

# Fire protection concept to preserve a historical building and add additional storeys using water mist installations

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## ABSTRACT

The Laeishof in Hamburg was constructed in 1898 as an office building for the Laeisz shipping line. (Flying P Liners)  
It was built as a remarkable specimen of contemporary architecture (fin de siècle) and reconstructed after WWII without the topmost storey which had been destroyed.(pict 1)

Some years ago that topmost storey was rebuilt, housing offices and a glasshouse. The increased height caused legal consequences insofar as it was considered a high rise building henceforth, demanding a different setup of fire prevention methods including fire safe escalators, sealed staircases and sprinkler installations as well as a hot smoke removal system.

After a building permit had been granted, based on these stipulations they could not be met under the limitations of monument preservation laws and pile foundation support in tidally influenced sediment soil.

Therefore a new concept was provided by the authors employing water mist system installations in the top storey and the main central hall, comprising the main staircase and the historical paternoster lift.

This solution avoids the high temperature exposure to the cast iron columns which support the storeys in the main hall, likewise the staircase (open to the hall) was protected and smoke, obstructing the safe passage, was removed by condensation. The small water supply tank (6m<sup>3</sup>) could be installed without overburdening the foundations like the bigger sprinkler tank.

After completion tests about assessed the viability of WMist within the staircase, serving as a secondary escape route. Results were as follows.: The staircase remained free of sight obscuration, smoke was effectively reduced and fire was suppressed, while passability remained unimpaired. So the staircase remained operational (safety stairs) and a second one was considered unnecessary

In addition to these favorable effects the small dimensions of the piping and pressure supply made it feasible to „hide“ the installation, preserving the appearance of the original architecture (pict.3)

All stipulations were met and the concept was furthermore approved by the authorities. The conversion of the monument is by now finished and has shown that water mist installations do provide solutions that would have been unattainable with other fire fighting equipment  
Lessons learned: Taking into consideration the different physical approaches between sprinklers and watermist installations, it has been shown that the reduction of water supply demands—as well as the induced-temperature drop by water mist injection does provide solutions that allow reduction of loads, optically detrimental aspects and residual water damage within existing buildings. In addition to these desirable effects, smoke is removed by mist as well.

The concept was honored by the leading fire protection publisher with the first prize for conceptual fire protection in 2016.

Moreover a building permit has now been granted that renders the second escape route in uplevelled building unnecessary, if the existing is equipped with a water mist installation of adapted design.

This means: There is now for the first time, a chance to provide additional living quarters by levelling up existing buildings without the necessity to provide an additional second staircase.

This solves most of the problems hitherto encountered in densely populated cities, where living spaces are badly needed and sought after.

Keywords: Preservation of architectural monuments, water mist, smoke removal, reduction of thermal and mechanical loads, prevention of collateral damage, fire protection for high rise buildings, droplet size. Additional living quarters in cities already densely populated. Additional levels of housings in confined quarters. Generation of additional income for landlords at reasonable cost. Solutions for the ever increasing demand for appartements in city centers.