

# Comparison of water mist and sprinkler systems to ensure fire safety for the Bonnet Tower

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## Abstract

Fire Safety of tall buildings can recently rely on more advanced water-based fire suppression systems such as water mist systems, which are getting more and more attention as a valid alternative to traditional sprinklers systems. This is mainly due to a better performance in controlling and suppressing the fire, reduced consumption of water and less water damage. In this presentation water mist and sprinklers systems are compared as two possible active fire safety protection measures of the Bonnet Tower, in Milan. In particular, the comparison aims at demonstrating the effectiveness of water mist systems and will be based on the following aspects: (i) fire safety performance; (ii) fire and water damage; (iii) benefits along the building life cycle.

The objective is achieved through the simulation of different fire scenarios for the fire performance case study. Data for the estimation of fire and water damage is retrieved from tests results, while the evaluation of benefits for the water mist system along the building life-cycle is based on data from the manufacturer. The comparative analysis between the Bonnet Tower project and a similar tall building located in Milan, where a sprinkler system is installed, is also undertaken.

Fire CFD simulations were performed considering different scenarios, which estimated the Available Safe Egress Time (ASET) and the Required Safe Egress Time (RSET) for sprinkler and water mist systems. The results show that the ASET requirement is achieved only with the water mist system while with a sprinkler system there is no safety margin between ASET and RSET. Furthermore, the longer activation time for the sprinkler system implies a wider fire spread before the system starts controlling the fire. Laboratory tests at the Technical Research Centre of Finland (VTT, now Eurofins) highlight a reduction

of water consumption of at least 70% for a water mist system in respect to the traditional sprinkler system and, consequently, a reduction in water damage. A comparative building life-cycle analysis between the two systems demonstrates that benefits of a deluge water mist system are significant, in spite of the initial higher cost of design and installation.

The Fire Safety strategy of the Bonnet Tower case study represents an example of innovation in the built environment because of the application of a deluge system, typically used for the protection of machinery with flammable liquid fire hazard, in an office building. The choice of such system allows for a better management of resources, internal spaces and the achievement of the fire performance requirements. The analysis demonstrates the importance having a global overview on long term benefits rather than considering just the initial costs during decision making processes.