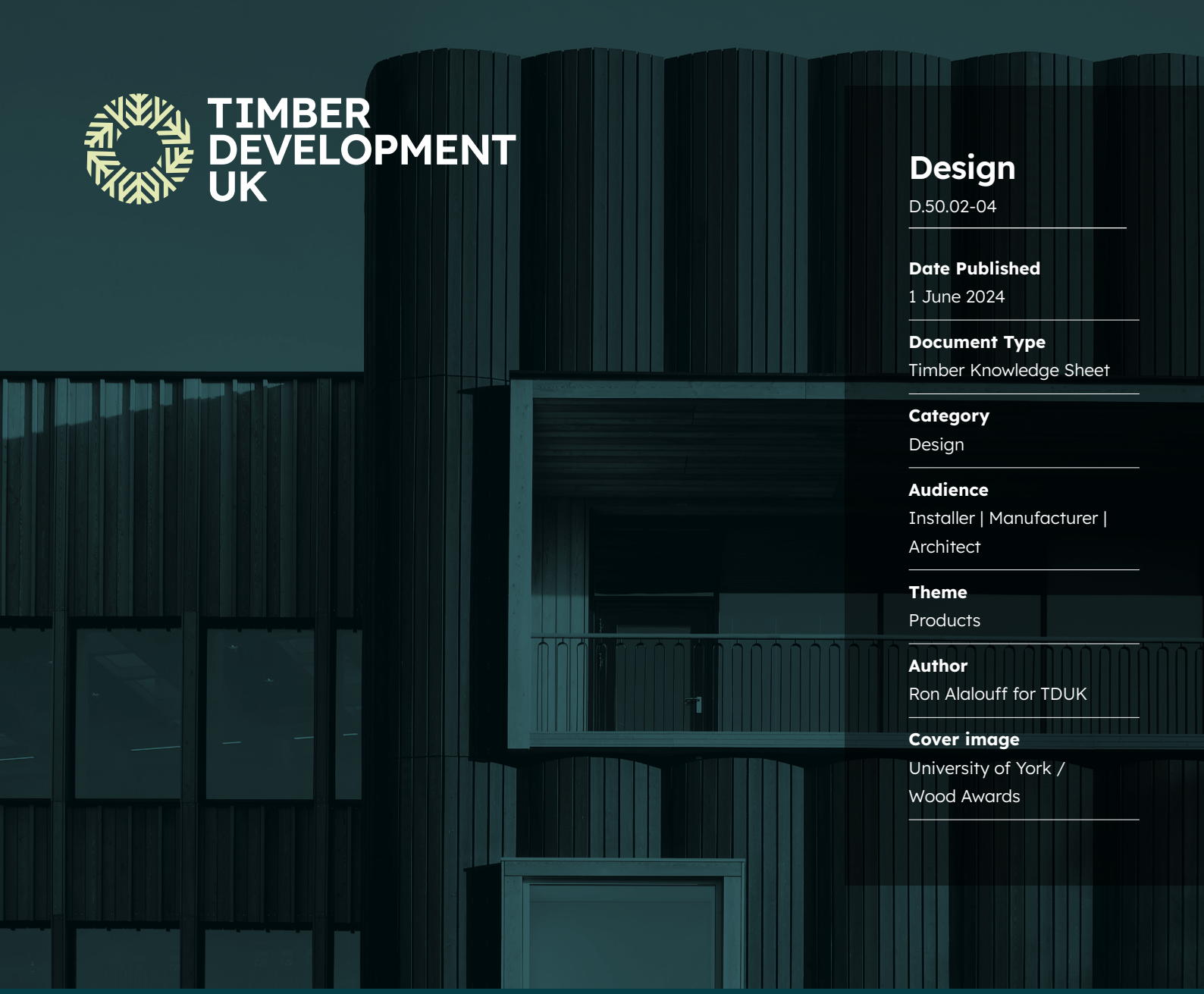
TIMBER DEVELOPMENT UK



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Fire Retardant Treatments

As timber has a high structural strength and slow charring rate, its general behaviour in a fire is predictable. Fire retardant treatments slow the rate at which fire develops, giving more time for a safe escape.

Fire Retardant Treatments

Fire retardant treatments reduce the surface spread of flame, heat, and smoke release, providing more time for building occupants to make a safe escape.

There are four recognised stages in fire development:

1. Ignition
2. Spread and growth
3. Flash point
4. Decay

Flame retardant (FR) treatments add chemicals that inhibit the 'reaction to fire' properties of timber. Reducing ignitability and the consequent spread of flame slows the fire development, allowing more time for building occupants to escape safely, and for the fire to be extinguished.

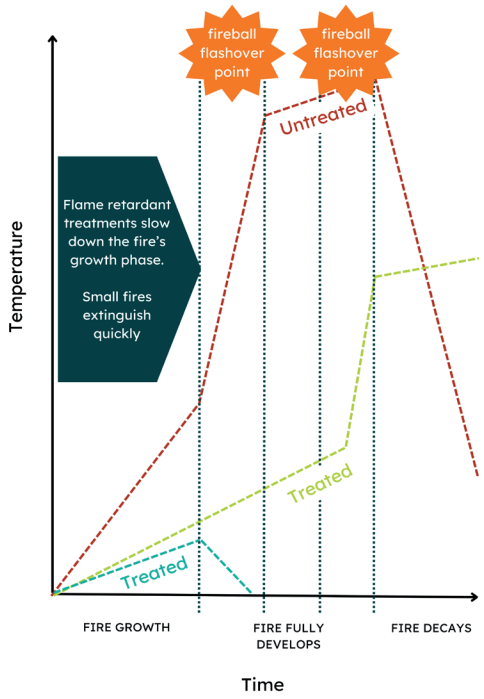

CHART: Stages of a fire for treated timber

Reaction to Fire and Fire Resistance

Both terms are frequently misunderstood and mistakenly assumed to mean the same thing.

Reaction to Fire: the measurement of how a material will contribute to fire development and spread, particularly in the early stages of a fire when evacuation is critical.

Fire Resistance: the measurement of the ability of a building or component to resist and ideally prevent the passage of fire from one area or compartment to another.

Combustibility

Under BS EN standards, untreated timber-based materials normally have a Euroclass combustibility rating of D or E. This can be enhanced to Class B or C by the addition of a flame retardant.

Euroclass BS EN 13501-1	Construction Products (excluding flooring)
Class F	Products for which no reaction to fire performances are determined or which cannot be classified.
Class E	Able to resist for a short period a small flame attack without substantial flame spread.
Class D	Able to resist for a longer period a small flame attack without substantial flame spread.
Class C	As D, but satisfying more stingent requirements and showing limited lateral spread of flame under thermal attack by a single burning item.
Class B	As C, but satisfying more stingent requirements and showing very limited lateral spread of flame under thermal attack by a single burning item.
Class A	As B for single burning item reaction plus no significant contribution to fire load and growth (A2 - limited combustibility) or no contribution in any stage of the fire (A1 - non-combustible)

TABLE: Fire performance ratings of building materials

Flame Retardant Treatments

There are three main types of FR treatments:

- Impregnating solid timber and panel products with liquid FR formulations using vacuum / pressure processes
- Incorporating FR chemicals during production or manufacture
- Adding surface coatings that may be pigmented or clear film-forming products or low viscosity products.

Flame retardants are often incorporated during the production of engineered timber such as OSB, MDF, and chipboard. A benefit is the treatment is embedded throughout the entire product, making it harder to remove by cutting, machining or washing, or accidentally by abrasion or leaching. Products such as MDF – which cannot be vacuum pressure impregnated post-production – can thus have their performance enhanced. However, incorporation during manufacture is unlikely to be viable for bespoke or short production runs.

FR treatments can also be added after manufacture, usually in a vacuum and pressure process or surface coating systems with factory production control. Solid timber and plywood are suitable for post manufacture applications, with the treatment penetrating to below the component surface, making it more durable than surface coatings alone.

FR treatments can also be applied on site, by brush or spray. Site control is difficult, however, due to the inability to measure retention of product per square metre.

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Specification

As well as the Euroclass rating requirement for the timber component, the appropriate FR treatment depends on where and how the component is used. Three service classes are defined in Eurocode 5:

- **1 - Internal, dry**

In this environment, the FR treatment should be based on inorganic salts, as these treated timber products are sensitive to high humidity where prolonged exposure results in salt efflorescence and/or migration. This should only be used for interior environments where humidity does not exceed 75%. Examples include thin plywood for interior exhibition work, scenery, interior hoardings, drywall linings, and shop fitting materials.

- **2 - Internal, humid**

Here, treatment should be based on blended organic and inorganic chemicals, with the treated timber product being far less sensitive to high or fluctuating humidity due to the lower solubility in water of the product, and a degree of chemical interaction with the timber. This includes all interior construction, weather protected external construction, and coated external weather protected applications.

- **3 - External**

This category applies to all interior and exterior above ground situations, such as cedar shingles and unprotected exterior cladding. Leach resistance can be achieved by high temperature curing of the complex chemical system in the treated timber following impregnation and redrying.

Verification and Audit

When specifying an FR treatment, it is vital to verify the product's performance credentials, to ensure they are independently verified and reflect the performance required.

Evidence to support performance in accordance with a European Standard can include a **Fire Classification Report**, in accordance with **BS EN 13501-1:2018 Fire classification of construction products and building elements**. This details timber species, component thickness, and intended use. In addition to this the product will need either a UKCA or CE Mark – mandatory under the Construction Products Regulation (CPR) and a Declaration of Performance (DoP).

Check that the description of the material given in the Classification Report can apply to the material as used. Different species and cross-sectional sizes affect fire performance ratings and require an **Extended Application Report**.

More information

There is further guidance available from the Wood Protection Association.

See also the following Timber Knowledge Sheets:
Timber & Fire: Building Regulations
Fire Design: Principles
Fire Design: Passive Fire Protection
Fire Design: Regulation
Fire-Resisting Doorsets