

# FIRE SAFE BUILDING WITH WOOD

## Executive statement

Modern engineered wood products and engineering techniques can now be used to construct large and complex timber buildings.

The concerns on fire safety of timber buildings relate to the nature of wood being a relatively lightweight and natural biomaterial compared with buildings of non-combustible materials.

### Key messages

**The topic of fire safety is gathering increasing interest**, as the current fire codes and regulations have been conceived for other building materials.

To be most effective, **fire prevention considerations and possible risks need to be considered at the design stage**.

**Human safety in wood buildings is assured**. Methods to prevent and limit spread of fire are compartmentation, automatic extinguishing, and if needed, limiting areas of visible wood. In exit routes, any combustibles must be limited in all buildings.

## Background

This brief was commissioned by the Technical Working Group 'Building' of the **European Wood Policy Platform (woodPoP)**.

**woodPoP** provides a dedicated forum for multilateral policy, knowledge, and experience exchange between public and private actors from the wood sector for developing policy solutions at the national and regional levels. It focuses on developing frameworks for sustainable wood-based value chains and their contribution to an innovative, circular bioeconomy.



## Using wood in buildings

The past few decades have seen renewed interest in wood as a structural and architectural material for many types of buildings.

There are many incentives for the increased demand for timber buildings, including **aesthetics, sustainability, prefabrication, construction speed**, and **economy**.

## Fire requirements for buildings

The Construction Products Regulation (CPR) provides harmonised rules and a common technical language to assess the performance of construction products.

Construction works must satisfy the following basic requirements:

1. Mechanical resistance and stability
2. Safety in case of fire
  - (a) the load-bearing capacity of the construction can be assumed for a specific time period
  - (b) the generation and spread of fire and smoke within the construction works are limited
  - (c) the spread of fire to neighbouring construction works is limited
  - (d) occupants can leave the construction works or be rescued by other means
  - (e) the safety of rescue teams is taken into consideration
3. Hygiene, health, and the environment
4. Safety and accessibility in use
5. Protection against noise
6. Energy economy and heat retention
7. Sustainable use of natural resources

## In most countries, there are two ways to satisfy fire safety requirements

**Prescriptive requirements** with tabled classes and numerical values often give simplified solutions and may have unnecessary limitations.

**Performance-based requirements** give more flexibility and are needed when going beyond prescriptive solutions or designing very high, large, or complex buildings.

In Europe, regulations widely differ. For instance, according to prescriptive rules, the allowed number of storeys when using wood varies from two to eight storeys or even to no limit.

## **Safety of people is assured in wood buildings**

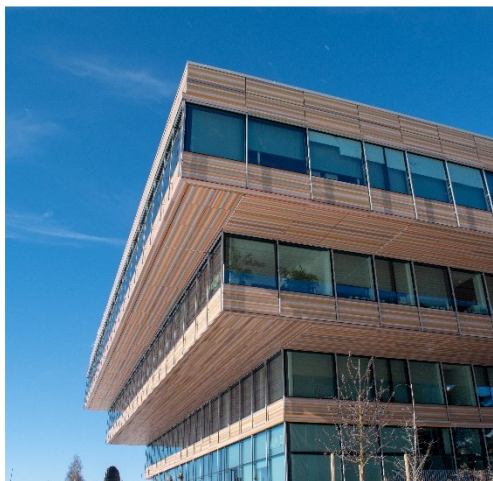
Wood structures or linings are hardly ever the first item to ignite. They will contribute to fire usually later on when people have already been evacuated. Methods to prevent and limit spread of fire are compartmentation, automatic extinguishing and if needed, limiting areas of visible wood. In exit routes of buildings, any combustibles must be limited.

## **The building design takes into account fire performance of wooden structures and linings.**

Fire safety design of wood products has a solid experimental basis because Eurocode 5 (EN 1995-1-2 Structural Fire Design) defines charring rate-based dimensioning of load-bearing structures as well as calculation rules for protective coverings and connections.

Concerning reaction to fire performance, most wood-based products are Classified Without Further Testing (CWFT) to D class with Commission Decisions and Commission Delegated Regulations which mean they have stable performance and there is no need for testing and classifying individual products. With fire retardant treatments, wood products can reach up to B-class performance.

## **How can regulations and supportive actions promote building with wood?**



Simplified prescriptive regulations or deemed-to-satisfy solutions in table formats are the easiest way for all stakeholders in handling fire safety of buildings.

However, because simple rules may not be useful (and possibly not even safe and cost-efficient) in large and complex cases, sufficient emphasis should be given to support competence in fire safety engineering (risk analysis and simulations), and this is concerning both engineers and the authorities.

Learning from experience, statistics, national solutions, and the like could be used to harmonise requirements, at least to some extent. This information is valuable in removing unnecessary obstacles in building with wood.

## Cooperation between stakeholders

Building authorities, code/standard developers, designers, and industries need to work together to provide new, innovative, and fire-safe possibilities for the use of wood.

## Examples of short-term activities are the following:

National Annexes in Eurocode 5, Fire part, which is being revised, has possibilities for harmonisation. New medium and large-scale facade fire tests are being developed: a critical review of the test methods and classification criteria would be needed to ensure the suitability of the methods to national requirements and to avoid unnecessary market distortions. Medium and long-term actions are e.g. requirements and technical guides for hybrid structures.

### More information

The publication *Fire Safe Use of Wood in Buildings* provides guidance and insights into the use of wood in construction, including fire science and international regulatory information. All forms of wood products from traditional use of dimensional timber to modern wood products are covered.

Buchanan, A., & Östman, B. (Eds.). (2022). *Fire Safe Use of Wood in Buildings: Global Design Guide* (1st ed.). CRC Press. <https://doi.org/10.1201/9781003190318>

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**Disclaimer:** The views expressed in this information product reflect those of woodPoP's Technical Working Group 'Building' and do not in any way represent the opinions of the Austrian Federal Ministry of Agriculture, Forestry, Regions and Water Management.