

Introduction to fire safety in timber buildings

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Abstract

The combustibility of timber, the increase in potential fuel load to a fire and the behaviour of loadbearing timber structures subject to elevated temperatures pose risks to the fire safety in a building. Different products of mass timber such as cross laminated timber (CLT), laminated veneer lumber (LVL) and glued laminated timber (glulam) behave differently in the event of a fire, where walls and ceilings of CLT have been found to experience char layer fall-off when subject to fire. As timber construction influences the fire dynamics and the potential fire scenarios, it is important to understand how associated risks can be addressed and mitigated with appropriate fire protection measures. It is also important to understand how the influence of mass timber construction relates to current building codes and standards, which in many countries does not account for combustible loadbearing timber structures.

There are different types of fire protection measures. These can be categorised into passive or active fire protection such as automatic sprinkler systems, which, in combination with a particular building, are part of its fire safety strategy (Buchanan and Östman 2022). Several experiments have proven that an automatic sprinkler system, as well as a water mist system, are effective in compartments with exposed timber in walls and ceilings (Zelinka 2018; Kotsovinos et al 2022). Based on a statistical study, Garis and Clare (2014) indicate that operating sprinkler systems reduces the extent of fire spread in a building independent of its construction materials. Encapsulation of timber structures with protective boards is an example of passive fire protection preventing the timber structure from being involved in a fire event. Provided with sufficient encapsulation, the fire can be expected to behave similarly to a fire in a non-combustible building structure which fire regulations historically have been written for.

Even if a mass timber building is built in accordance with current fire regulations, recent incidents have shown that extensive property damage can occur if the fire spreads into cavities of timber construction. This, together with the potential of extensive and severe fires due to the inherent fuel load of timber structures. This can result in a deficit of insurer confidence, as compliance with the building regulations does not necessarily provide resilient property protection (RISC Authority 2022).

Due to an absence of historical data and a lack of comparable projects to help the insurance industry to develop a statistical record of timber buildings, focus tends to be on determining a level of adequate fire protection measures in timber buildings. Insurance companies tend to favour the installation of automatic suppression system in timber buildings and some companies have adopted internal policies of not offering insurance to timber buildings without automatic suppression system.

The provision of an automatic suppression system in a timber building will help reduce the risk of an initial fire spreading to include the timber structure. If an exposed timber structure is involved in the fire, an automatic suppression system will mitigate the risk of flashover in the compartment. This subsequently means that the risk of fire spread between fire compartments, buildings and into combustible cavities will be reduced.

References

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