

FIRE MANAGEMENT AND SAFETY

Fire safety is an important aspect when choosing building materials. Wood, being a combustible material, is often given less preference due to perceived fire risk.

No meaningful relationship has been found between construction material (steel, concrete or timber) and durability or fire damage in commercial buildings.¹

Mid-rise timber buildings

Structural timber can be used in the construction of mid-rise timber buildings up to 25 metres or eight storeys when protected with fire-grade coverings in conjunction with an automatic sprinkler system. In 2019, the National Construction Code Volume One expanded the range of building classes where fire protected timber construction systems can be used. It now includes schools, retail premises, hospitals and aged-care facilities in addition to multi-residential, hospitality accommodation and offices.

Timber in bush-fire prone areas

The consensus based Australian Standard AS 3959-2018 *Construction of buildings in bushfire-prone areas* specifies the minimum construction requirements for buildings in bushfire-prone areas.

Structural timber can be used in the construction of house frames across all Bushfire Attack Levels (BALs) and AS 3959 also provides requirements when using timber externally in applications such as cladding, windows, decking and pergolas.

Specific timbers can readily be used in areas up to BAL-29 while a building system approach (e.g. fire-grade plasterboard walls) is required in BAL-40 and BAL-FZ (flame zone).²

Managing fire risk in wood structures

As with other building materials, fire risk in wood structures can be managed through appropriate design, and fire safety and protection measures.³

- Wood-frame assemblies can resist fire for up to two hours if the right materials and construction methods are used.
- When exposed to fire, the outer layer of thick mass timber chars, which will act as insulation. This will slow combustion, delay fire penetration and allow time to evacuate the building. Wood chars at a predictable rate of approximately one millimetre per minute, hence its load resistance and liability to collapse in a fire situation can be accurately predicted.
- Using oversized timber will allow for loss of material charring throughout the burn period, as there will still be enough timber remaining in the cross-section to give it the required strength.



- Timber can be further protected by covering it with a good insulator such as fire-rated plasterboard. It would then take longer for timber to reach ignition temperature and it can remain functional for a longer period while a fire is burning.
- Treating timber with fire-retardant chemicals delays the initiation of combustion and can prevent the spread of flames.
- In addition to structural fire protection, the use of active precautions like automatic extinguishing systems, such as sprinklers, will help to reduce the risk of serious fire damage.

Technical and practical guides for fire design and management

Wood Solutions has a series of Technical Design Guides (TDG) on fire design and fire management, which are freely available from www.woodsolutions.com.au/articles/technical-design-guides. They include the following:

- TDG 4 Building with timber in bushfire-prone areas
- TDG 15 Fire Design
- TDG 17 Alternative Solution Fire Compliance, Timber Structures
- TDG 18 Alternative Solution Fire Compliance, Facades
- TDG 19 Alternative Solution Fire Compliance, Internal Linings
- TDG 20 Fire Precautions During Construction of Large Buildings
- TDG 37 Mid-rise Timber Buildings (Class 2, 3 and 5 Buildings)
- TDG 38 Fire safety design of mid-rise timber buildings
- TDG 45 Code of Practice – Fire Retardant Coatings

¹. Athena Institute (2004), Minnesota Demolition Survey, Phase II Report; Bowyer, et. al (2013), Life cycle cost analysis of non-residential buildings; CSIRO – Division of Building, Construction and Engineering (1996), Fire Resistance and Combustibility, Objectives & Performance Levels for Fire Resistance, <https://www.abcb.gov.au/Resources/Publications/Research/FCRC-Objectives-Performance-Levels-for-Fire-Resistance>.

². Iskra (2019). Forest and Wood Products Australia

³. Various sources: Östman, et. al. (2010), Fire safety in timber buildings. Technical guideline for Europe. SP, 19; Think WOOD (n.d.), Fire Safety and Protection, <https://www.thinkwood.com/performance/fire-safety-and-protection>; Think WOOD Infographic on Wood and Fire Safety; White and Dietenberger (2010), Fire safety of wood construction, Forest Products Laboratory. Wood Handbook-Wood as an Engineering Material. 1-17; WOODPRODUCTSfi (n.d.), <https://www.woodproducts.fi/content/fire-safety-wood-structures>.