

Fire Safety Technical Briefing Sheet

Your Fire Safety Strategy

Your **Fire Safety Strategy** should form an integral part of your project design and must be in place from the point at which a building project is identified and should continue through the ongoing asset management of the building.

Much of the regulation regarding fire safety is concerned with ensuring that people can escape from a building or structure, firefighters are protected and that the fire cannot spread to other buildings or areas.

Fire and structural safety issues can be exacerbated by poor procurement, including poorly designed tender specifications and processes, last-minute contractor appointments, lack of appropriate engagement with the supply chain and contract forms which prioritise low-cost solutions at the expense of building safety. **Dura Composites** is committed to helping ensure that you choose the most appropriate product for your specific fire safety project needs.



Whilst the general guidance found in this document is applicable to a range of construction projects, additional measures may be required where high risks are involved or where specialised work is undertaken. **Dura Composites** can assist with guidance and technical information, however please note that it is the responsibility of the client and contractor to ensure that your planned design is fully compliant with Building Regulations.

For further guidance on fire safety, please refer to the latest government documentation and for complex or high risk projects, please ensure that you consult a competent fire safety specialist.

Technical Data Sheet

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Understanding Terminology

When considering fire safety, it is first important to understand the fire performance terminology in common usage. Two key aspects to fire testing are reaction to fire and fire resistance and there is often confusion between them, but they mean different things and shouldn't be used interchangeably.



Reaction to Fire

This is the response of a material to a fire, such as flame spread, flammability and release of fumes and smoke. Essentially it is a measurement of how a material or system will contribute to the development and spread of a fire, particularly in the very early stages when evacuation is crucial. The smoke and fumes released during a fire event can be a particular concern, and so careful material choices need to be made for internal applications.



Fire Resistance

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. A material's fire resistance properties can also give guidance as to the ability of the material to retain its functionality during and after a fire, such as the ability to retain structural strength (e.g. for a supporting beam).



Fire Retardant

Fire retardants are additives that are sometimes used with combustible materials, to slow down the ignition of these materials. These fire retardants are consumed when exposed to a fire; they slow down the combustibility but do not reduce it. Untreated wood typically has a Euroclass rating of E or D for example. When fire treated under factory conditions, this rating can reach as high as B (combustible material with very limited contribution to fire). However, fire retardant treated wood is heavier than untreated wood, and the treatment and drying process reduces its strength and structural properties. Each and every species and profile shape needs to be tested independently and in many cases, if the profile is cut to the required length, the exposed edge then becomes vulnerable.

Legislation

In the case of England and Wales, Building Regulations Part B: Fire Safety, addresses the precautionary measures necessary to provide safety from fires for building occupants, people in the vicinity of buildings, and firefighters.

National building regulations in the UK deal with fire safety in the following documents:

- England: Approved Document B, volumes 1 and 2.
- Wales: Approved Document B, volumes 1 and 2.
- Scotland: Section 2 of the technical handbooks.
- Northern Ireland: Technical Booklet E.

Adherence to the requirements is enforced by local authority building control officers, approved inspectors or district surveyors.

Requirements cover the means of escape, fire detection and warning systems, the fire resistance of structural elements, fire separation, protection, compartmentation and isolation to prevent fire spread, control of flammable materials, and access and facilities for firefighting.

The 'approved documents' provide guidance for how the building regulations can be satisfied in common building situations. Two approved documents are provided:

- Approved Document B - Fire Safety: Volume 1 - Dwellinghouses.
- Approved Document B - Fire Safety: Volume 2: Buildings other than dwellinghouses.

The latest documents are easily accessible from:

<https://www.gov.uk/government/publications/fire-safety-approved-document-b>

Standards

In the past, each country in the European Union developed their own fire tests in support of their national building regulations. Consequently, it became extremely difficult to compare the data arising from these different fire tests. Manufacturers had to conduct testing in each individual country in which they wanted to sell their products.

Test results for a product can vary depending on material properties such as density, colour and thickness, and the fixing of the product into a building in its end use can also affect the results, so it's critical that you choose a material supplier who has subjected their products to extensive testing and can provide copies of the certification by independent testing bodies.

The British Standards Institute BSI is the UK's National Standards Body, and publishes in English all National, European and many International standards. In many cases standards are double prefixed "BS EN" which means this is the UK version in English of a European harmonised standard (in some cases the prefix may be "BS EN ISO" where an international standard has been adopted by Europe as a European standard). Where harmonised product standards exist, British standards are withdrawn.

The United Kingdom left the European Union on 31 January 2020. A transition period is now in place until **31 December 2020**.

During this period the UK must comply with all EU rules and laws.

BS EN 13501-1:2018 - Fire classification of construction products and building elements:

This European Standard (EN 13501) is common to all EU Member States. It is presented as NEN 13501 in the Netherlands, BS EN 13501 in the UK, as DIN EN 13501 in Germany etc., to include the prefix of the national standards' body responsible for publication. BS EN 13501-1:2018 was published on 14th January 2019. It provides the reaction to fire classification procedure for all construction products, including products incorporated within building elements.

The process for classification under this standard involves a combination of up to five rigorous tests designed to assess the product on a range of characteristics, including combustibility, heat levels, flame spread and smoke release. Once tested, the product receives an official classification of its fire rating, known as a Euroclass rating. From best performing to worst performing, the Euroclass system is: A1, A2, B, C, D, E and F. It also provides additional classification (typically associated with reaction to fire classes D – B) for smoke production (from s1 (little or no smoke) to s3 (substantial smoke)) and flaming droplets/particles (from d0 (none) to d2 (quite a lot)).

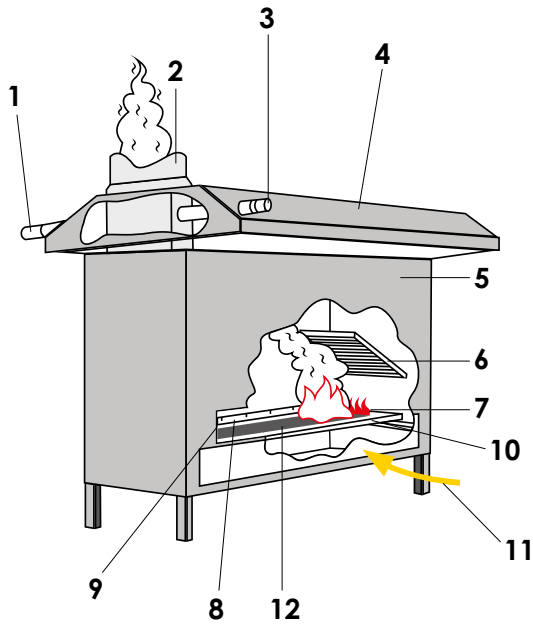
Product	Construction products			Floorings	
	A1			A1 _{fi}	
Non-Combustible materials	A2 - s1 d0	A2 - s1 d1	A2 - s1 d2	A2 _{fi} - s1	A2 _{fi} - s2
	A2 - s2 d0	A2 - s2 d1	A2 - s2 d2		
	A2 - s3 d0	A2 - s3 d1	A2 - s3 d2		
Combustible materials - very limited contribution to fire	B - s1 d0	B - s1 d1	B - s1 d2	B _{fi} - s1	B _{fi} - s2
	B - s2 d0	B - s2 d1	B - s2 d2		
	B - s3 d0	B - s3 d1	B - s3 d2		
Combustible materials - limited contribution to fire	C - s1 d0	C - s1 d1	C - s1 d2	C _{fi} - s1	C _{fi} - s2
	C - s2 d0	C - s2 d1	C - s2 d2		
	C - s3 d0	C - s3 d1	C - s3 d2		
Combustible materials - medium contribution to fire	D - s1 d0	D - s1 d1	D - s1 d2	D _{fi} - s1	D _{fi} - s2
	D - s2 d0	D - s2 d1	D - s2 d2		
	D - s3 d0	D - s3 d1	D - s3 d2		
Combustible materials - high contribution to fire	E	E - d2		E _{fi}	
Combustible materials - easily flammable		F		F _{fi}	

BS EN 13501-1:2018 Applicable Tests

EN ISO 9239-1 (Tests the burning behaviour from radiant heat)

Key:

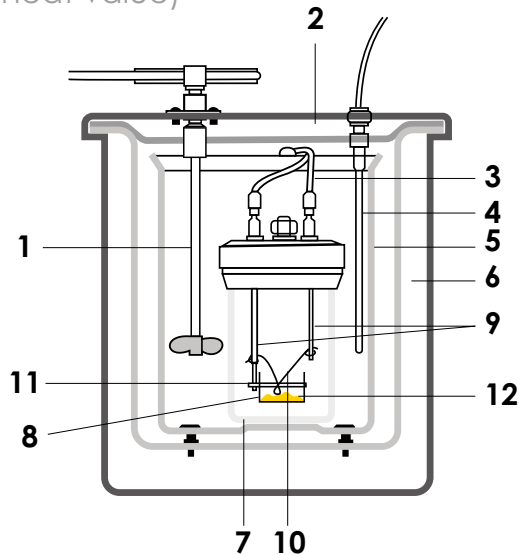
- 1 Lamp
- 2 Exhaust duct
- 3 Detector
- 4 Exhaust hood
- 5 Test Chamber
- 6 Gas-fired radiant panel
- 7 Pilot flames from line burner
- 8 Scale
- 9 Observation window
- 10 Specimen holder with specimen together on sliding platform
- 11 Air inlet all around specimen at bottom of chamber
- 12 Material



EN ISO 1716 (Tests the calorific heat value)

Key:

- 1 Stirrer
- 2 Jacket lid
- 3 Ignition leads
- 4 Temperature measuring device
- 5 Calorimetric vessel
- 6 Jacket
- 7 Calorimetric bomb
- 8 Crucible
- 9 Electrodes
- 10 Firing Wire
- 11 Crucible holder
- 12 Material



BS 476 - Reaction to fire

In 1991, the BS 476 classification was introduced to determine the surface spread of flames for materials used in construction. The classification was rated from 1 through to 4 – Class 1 being best performing and Class 4 being worst performing. Performance was measured on distance and speed of flame spread. The classification also has Class 0 which indicates a Class 1 spread of flames and also the (limited) amount of heat released from the surface of a product. To achieve Class 0 a product must have achieved Class 1 in the Part 7 test and also passed the Part 6 test.

BS 476 part 6: Fire Propagation Test.

This measures the amount of heat released when the product under test is burned. This is essentially a pass/fail test.

BS 476 part 7: Surface Spread of Flame Test.

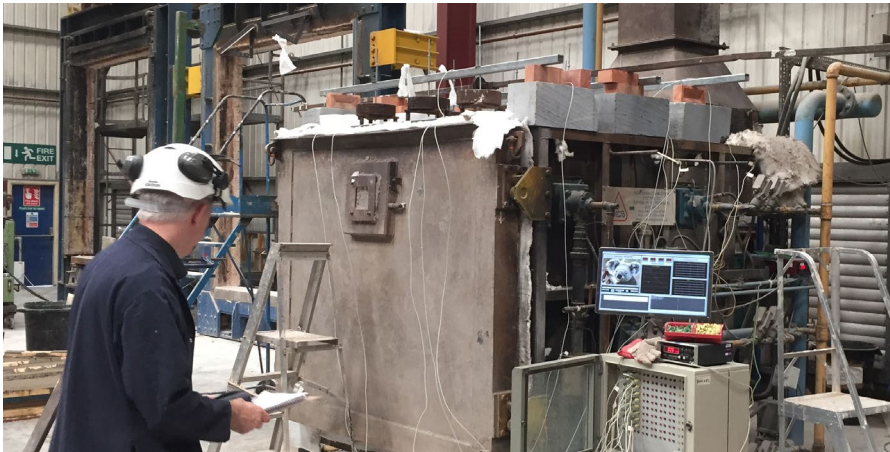
This test produces a fire rating of Class 1, 2, 3 or 4 depending upon how far a flame travels over a coated surface. Class 1 is the best rating i.e. the lowest flame spread.

BS 476 Part 20/21: 1987

This section of the standard sets out the general principles for assessing the fire resistance of construction elements. It sets clear criteria by which an element's load-bearing capacity, fire containment (integrity) and the thermal transmittance (insulation) can be assessed. It is supported by BS 476 Part 21: 1987 - Load-bearing elements, which is applicable for floors and flat roofs (up to a 10-degree pitch).

For load-bearing horizontal elements, the specimen is deemed to fail when either of the following values is exceeded:

- A deflection equal to the span of the specimen in mm (L)/20; or
- The rate of deflection (in min/mm) calculated in 1-minute intervals from 1 minute after the test began exceeds the following equation: rate of deflection = $L^2 / 9000 \times$ the distance from the top of the structural section to the bottom of the design tension zone in mm.



What about ASTM E84?

ASTM E84 Surface Burning Characteristics of Building Materials (sometimes referred to as the Steiner tunnel test), is an American standard test method for surface burning characteristics of Building Materials. The test consists of a long tunnel where the material being tested is mounted to the roof. A flame is then applied to one end of the material and the distance the flame travels and the smoke developed is measured during the 10 minute test. The measured values are then converted to a flame spread and smoke developed index by comparing them to two reference materials -fibre cement board and red oak, where cement board has a value of 0 and red oak has a value of 100.

However these indices cannot be easily used as basic fire engineering properties or be correlated to performance in an exterior wall end use for example. Critics of this test also state that it does not properly assess thermoplastic materials which may tend to melt away from the assembly rather than spread flame in the horizontally prone test orientation. It is critical that you specify the correct test for your specific application. Selecting the wrong test may lead to inaccurate data, non-conformity with local building codes, or more seriously, the selection of building materials that do not afford the desired level of protection.

Which standard is most relevant for my project - BS EN 13501-1:2018 or BS 476?

The test in BS 476 for reaction to fire is seen by many industry experts as being less rigorous than the European standard EN 13501-1. Most notably, Class 0 and the BS 476 tests do not measure the combustibility of a material, meaning that combustible materials could in theory achieve a Class 0 classification, which is of course undesirable. One crucial point is that under the relevant part of BS 476 only a surface test of the material is required, whereas EN 13501-1 includes the vulnerable cut edge of the panel as well.

The Euroclass system focuses on the combustibility of materials, not only the spread of flames. It is possible that a material classified as Euroclass B under BS EN 13501 for example may also be classified as a Class 0 product, however it cannot be assumed the other way around. The British Standard classifications do not automatically equate with the equivalent classifications in the European Standards, therefore products cannot typically assume a European class, unless they have been tested accordingly. The update to Approved Document B (England) in 2019 saw the focus placed on the Euroclass System.

BS476 may well not be a relevant measure for your application in 2020 and beyond, so please ensure that you are fully up to date on the legislative requirements affecting your project. For example, the Government has now banned combustible cladding on high-rise buildings by amending Regulation 7 of the Building Regulations so that materials which become part of an external wall or balcony of a high-rise building now have to be of European Classification A2-s1, d0 (i.e. of limited combustibility) or Class A1 (non-combustible), which is only achievable through accredited certification via BS EN 13501.

How Dura Composites can help?

Dura Composites is committed to ensuring that all users of our products are as informed as possible on the fire standards our products adhere to. Designing out risk will ensure that your building project will comply with current and future building regulations.

We offer a range of accredited certificates assessed by a third party organisation (a certification body) confirming that the products have passed the specific assessments.

A summary of the certification achieved for each of our most popular product ranges is shown below:

Dura Composites Product	BS EN 13501	BS 476 Part 7	BC 476 Part 20/21 (Indicative)
Grating d ²	Class B fl s1	Part 7 Class 1	N/A
Grating d ¹	Class B fl s1	Part 7 Class 2	N/A
Slab Type 75	Class B fl s1	Part 7 Class 2	71 mins insulation, 178 mins remains structural
Slab Type 100	Class B fl s1	Part 7 Class 2	Coming Soon
Slab Stair Tread FR (& Type 50 FR)	Class B fl s1	Part 7 Class 2	N/A
Tread	Class B fl s1	Part 7 Class 2	-
Profile	Class B fl s1	Part 7 Class 2	N/A
Platform Type 40	Class B fl s1	Part 7 Class 1	39 mins insulation, 60 mins remains structural
Platform Type 100	Class B fl s1	Part 7 Class 1	58 mins insulation, 60mins remains structural
Handrail	N/A	Part 7 Class 2	N/A
Deck Aluminium	Class A2 fl s1	N/A	N/A
Cladding Aluminium	Class A2 s1 d0	N/A	N/A
Aluminium Pedestals	Class A2 fl s1	N/A	N/A
Deck Resist Flip	Class C fl s1	Class 1	-
Deck Eco	Class C fl s1	Class 1	-
Cladding Flush Resist	Class B s1 d0	Class 0	-
Cladding Weatherboard Resist	Class B s2 d0	Class 0	-
Park Deck	Class B fl s1	Class 0	-
Park Deck Handrail	Class B fl s1	Class 0	-

Key: - Beyond safety factor

*Single span simply supported and unfixed.