19th International Water Mist Conference IWMC 2019
23-24 October 2019 - Berlin

WATER MIST IN TALL BUILDINGS

Case study: «Unipol Sai – New Headquarter – Milan»
Sprinkler vs Water Mist

Water Mist: advantages

- Cooling of flames and gases by evaporation
- Depletion of oxygen by evaporation
- Attenuation of radiant heat
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WATER MIST IN TALL BUILDINGS

- DONAU CITY TOWER - WIEN
- RENAISSANCE AT ST. PANCRAS INTERNATIONAL - LONDON
- ZOOFENSTER SKYSCRAPER - WIEN
- WARSAW SPIRE TOWER - POLAND
- NÄSINNEULA TOWER - FINLAND
- NH EUROBUILDING - MADRID
Water Mist

Italian application
Case Study: Unipol Sai
Case Study: Unipol Sai
Spatial layout and Floor usage
Case Study: Unipol Sai
Firefighting accessibility
Case Study: Unipol Sai

Water mist in unique spatial layout
Case Study: Unipol Sai
Facade and structure
Case Study: Unipol Sai
Effect of water mist
Would it help if I could have a single fire protection technology?

Would it be a benefit if I could reduce significantly the fire rating of the structural materials?

Would it be interesting if I could use a technology that discharges up to 90% less water than traditional technology?

...?
«Of course, using **high pressure water mist** as fire suppression technology throughout the entire building complex!»

Critically important to consolidate all different **type approvals, full-scale fire tests reports** and **integrated numerical simulations** covering all the different occupancies in the building, and present them in a structured manner for the local AHJ approval.

*Case Study: Unipol Sai*  
Water mist system suitability
Dossier based on:

Local rules on fire prevention

International standards on land-based water mist systems
- NFPA 750 “Standard on Water Mist protection Systems”
- VdS 3188 “Guideline for planning and installation”
- FM (Factory Mutual) Approval 5560 “Water Mist systems”
- UL (Underwriter laboratories) standard 2167 “Standard for Water Mist nozzles for fire protection service”.

Standard fire test protocols and type approvals for water mist systems

No standard fire test protocols and detected performances for water mist systems (paying more attention on the set goals and validity limits)

Dossier integrated with:

Case-history of water mist protection in similar buildings

Fire dynamic simulations

Case Study: Unipol Sai
Water mist system suitability
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WATER MIST IN TALL BUILDINGS

Main occupancy classifications

OH1 & OH2

Based on standards

Case Study: Unipol Sai

Predominant fire risk scenarios
Specific occupancy classifications

OH1 & OH2

Based on fire consultant evaluations

Case Study: Unipol Sai
Predominant fire risk scenarios
### Summary table of the main solutions envisaged in the project and of the test certificates taken as reference for the different types of occupancies of the building

<table>
<thead>
<tr>
<th>Occupancies</th>
<th>HI-FOG® System</th>
<th>Type Approvals / Fire Tests / FDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parking garages</td>
<td>HI-FOG® 1000 sprinklers (dry system)</td>
<td>VdS OH2 approval</td>
</tr>
<tr>
<td>Offices</td>
<td>HI-FOG® 2000 sprinklers (wet system)</td>
<td>VdS OH1 approval</td>
</tr>
<tr>
<td>False ceilings</td>
<td>HI-FOG® 2000 sprinklers (wet system)</td>
<td>VdS OH1 approval</td>
</tr>
<tr>
<td>Technical rooms</td>
<td>HI-FOG® 2000 sprinklers (wet system)</td>
<td>VdS OH1 approval</td>
</tr>
<tr>
<td>Garbage rooms</td>
<td>HI-FOG® 2000 sprinklers (wet system)</td>
<td>UL OH1 approval</td>
</tr>
<tr>
<td>Sky garden</td>
<td>HI-FOG® 1000 sprinklers (wet system) &amp; HI-FOG® 1000 spray heads</td>
<td>HI-FOG® full-scale fire tests at CNPP, integrated and verified by numerical simulations</td>
</tr>
<tr>
<td>Offices open on the big void</td>
<td>HI-FOG® 2000 sprinklers (wet system)</td>
<td>VdS OH1 approval, integrated and verified by numerical simulations</td>
</tr>
</tbody>
</table>

#### Case Study: Unipol Sai

Main occupancies & the relevant water mist solutions
WATER MIST IN TALL BUILDINGS

Case Study: Unipol Sai
Water mist pressurization units

2 x HI-FOG® EPU
Working pressure 140 bar
Installed in the basement
Protecting all the complex
Case Study: Unipol Sai

Water mist system for parking garages
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Tests at VTT

VdS OH2

PARKING GARAGE PROTECTION

Installation according to approvals and tests

Case Study: Unipol Sai
HI-FOG® system for parking garages
Case Study: Unipol Sai
Water mist system for garbage rooms

GARBAGE ROOMS PROTECTION
UL OH1

GARBAGE ROOMS PROTECTION

Tests at SP & VTT

Installation according to approvals and tests

Case Study: Unipol Sai
HI-FOG® system for garbage rooms
Case Study: Unipol Sai
HI-FOG® system for offices
Case Study: Unipol Sai
Water mist system layout
Offices

Standard fire test protocols and type approvals for water mist systems
- VdS Test Assembly and Requirements - OH1 (False Floors and False Ceilings)
- VdS OH1 approvals

Spacing of sprinklers based not only on the fire tests and approvals but also on the type and size of ceiling panels (radiant system).

Case Study: Unipol Sai
Critical elements in offices
Case Study: Unipol Sai

Water mist system for the sky garden
SKY GARDEN PROTECTION

Case Study: Unipol Sai
Water mist system for the sky garden
SKY GARDEN PROTECTION

Tests at CNPP

Simulations

Case Study: Unipol Sai
HI-FOG® system for the sky garden
Sky garden

No standard fire test protocols for water mist systems
- Specific tests for evaluation of the performance of water mist system for protection of occupancies with high ceilings
- Case studies of similar occupancy based on the fire tests above and integrated simulations

Spacing of sprinklers based not only on the fire tests and case studies above but also on the layout of anchoring structures

Installation of sprinklers below glazed walls is a critical factor and requires attention to avoid false activations by sun, evaluating the right temperature glass bulb!
Simulated building

Case 1A: Free burn
Case 2A: Curtain
Case 3A: Ceiling grid

3 minutes
5 minutes

OFFICE OPEN ON THE BIG VOID

Case Study: Unipol Sai
HI-FOG® numerical analysis for similar scenario
• Water mist systems are a firefighting solution for new application challenges related to modern architectural configurations of tall buildings

• UNIPOL SAI tower is an example of challenging architectural configuration, where the definition of the firefighting strategy led to choosing the water mist system for protection of all areas of the building complex

• The water mist system provides optimal architectural, structural and engineering solutions to maintain the highest fire protection performance over time with the same expected safety level as traditional sprinkler systems

• Clearly, following accurate design and installation, proper actions, methods, procedures and highly qualified workers must be implemented and then assured during the building occupancy by a quality Fire Protection Management System
WATER MIST IN TALL BUILDINGS

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