Exposure of modern compartment fires to facades

Fire spread through façades is a key feature of many high-consequence fire incidents with exceptionally difficult suppression challenges, often involving unproportionate damages and high fatality risk. Unlike many other aspects of fire safety, the framework for assessing the façade performance is far from harmonized. Most countries have their own methods and little is known regarding how relevant these are for the limitation of real fire spread. The impact of realistic fires to facades or how it correlates to different assessment methods is not known. As steps are taken to European harmonization a scientifically based knowledge on relevant façade exposures is important.

Recent developments resulting from architectural trends and an increased focus on sustainability of the built environment, inter alia, have led to a growth of structures with timber as the main material. Having visible wood is commonly desired and increasingly often implemented in multistorey buildings, which requires consideration of additional fire safety challenges such as a potential impact on façade fire exposure. Research indicates that the presence of exposed combustible structural members within compartments could increase the exposure on the external façade in case of fire. However, it is not known to which extent this occurs in real scenarios and if the standard tests impose representative exposures.

Test plan

The project will involve the construction of an incombustible façade structure that is placed on the six compartments to be tested. It will be instrumented to resemble the most relevant instrumentation of a number of full scale standard façade fire testing methods around world.

Measurements points in the façade will correspond to SP Fire 105 (Sweden), the new proposed harmonized European test (EU), BS 8414 (UK), NFPA 285 (USA), CAN/ULC S134-13 (Canada). The results will be compared to available outcomes of standard façade fire testing on incombustible facades. The test series will include statistically challenging scenarios with respect to the façade, with statistically small ventilation openings (increasing the risk and quantity of external combustion), an above average fuel load density and significant exposed (i.e. visible) mass timber surfaces.

Additional measurements of radiant heat fluxes at a distance in front of openings, will provide insight of radiation exposure to neighbouring buildings and risks of ignition in opposing facades. Test results of standard façade tests with incombustible materials, according to standards listed above will be requested and collected if available (some results, such as for the Swedish SP Fire 105 test are already collected). The temperatures and duration of the exposure measured in the facades of the six compartment fire tests (including statistically severe tests) will be compared to available results of the different standard façade tests. This allows the assessment of the severity and relevance of different standard façade fire tests.

Projektinformation

***Projektgruppen**: Daniel Brandon, Johan Sjöström, Fredrik Kahl och Emil Hallberg, RISE*

***Projekttid**: 2020-06-01 -- 2021-12-10*

***Projektstorlek:** 318 300 kr*

Brandforsk

Brandforsks verksamhet möjliggörs av stöd från olika organisationer i samhället. Läs mer om alla vårastödorganisationer på wwwbrandforsk.se