Abstract

Traditional deterministic fire engineering builds on the collective experience of the fire safety profession, obtained through a continuous process of trial and error. For uncommon fire safety designs, probabilistic risk assessment (PRA) is a necessary methodology to demonstrate adequate safety. Guidance on the application of probabilistic methods to fire engineering can be found in the UK PD 7974-7:2019. But there are no reference case studies demonstrating a structured application of the probabilistic methods to fire engineering design. At the same time, there is no guidance on defining the risk tolerability limits for a building project through stakeholder communications in PD 7974-7:2019.

Aiming to clarify these aspects, PD 7974-7:2019 is explored and a literature review of risk acceptance in fire safety engineering is performed. In the context of fire safety engineering, the literature review indicates that there are no established risk tolerability criteria in the building sector when compared to the industrial and transportation sectors. Through literature review and carefully analysing public reaction on past fire incidents, the important risk perception factors that need to be considered in fire safety engineering specific to the built environment are identified. Acknowledging that what need to be considered in setting risk tolerability criteria for a specific project in the built environment, a risk tolerability framework is proposed. Also, a methodology is developed to demonstrate structured application of the probabilistic methods to fire engineering design. This methodology together with the proposed risk tolerability framework, incorporating the feedback of fire safety professionals, is demonstrated through three case studies. These case studies can serve as a reference to practicing fire safety engineers. Moreover, the risk tolerability framework provides a clear guidance to fire safety engineers and authorities to establish a risk tolerability criterion for a specific project in the built environment acknowledging the public risk perception.