

A SPECIFICATION GUIDE TO Flame Retardant Wood Panels

Part 1: Terminology and the fundamentals of fire

Flame retardant wood panels have been developed specifically for use in fire-rated applications where a **Euroclass B** or a **Euroclass C** material is required under the Building Regulations. This chapter explains the terminology used in their specification...

The stages in the development of a fire

When a fire breaks out every second counts. The more slowly a fire spreads the more time occupants will have to evacuate the area and the greater the opportunity to fight the fire and limit its damage.

The terminology used to describe the fire performance of a wood panel is related to the stages of a fire's development and growth. These are:



1. Ignition: when oxygen and a fuel source are ignited they combine in a chemical reaction to form a fire



2. Spread and growth: the fire is established, the heat it generates results in combustion of surrounding fuel sources; if the fire continues to increase in temperature and size it will eventually reach flashover



3. Flashover is when the flammable contents of a room or building simultaneously ignite. The fire is at its hottest at this point and is consuming all available fuel sources



4. Decay: The fourth stage of a fire is its eventual decay, which happens after all the available fuel has been consumed and its temperature drops. This document does not cover this stage.

In the early stages of a fire, when the fire is becoming established, it is the **Reaction to Fire** properties of a material that will determine how it will contribute to the fire's development. Once a fire is established, containment is the priority and the **Fire Resistance** of construction elements, such as walls and floors, in resisting the passage of fire is then the focus.

Reaction to Fire

A material's reaction to fire determines how quickly it will burn and to what extent it contributes to the growth of the fire. There are a series of standardised tests to measure the contribution a particular material will make to a fire's development and spread. The tests measure:

- **Ignitability:** How readily will a wood panel ignite and catch fire
- **Spread of flame:** Once ignited how readily will flames spread across the panel's surface
- **Heat release:** When alight, how much heat energy does the panel release
- **Smoke production:** What quantity of smoke and combustion gases will the panel generate
- **Flaming droplets:** Will the panel disintegrate and produce burning debris which might fall and ignite other surfaces?

A wood panel's reaction to fire performance, including when used as flooring, is determined using the following European and ISO Standards:

- **BS EN 13823:** Reaction to fire tests for building products. Building products excluding floorings exposed to the thermal attack by a single burning item
- **BS EN ISO 11925:** Reaction to fire tests. Ignitability of products subjected to direct impingement of flame. Single-flame source test
- **ISO 9239-1:** Reaction to fire tests for floorings - Part 1: Determination of the burning behaviour using a radiant heat source

Euroclasses

The results from the reaction to fire tests are used to determine a material's fire performance classification.

The European Standard BS EN 13501 defines seven levels (Euroclasses) of fire performance with products classified A1, A2, B, C, D, E and F. Class A1 is the best performing with a product assessed as making no contribution to a fire; if a product is Class F, it is an indication that it does not meet the criteria of any class or that the material has not, or cannot, be tested.

Table 1: European fire test classes

Class	Definition
A1	Non contribution to fire
A2	Negligible contribution to fire
B	Very limited contribution to fire
C	Limited contribution to fire
D	Medium contribution to fire
E	High contribution to fire
F	Easily flammable

Enhanced Euroclass classification

The Euroclass definition can also contain information about the amount of smoke and burning droplets produced when a material burns.

Smoke

Smoke inhalation kills: it can obscure vision, create disorientation and cause asphyxiation. Limiting smoke emission is a key aspect of fire safety so alongside the overall Euroclass classification, additional detail is provided in the form of a subscript for the amount of smoke a burning material will produce.

The three additional classifications are:

- **s3:** high intensity of smoke production
- **s2:** average smoke production
- **s1:** no or low smoke production

Flaming particles

While wooden products char in a fire, some construction products, like those made of polystyrene for example, can melt and ignite to form flaming droplets which can initiate new fires. For that reason the classification system ranks the rate of release of flaming droplets.

For flaming droplets the three additional classifications are:

- **d0:** No dripping
- **d1:** slow rate of dripping
- **d2:** high rate of dripping

Flooring

Floors have their own Euroclass rating for reaction to fire tests which are indicated by an "fl" subscript. The reason being is that flooring materials are tested in a horizontal position (all other construction materials are tested vertically) to measure the spread of flame using a radiant heat source according to the standard ISO 9239: Reaction to fire tests for floorings. Materials are awarded an A to F classification and a smoke classification subscript.

Identifying a product's fire performance

Reaction to fire tests for SMARTPLY MAX FR B have been undertaken by independent notified body Efectis in its accredited laboratory.

MEDITE SMARTPLY's 11mm - 18mm thick SMARTPLY MAX FR B boards have the classification: B_{fl} - s1 when used for flooring, wall, ceiling, and roof applications. In other words:

- When used for walls the panels have a Euroclass B and so contribute to a fire to a minor extent; they have average levels of smoke production and produce zero dripping.
- When used for flooring the panels will make a limited contribution of a fire, with little or no smoke production

National Standards

Some older products in production pre-2013 may still have a National Classification.

Prior to the introduction of the harmonised European standards, national classification systems were common. In England and Wales, for example, British Standard (BS 476) was used to determine the surface spread of flame for building materials. This had four performance Classes: 1 to 4.

National tests fell out of favour and many manufacturers stopped using them for new products after the CE marking of materials for use in construction became mandatory in 2013. The reason for that is that a manufacturer has to produce a Declaration of Performance, which can only be determined using European Standards, before a material can be CE marked.

It is important to note that the testing systems for national standards is different to the European test regime, so for panel to be rated under both classification systems it has to have been tested in accordance with each test regime.

Combustibility

There can be some confusion about the use of the term non-combustible related to construction products. For a material to be classed non-combustible it must be Euroclass A1 or Class A2. Any material rated Class B or lower is, by definition, combustible.

All wood panel products are therefore combustible, even those manufactured incorporating Flame Retardant. That is because a flame retardant treatment will enhance the panel's reaction to fire properties to limit the spread of flame and slow development of the fire, but it does not mean that the product is non-combustible.

Note: TRADA's Wood Information Sheet WIS 2/3-3 Flame-retardant treatments for timber products provides additional detail on fire test evidence.

Service Environment

In some situations, it is required that the durability of the reaction to fire performance of a product be declared against the environmental conditions in service. Three service classes are defined in the structural design code BS EN 1995-1.

The Wood Protection Association categorises flame retardant formulations into Type INT1, INT2 and EXT. Each type is distinguished by properties that make them suitable for particular service classes. The variation in these properties is largely due to the nature of the chemicals used in the formulations and the complexity of chemical reaction required in formulating them. The WPA FR Types align with those defined in BS EN16755 'Durability of reaction to fire performance'.¹

WPA FR Type BS EN 16755	Service Class BS EN 1995	Conditions	Examples	Conditions
INT 1	1	Moisture content in materials corresponding to 20°C rh <65% for most of the year.	Timber in buildings with heating and protected from damp: Internal walls, internal floors and warm roofs	The common feature is that the FR wood-based product is sensitive to high humidity; prolonged exposure may result in salt efflorescence and/or migration.

NT 2	2	Moisture content in materials corresponding to 20°C and a rh <85% for most of the year.	Ground floor structures where no free moisture is present, cold roofs, swimming pools and fully protected external uses.	Treated wood or wood-based panel is far less sensitive to high or fluctuating humidity and can therefore be used in practically all interior and semi-protected external situations.
EXT	3	Conditions leading to higher moisture content in materials than in SC 2	Cedar shingles and unprotected exterior cladding	The treated wood product can be used in all interior and above ground exterior situations.

The interior classifications, Service Class 1 and Service Class 2, apply for the lifetime of the wood product provided the product is only used in the intended service class.

Resistance to fire

While Reaction to Fire is the measurement of how a material will contribute to the early stages of a fire, after flashover when the fire at its hottest it is the ability of construction elements to contain the fire and prevent it from spreading that is critical. Resistance to Fire is the ability of a construction element to continue to perform in a fire over a specified period of time. Fire resistance is also classified under the the European Standard BS EN 13501.

It is important to understand that resistance to fire is a property of a particular construction element, such as a fire compartment wall, and not the materials it is constructed from. Such elements are often constructed from a combination of several materials; it is the performance of this specific combination of materials and their fixings that must be tested by exposing them to levels of heat that they would be subject to in an actual fire to determine the element's fire resistance.

Fire resistance is a measure of one or more of the following in minutes:

- Resistance to collapse or load-bearing capacity, denoted by R
- Resistance to fire penetration (integrity), which is the element's ability to resist the passage of gases into the protected area. It is denoted by E
- Resistance to the transfer of heat from the fire side of an element to the unexposed side, denoted by I

¹ WPA Guidance Note: WPA FR 3

A construction element's REI rating identifies its fire resistance. A wall construction might, for example, be classified EI60; that means the wall has certified integrity (E) and insulation (I) performance for 60 minutes.

As with reaction to fire tests, the fire resistance tests are harmonised across Europe.

The The European Standards for testing fire resistance are:

- BS EN 1363-1 Fire resistance tests. General requirements
- BS EN 1364-1 Fire resistance tests for non-load-bearing elements. Walls
- BS EN 1365-1 Fire resistance tests for load-bearing elements. Walls
- BS EN 1365-2 Fire resistance tests for load-bearing elements. Floors and roofs

For further information

TRADA WIS wood-based-panel-products-and-timber-in-fire.pdf

Wood Protection Association Guidance notes FR1, FR2 and FR3

For more information on **MEDITE SMARTPLY**
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