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NUMERICAL SIMULATION OF FIRE DYNAMICS IN TIMBER COMPARTMENTS

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ABSTRACT

The numerical simulation of fire dynamics is challenging due to the wide range of time and length scales that must be considered, and due to the complex interaction between solid and gas phase that govern the production of gaseous fuel that feeds the flames. Over the years some modelling techniques have been developed that permit to reproduce temperatures and flow fields in some configurations of fire compartments using computational fluid dynamics combined with simplified combustion models. None of these techniques include the actual simulating of fire growth (i.e. the gaseous fuel production) but rely on the heat release rate as an input parameter. With the boom of high-rise timber construction, there is a need to assess the impact of timber construction elements on the fire dynamics and fire propagation inside a compartment, as the additional fuel fundamentally changes the flow and combustion dynamics. Numerical simulation of fire dynamics in timber compartments is thus becoming a subject of study all around the globe. Since the gaseous fuel production is the differentiating aspect of timber compartment fires, it needs to be included in the simulation efforts. This poses new challenges to the fire simulation community.