Hot Issues in Fire Engineering

17 January 2012

Concerns on Installing Long-throw Sprinkler in Tall Atria

K.P. Cheung
Department of Architecture
University of Hong Kong, Hong Kong, China

Fire protection of tall halls with long-throw sprinkler and smoke exhaust system refers. Burning a Christmas tree might give a 7 MW fire and burning an exhibition stall might give 10 MW. The hot smoke test was on a 2 MW fire, with alcohol as the fuel, and a smoke generator added smoke for easy visual examination of the rising hot air plume. The long-throw sprinklers were tested separately without actual spray on the alcohol bed and smoke generator bed, and the intention was to measure the water density of the sprinkler spray, possibly without recording the entrained air velocity of the sprinkler before.

Two points should be considered:

- The entrained air and water drops from side spray can cool the smoke and push it as colder slumps to relatively low levels chasing after people inside.

- Blocking views to people and firefighters.

The strong side push of the air entrainment of the long-throw sprinklers will generate big volumes of diluted smoke dispersing into low areas of the hall, unless physical stops exist.

Therefore, the following are suggested to be further explored:

- Set up the intended long-throw sprinklers, and operate them to obtain data and to map out 3-dimensional envelopes to calculate and estimate air and water mist entrainment, and volume extent without burning objects.

- Put a big enough fire testing set up into estimations and investigate the likely outcome.

Further, statistics show that this sprinkler system is to be actuated by a sequence of electronic fire detection, comparing and analysis of signals, actuating of electro-mechanical valves and pumps. The overall system reliability would be in the range of 75% to 85%, unless there is a detailed quantitative analysis report to show a more reliable number, with supporting evidence. The failure of the sprinkler system in case of a fire of the captioned case may lead to damage of the ceiling and a huge surface area high and very difficult to clean and touching up, and deformation of certain metal members, though possibly without collapsing.

FireNewLTS KPC1C(KPC)