

Understanding fire protection terms

‘Reaction to fire’ and ‘fire resistance’. What’s the difference?

Reaction to fire classifications are completely different to resistance to fire ratings yet the two terms are often misunderstood and taken to mean the same thing. This is not the case. This WPA fire protection fact sheet aims to set out the important differences. Understanding fire performance terminology starts with understanding the stages in the development of a fire.

Stages in the development of a fire

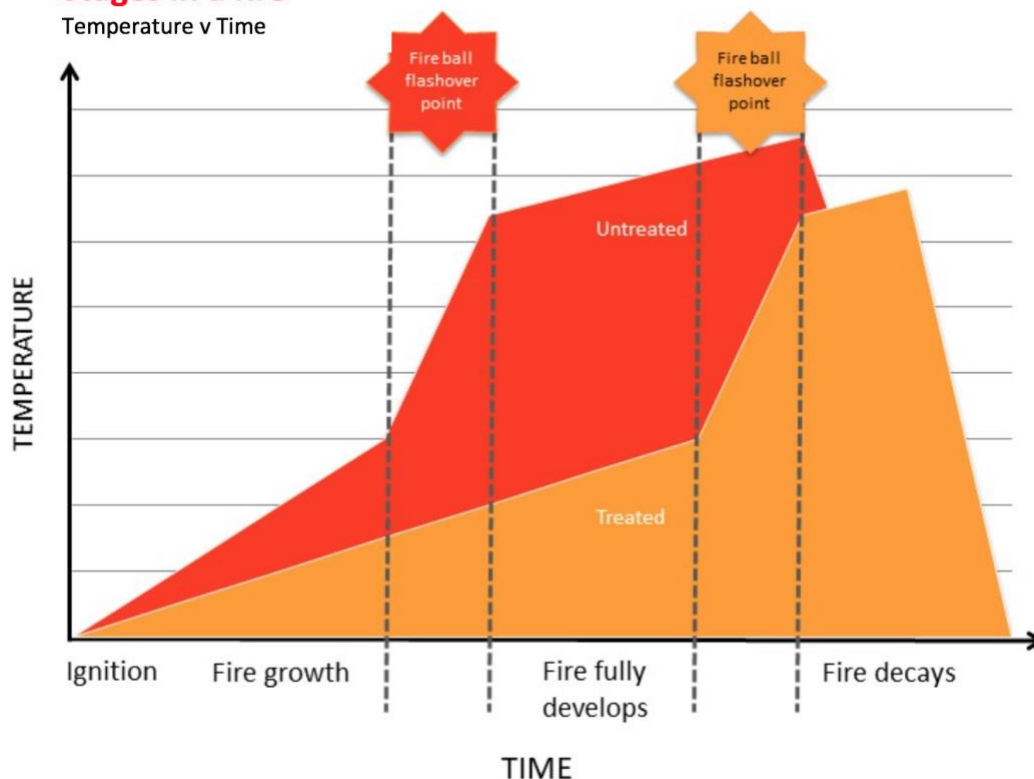
There are four recognised stages in the development of any fire: Ignition, Spread and growth, ‘Flash point’ into a fully developed fire and Eventual decay.

In the early stages, it is the **reaction to fire** properties of the various individual materials exposed to flame that is the critical factor i.e. ignitability, heat release and subsequent spread of flame across the materials surface.

Once the fire is more developed, then containment becomes the top priority with the use of compartmentalisation as a common strategy in buildings. At this stage, it is the **fire resistance** ratings of the building structure and its design elements such as walls, floors and fire doors that become the critical factors.

Stages in a fire

Temperature v Time



Benefits of flame retardant treatment
 Flame retardant treatment will enhance the **reaction to fire** properties of wood-based materials, reducing ignitability and consequent spread of flame - slowing down the development of the fire and allowing significantly more time for the occupants of a building to escape and for the fire to be extinguished.

Reaction to fire

During the early stages, when a fire is still becoming established the important factors are:

Ignitability – how readily will a material ignite and catch fire?

Spread of flame – once ignited, how quickly will flames spread across the surface of that material?

Heat release – once alight, how much heat energy will be generated by the burning material, which will contribute to the further growth of the fire?

Flaming droplets – will the burning material disintegrate and produce burning droplets or debris which might fall onto and ignite other surfaces?

All these factors are elements of a material's **REACTION TO FIRE** properties, all of which can be measured, tested and enhanced by a WPA approved flame retardant product and quality assured application system.

Resistance to fire

When flashover is reached, the fire is out of control, all combustible materials are assumed to be burning and the safety critical focus is on **fire containment**. Containment is achieved through the performance of building structures and design elements such as walls, ceilings, floors, doors etc - not by the performance of materials alone. Such elements commonly comprise several materials in combination e.g. facing material, frame, insulation, backing face etc. It is the **RESISTANCE TO FIRE** performance of these composite elements that is critical and this can be measured, tested and altered through design.

Fire testing differences

Completely different test regimes are used to measure **reaction to fire** properties and **resistance to fire** ratings. Reaction to fire results are now expressed as Euroclass classifications to EN 13501-1. (Note: BS 476 Class 0 or 1 is older and little used terminology). Flame retardant treated wood can achieve Euroclass B or C reaction to fire classifications depending on species and thickness. The **resistance to fire** rating of a building element (in accordance with EN 13501-2), is normally expressed in minutes of fire containment (e.g. a fire door with a 30-minute fire resistance rating).

The key differences between 'reaction to fire' and 'resistance to fire'

Reaction to fire is the measurement of how a **material** will contribute to the fire development and spread, particularly in the very early stages of a fire when evacuation is crucial.

Fire resistance is the measurement of the ability of a **building/construction element** to resist, and ideally prevent, the passage of fire from one distinct area/building compartment to another.

WPA fire protection fact-sheet No:1 Understanding fire protection terms

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