Growth Rate (FIGRA). How quickly a fire develops and how much heat energy is produced are the crucial factors in determining the ease of evacuation from a building. These values are then used to determine the class (A2, B, C or D).

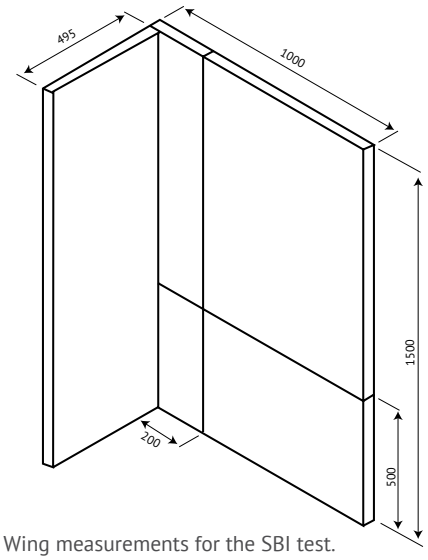
A Lateral Flame Spread (LFS) observation is used to see whether flames spread across the test specimen's long wing during the test. If this occurs beyond specified limits, the product or material can only reach a European class D.

Measurement of the smoke produced and observation of any flaming droplets or particles are used to determine the additional classifications s1 to s3 and d0 to d2.

A minimum of three specimens must be submitted for test. Each specimen usually comprises a long (1000mm x 1500mm) and short (495mm x 1500mm) wing (see diagram opposite).

Specimens are often project specific, therefore we recommend you always discuss with one of our team before manufacturing specimens.

Single burning item test apparatus.



Wing measurements for the SBI test.

05 Conditioning

Prior to testing, all specimens must be stored in our controlled environment. The time period for conditioning will depend upon the nature of the test specimens and can vary between 48 hours and eight weeks.

06 Testing for product ranges or different end use applications

More testing can be required when classifying a range of product parameters or end use applications.

Product ranges can include:

- Thickness
- Density
- Colour
- Material choices/finishes (i.e. timber species)

Different end use applications could include:

- Substrates
- Air gaps
- Mounting and fixing
- Joints
- Exposed edges

We need to have a good understanding of any product ranges and the end use application of your product in order to ensure you provide a test specimen which produces the test evidence that best suits your requirements with the minimum amount of testing.

With careful design of the test specimens or through the use of available rules within relevant harmonised technical specification documents, additional product parameters and end use applications can be included in the classification document without further testing.

However on occasions further testing is required to evaluate the effect that different product parameters or end use applications have on the fire performance of the product. When required by the standards this evidence is documented in an extended field of application report.

Example of exterior cladding which may require testing (Copyright: disPLAY Architecture Ltd C/O The Wood Awards).

Example of a wall lining product which may require testing (Copyright: Chloe Dewe Mathews C/O The Wood Awards).

07 European classification document

Evidence obtained from test results allow the products to be classified according to BS EN 13501-1: *Fire Classification of Construction Products and Building Elements: Part 1: Classification using test data from reaction to fire tests.* The table overleaf shows which European reaction to fire test evidence is required to gain each European classification.

The table is also representative of the statutory regulations for England and Wales. It explains which Euroclass would also be acceptable where previously only a National class was used. For example, if an application has previously required Class 0, then the regulator can now accept either Class 0 or Class B test evidence.

European reaction to fire classifications are intended to be accepted across all European member states.

NB: For products being tested, it is not possible to obtain a National class and claim a European class or vice versa. In other words, you must carry out testing against European standards to achieve a European classification.

National Class (England & Wales)	National Test Standard (England & Wales)	Euroclass	European Test Standard
Non-combustible	BS 476: Part 4	**A1**	BS EN ISO 1182 BS EN ISO 1716
Limited combustibility	BS 476: Part 11	**A2**	BS EN ISO 1182 BS EN ISO 1716 BS EN 13823
0	BS 476: Part 6 BS 476: Part 7	**B**	BS EN 13823 BS EN 11925-2
1 & 2	BS 476: Part 7	**C**	BS EN 13823 BS EN 11925-2
3	BS 476: Part 7	**D**	BS EN 13823 BS EN 11925-2
4	BS 476: Part 7	**E**	BS EN 11925-2
Unclassified	No test	**F**	No performance determined

Performance requirements not specified in this table.

BM TRADA offer a suite of reaction to fire testing. Further information on classifications can be found in our document TI-02: Reaction to fire - European classification documents explained.