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International Water Mist Association

Ann Micheli has been Managing Director at Ultra Fog since 2012. Her background in assisting Small & Medium Sized firms to diversify and to internationalize brought her into the fire suppression industry some 15 years ago, where she has been enjoying the challenge of developing a small, Italian marine fire company into the international group that it is today.

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CULTURAL HERITAGE WATERMIST FIRE PROTECTION:
A Heritage Project in Venice

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IWMA Webinar

15th April 2021

International Water Mist Association

Preservation: a conservation architect's dilemma

Wouldn't it be wonderful if we could just wrap up our heritage buildings in cellophane and never let anyone in?

The reality however is that buildings need to survive through the centuries, and in so doing they require **financial resources**:

- Restoration and management
- Change of use
- Visitors and Visitor management

- All of the above combine to create an increase **RISK** to the very heritage that we are trying to preserve….

WINDSOR CASTLE FIRE
20 November 1992

- No fixed fire suppression system installed
- 200 fire fighters
- Fire took 15 hours to bring under control
- More than 1.5 million gallons (5.7mill. lt) water “which in many ways caused more complex restoration problems than the fire”
- 9 state rooms destroyed, more than 100 others damaged
- Cost of Restoration: £37 MILLION AND 5 YEARS TO COMPLETE

LA FENICE OPERA HOUSE
VENICE FIRE
29 January 1996

- The second fire in the history of the theatre.
- No fixed fire suppression system installed
- Fire caused by ARSON
- Clean up post fire: removal of 2300 cu.mt of remains and debris, 300 mts wooden beams, 180 tons of iron beams over a period of 3 months.
- The theatre was completely destroyed
- Cost of Restoration: over €90 MILLION AND 8 YEARS TO COMPLETE
- Reopened in 2004

NOTRE-DAME DE PARIS FIRE
15 April 2019

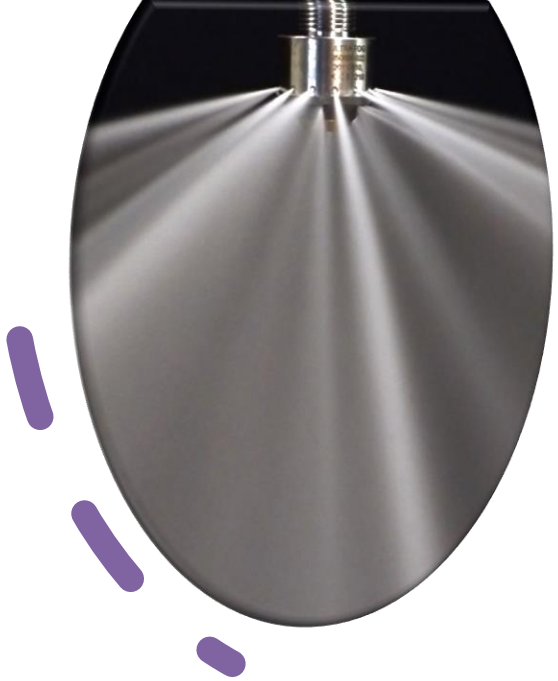
- No fixed fire suppression system installed
- Fire alarm sounded but the guard sent to investigate went to wrong location where he found no fire.
- Alarm system was not designed to automatically notify the fire brigade.
- Over 400 fire fighters engaged
- Over 100 government workers formed a human chain to move precious objects to safety
- Water was supplied by pump boat from the Seine.
- Aerial Fire Fighting was not used because water dropped from heights could have caused structural damage and heated stone can crack suddenly if cooled.
- Helicopters could not be used because of dangerous updrafts.
- Molten lead falling from the roof posed a special hazard for fire fighters.
- Adjacent buildings were evacuated due to concern about possible collapse.
- Environmental damage: high lead levels and settling dust particles across the Ile de France.
- Cost of Restoration: budget not yet finalized but estimated at over $8 billion up to 20 YEARS TO COMPLETE

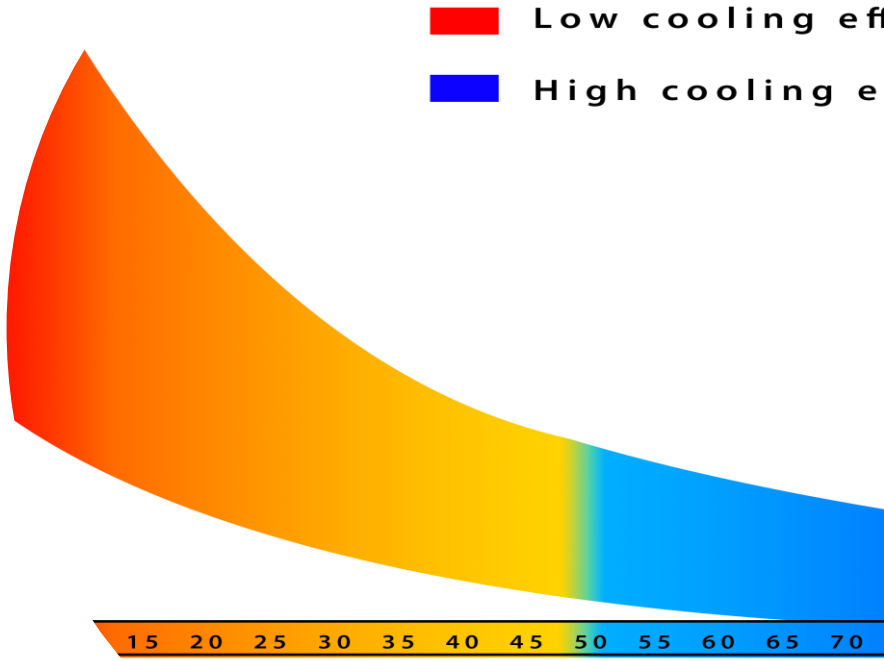
KEY POINTS

- No fixed fire systems installed
- Inadequate fire alarm systems (unable to pinpoint exact location of fire)
- External fire fighters: in great numbers, and at high risk to themselves
- Massive volumes of water to extinguish the fire = serious water damage
- Increased fire damage = increased downtime, loss of revenues, costly restoration costs

Why is Watermist a good choice?..

- An automatic fixed fire suppression system acts as a first responder to fire, even when the building is unattended.
- It is designed to suppress fire, but above all it will control and limit the fire growth, allowing time for external responders to arrive at the scene.
- Watermist is efficient:
  - Water absorbs a large amount of heat
  - Smaller water droplets = increased surface area and increased ability to absorb heat and cool surroundings
  - Less water = facilitates evacuation and reduces down time
  - Pressure increases the ability of the water to penetrate the fire plume.





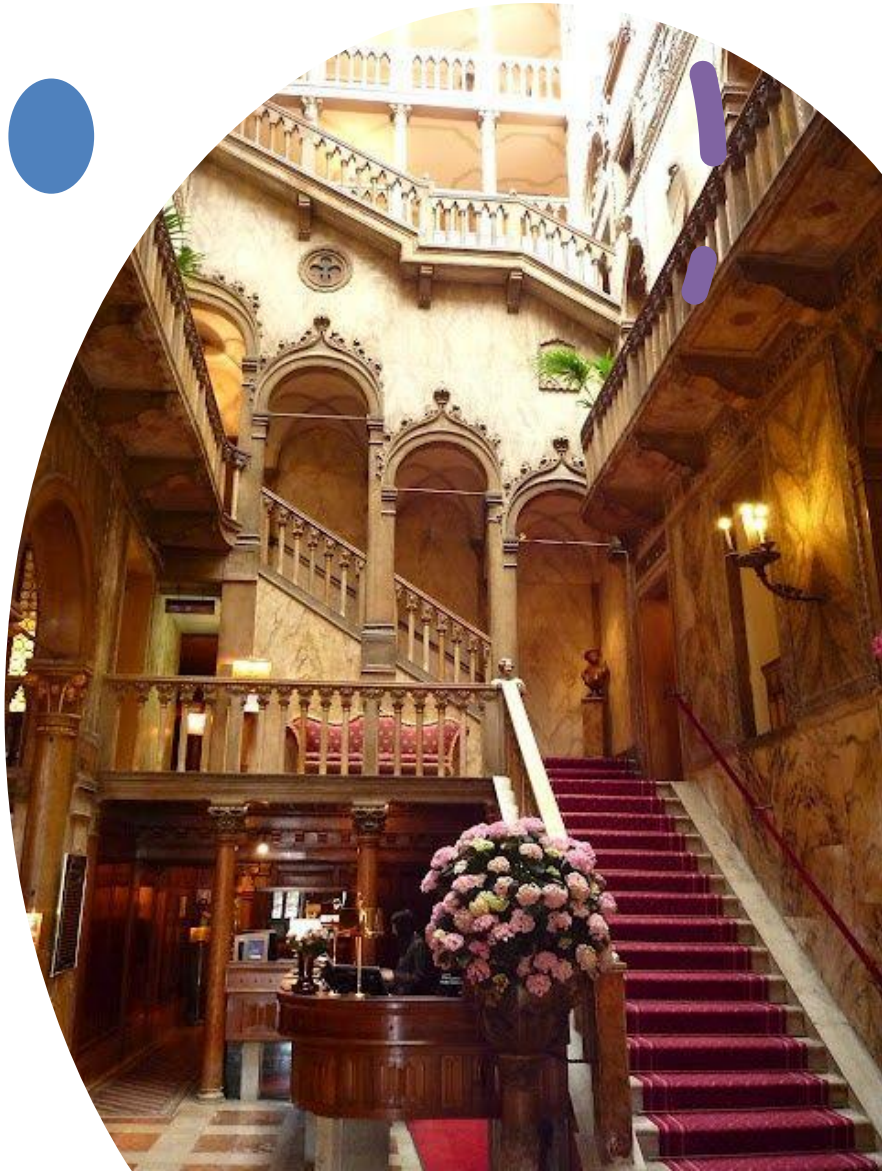
CASE STUDY: HOTEL DANIELI VENICE

- UNESCO world heritage site since 1987
- Hotel Danieli is a complex comprising 3 buildings:
  - Palazzo Danieli Excelsior (20th Century)
  - Palazzo Casa Nova (19th Century)
  - Palazzo Dandolo (14th Century)

  - A mixed group of buildings which over the years has changed use from private family home to the hotel it is today.

The High Pressure Watermist System…

- The watermist installation project started in the oldest part of the complex: Palazzo Dandolo.
- The project is still ongoing because the hotel has remained in operation during the course of the installation.
- Watermist lends itself to this type of installation as it uses small pipes (12mm to the nozzles) which are relatively simple and quick to install.
- The system was selected by Starwood Hotel chain and Danieli, and ultimately the Marriott chain of which the hotel is currently a member for the following reasons:
    - Low visible impact of system
    - Reliable and tested technology
    - Flexibility of design and high degree of customization deemed "sensitive" to the historical features of the spaces

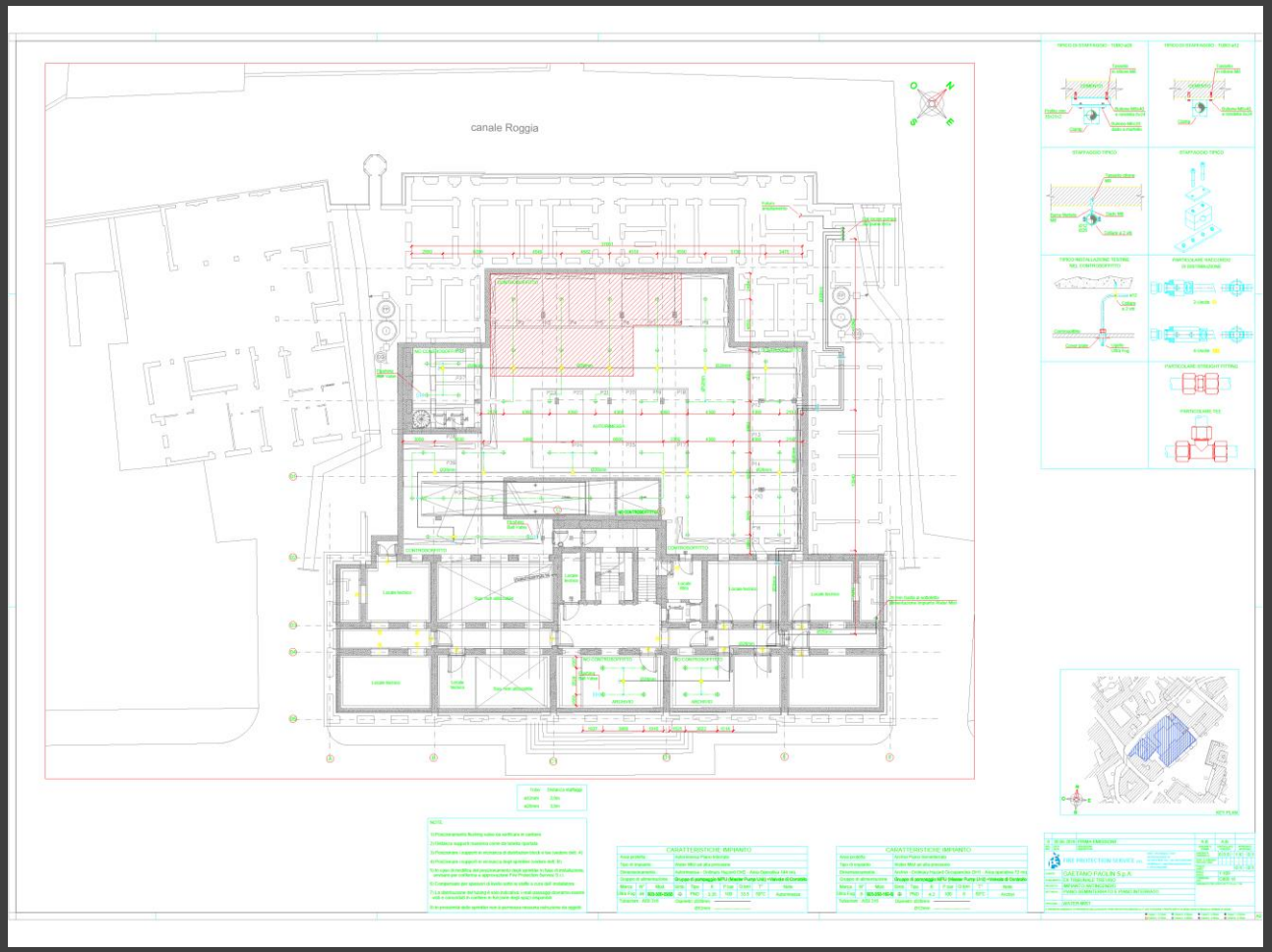


A few technical details…

- All watermist projects involving historical buildings start with the need for acceptance both by the AHJ and by the all important architects and conservation authorities.
- This can often be a complex negotiation where the need to balance the efficacy of the fire system with the lowest possible intervention or alteration to the structure or appearance of the building is paramount.
- In Venice, the favorable opinion of the Superintendency is always required before starting the installation of a fire prevention system; in the case of Venice, the Superintendency since 2002 has followed many projects with its architects, including those for the protection of the domes of the Basilica of San Marco, the attics of the Royal Palace, the attics of the Accademia, Palazzo Ducale and dozens of others so he is still familiar with water mist technology which he generally accepts favorably.

…. Technical details

- The guidelines of the NFPA 750 standard (listed system) were followed, while for the classification of the risk for the purposes of local fire prevention, the designers referred to the OH-1 risk class (Hotel) according to the EN 12845 standard.
- The system is an automatic “wet system” using a heat sensitive bulb nozzle
- It is a High Pressure system with a working pressure of 100 bar designed for the most part across a 72m2 ‘most demanding area’.
- 12 mm stainless steel pipes were used for the distribution and 28mm for the horizontal manifolds. The vertical manifolds used 38 mm pipe dimensions.
- The system is independent from the detection system, but the status and alarm signals of the water mist system are reported to the detection system in case of intervention
- A pump room has been created where the pump, cabinet and a CPSS certified rescuer unit are located, which guarantees emergency power supply in the event of a main power failure.



FLEXIBLE DESIGN FOR A COMPLEX BUILDING

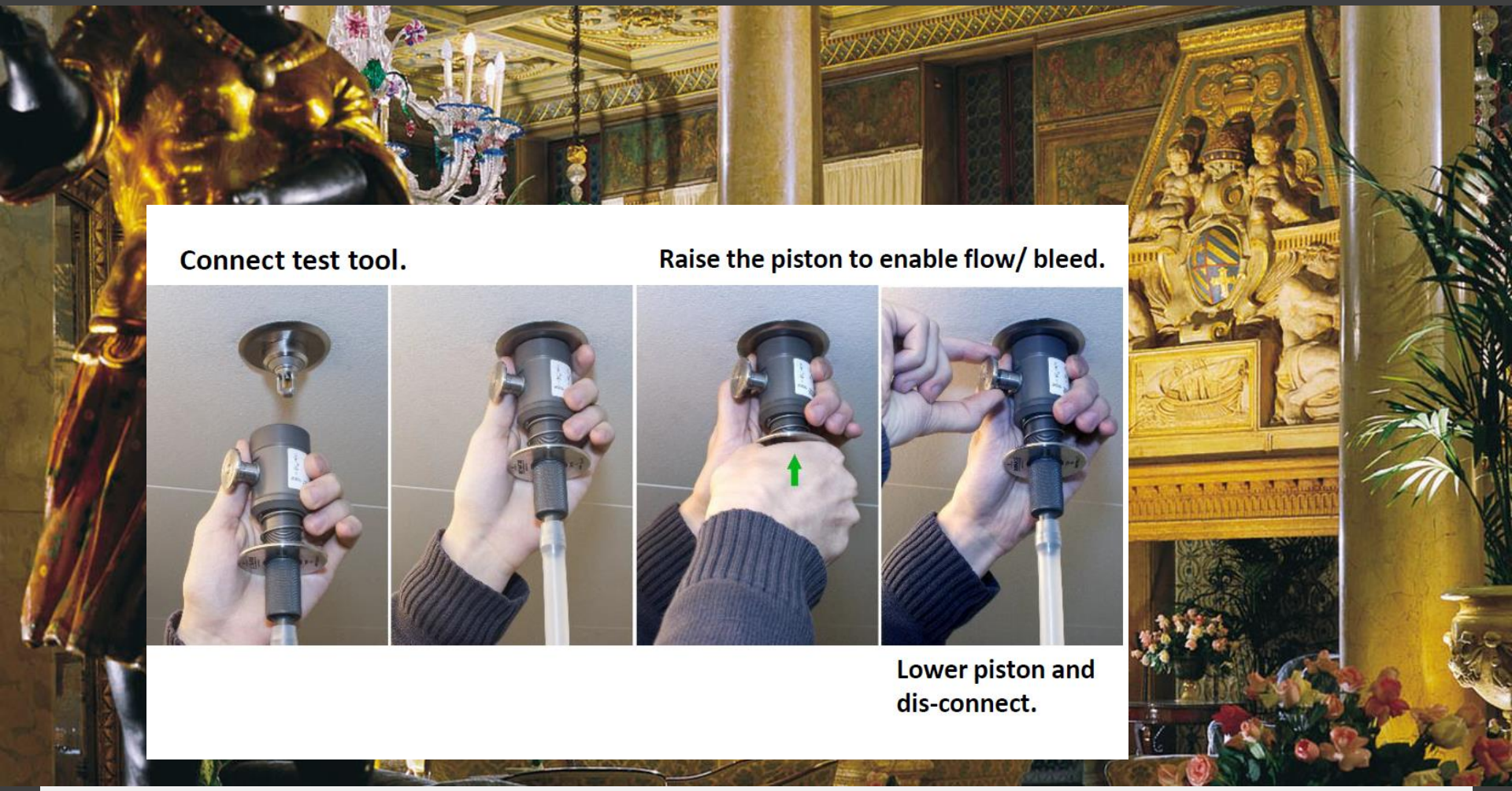
- Different types of areas with different types of usage
- On this floor plan we have technical rooms, archives, parking facilities, all of which require individual flow and pressure calculations.
- At the end of the works, approximately 800 nozzles will be installed in common areas and rooms that vary in height from about 3 to 5.5 meters.

Low Impact and Historical Sensitivity

- Hidden nozzles, especially in the most prestigious rooms, such as the sidewall ones in the suites, have been camouflaged in the walls" or camouflaged nozzles so as not to attract attention
- Areas with exposed piping are rare and are limited to staff areas
- During the installation phases we were assisted by company specializing in restoration who made the holes for the passage on our recommendation and then sealed them, restoring and "painting" all the passages.

Low Impact and Historical Sensitivity

- Thanks to their small size, the integration of the pipes in the building had a modest impact on the structure
- On several occasions during the installation the specific authorisation of the Superintendency as the authority responsible for preserving the aesthetic and architectural integrity of historic buildings in Venice was consulted and solution sought.
- In the above photo, see how the manifold has been “camouflaged” into the décor of this splendid reception room.



Safe system Maintenance in a Heritage Context

- Watermist manufacturers are sensitive to the lifetime maintenance requirements of their systems.
- With historical interiors and invaluable works of art, system maintenance needs to be as simple and safe as possible.
- Here we have an example of a maintenance tool which fits over the nozzle so nozzles can be tested individually and pipes flushed without having to release the system itself.
- During his visit to Hotel Danieli in 2020, a Mariott Architect was particularly impressed by the watermist system and this neat, easy to use maintenance tool.

High Pressure Watermist: Excellent Fire Protection for our World Heritage

- **Watermist is a tried and tested technology**
- **Recognised International Standards**
- **Flexible Personalised Solutions with historical sensitivity**
- **Fit for Purpose**
- **High fire suppression efficacy with LESS water and less water damage**
- **Ease of Installation and maintenance with minimal disruption in a 24/7 environment.**