



# High Pressure Water Mist Systems: Alternative Solution For Critical Civil Applications



# • Fire Fighting In Civil Applications

## High-Rise Buildings

- Buildings with heights from 160 m to 250 m and higher (due to ground space high prices), 30 to 80 floors and more
  - Offices
  - Residential properties
  - Commercial activities : restaurants, stores, entertainment venues (casinos, etc.)

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## Historic Buildings: Museums, Hotels, Libraries

- Various types of hazard in the same, complex building
- Installation of the FF system: Damage to Historical Wooden Furniture During Installation
- Pumping station, gas (inert or HFC) cylinders storage
- Damage to areas of historical interest
- Engineering: piping lay-outs, nozzle proper positioning

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## Historic Buildings

- Guest Rooms
- Corridors
- Escape Routes
- Wardrobes, Offices,
- Warehouses, Storages,
- Technical Spaces



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LH Non-storage and non-manufacturing occupancies

Residential occupancies

Schools and educational institutions

Offices (certain areas)

Prisons

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OH occupancies

Hospitals

Libraries

Restaurants

Offices and meeting rooms

Laboratories, data processing

Car Parks

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OH occupancies

Broadcasting studios, Railway stations

Cinemas and theatres , Concert Halls

Department Stores, Shopping Centre

Clothing , paper and wood storages not over OH3

# Risks Associated With Civil Applications

- Not only light hazards, often remarkable OH1 and OH3 combustible loadings located at the uppermost building levels, occupied by 80-100 150 thousand people, non only during office hours
- Public Fire Services Response is usually complicated for limited reach of the fire ladders (7-8 stories) and to reach the fire floor may take several minutes (30 min to..... 1 hour) or being nearly impossible for some historical buildings
- *Exterior* floor to floor fire spread hazard (flames can break windows, igniting commodities)





# Risks Associated With Civil Applications

- *Internal* floor to floor fire spread hazard:
- Stairwells or escalators
- ductwork or utilities openings, heating ventilation, air-conditioning
- Inadequately sealed spaces between building internal front face and floor slabs
- Conclusion: a potentially devastating fire can be fought.....**from the inside**

# Fire Loss History: Monuments, exhibition areas





# The Choice of The Fire Fighting Means

- Fire Temperature Control (steel frame collapse)
- To minimize:
  - the smoke generation
  - Property loss
  - Occupants safety
  - Fire and rescue services safety
  - Environmental damage
- **Reliable and Effective (98% as a minimum)**



# The Choice of The Fire Fighting Means

## Traditional FFS:

- Gas extinguishing Systems (inert gases, HFC)
- Sprinkler or Foam Systems

## New FF Technologies:

- Aerosol
- Sprinkler Equivalent Water Mist Systems
- Total flooding and Local applications can be realized for particular protections

# Civil Applications: Listing and Approvals For the New Water Mist technology NFPA 750 - Water Mist Fire Protection Systems

- Standard to: design, approve, install, do maintenance & tests of water mist systems

- Ch. 1 Administration
- Ch. 2 Referenced Publications
- Ch. 3 Definitions
- Ch. 4 General
- Ch. 5 System Components & Hardware
- Ch. 6 System Requirements
- Ch. 7 Installation Requirements
- Ch. 8 Design Objectives & Fire Test Protocols
- Ch. 9 Calculations
- Ch. 10 Water Supplies & Atomizing Media
- Ch. 11 Plans & Documentation
- Ch. 12 System Acceptance
- Ch. 13 System Maintenance
- Ch. 14 Marine Systems
- Annex A Explanatory Material
- Annex B Research Summary
- Annex C Examples of Fire Test Protocols
- Annex D Reliability
- Annex E Informational References
- Index



# Civil Applications: Listing and Approvals For the New Water Mist technology

- Factory Mutual (Class Number 5560) LH
- Underwriters Laboratories, UL 2167
- VDS
- IMO

# Civil Applications: Listing and Approvals For the New Water Mist technology



- In order to approve the system, local Fire Brigade Authorities or AHJ accepted in the past certificates relevant to fire tests according to IMO Res. A.800 (19).

-Acceptable as sprinkler system alternative

Tested Heights: 2.4 m to 5 m

Nozzles flow rates:  
from 14 lpm to 26 lpm

*This has limited the possible applications of water mist systems*



fire development in the disabled nozzle test



# Civil Applications: Listing and Approvals For the New Water Mist technology

**EN 12845:** Fixed Fire Fighting Systems - Automatic Sprinkler Systems Design, Installation and Maintenance

**CEN TS 14972 :** Water Mist Systems- Design and Installation Annex A (Normative) TEST PROTOCOLS

**A.3 Fire Test Protocol For Office Occupancies of OH group 1:**  
This test method is intended for evaluating the fire performance of watermist systems equivalent to the fire performance of a sprinkler system for office and school occupancies belonging to OH1 as defined in EN 12845





# Civil Applications: Listing and Approvals For the New Water Mist technology

## **CEN TS 14972** : Water Mist Systems

### A.3 Fire Test Protocol For Office Occupancies of OH group 1:

- Unlimited volumes
- Demand area of 72 m<sup>2</sup> or 4 nozzles (most unfavourable)
- No limit on the tested height

# Civil Applications: Listing and Approvals For the New Water Mist technology

**CEN TS 14972 : Water Mist Systems**

A.3.2 office fuel package:



# Civil Applications: Listing and Approvals For the New Water Mist technology

## **CEN TS 14972 : Water Mist Systems**

### A.3.3.2.2 Reference sprinkler tests

Classification:OH1

Water Density: 5 lpm/m<sup>2</sup>

Protected area per spk:12 m<sup>2</sup> (3,5 x3,5 m)

Sprinkler type: pendent spray according to EN-12259-1

Spk thermal sensitivity: special response as in EN 12845 and 68°c

K-factor= 80

Pressure: min pressure 0,563 bar



# Civil Applications: Listing and Approvals For the New Water Mist technology

**CEN TS 14972** : Water Mist Systems

A.3.3.2.3 watermist system tests

Water Density: **1 lpm/m<sup>2</sup>**

Protected area per spk: 12 m<sup>2</sup> (3,5 x3,5 m)

Nozzle type: water mist High Pressure

Spk thermal sensitivity:

K-factor= 1

Pressure: min pressure 100 bar



# Civil Applications: Listing and Approvals For the New Water Mist technology

## CEN TS 14972 : Water Mist Systems

A.3.3.3 Evaluation of test results: damage and ceiling average temperature for water mist two tests less than worst spk test

Sprinkler System 5 lpm/m<sup>2</sup> [D:\VIDEO\\_TS\VTS\\_01\\_2.VOB](#)



Water Mist System 1 lpm/m<sup>2</sup> [D:\VIDEO\\_TS\VTS\\_02\\_1.VOB](#)





# Civil Applications: Listing and Approvals For the New Water Mist technology

## **CEN TS 14972 : Water Mist Systems**

### **Annex B: Guidelines for developing fire test procedures for watermist systems**

- in accordance with scientific and engineering principles of fire protection that incorporate widely accepted methods
- generic fire hazard or particular application
- based on compartment evaluation (open or enclosed fire), fire hazard and performance objectives (water damage, smoke damage, tenability) of the water mist system
- developed, carried out and interpreted by qualified fire testing laboratories implementing procedures according to EN/ISO 17025

# Civil Applications: Listing and Approvals For the New Water Mist technology



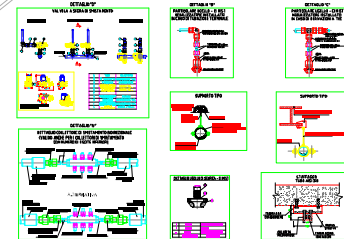
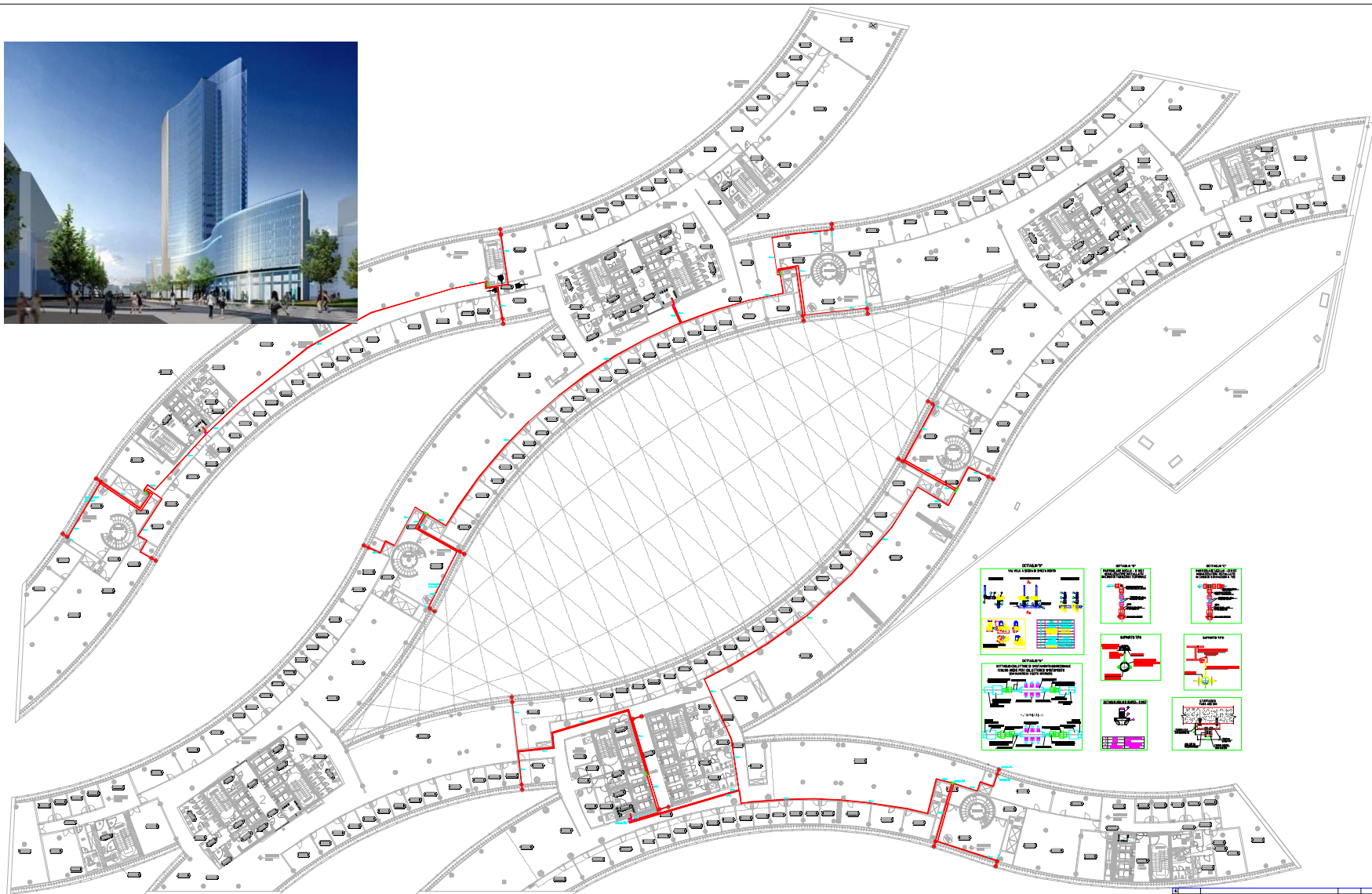
**CEN TS 14972 : Water Mist Systems**

**Annex B: Guidelines for developing fire test procedures for**

**watermist systems:**

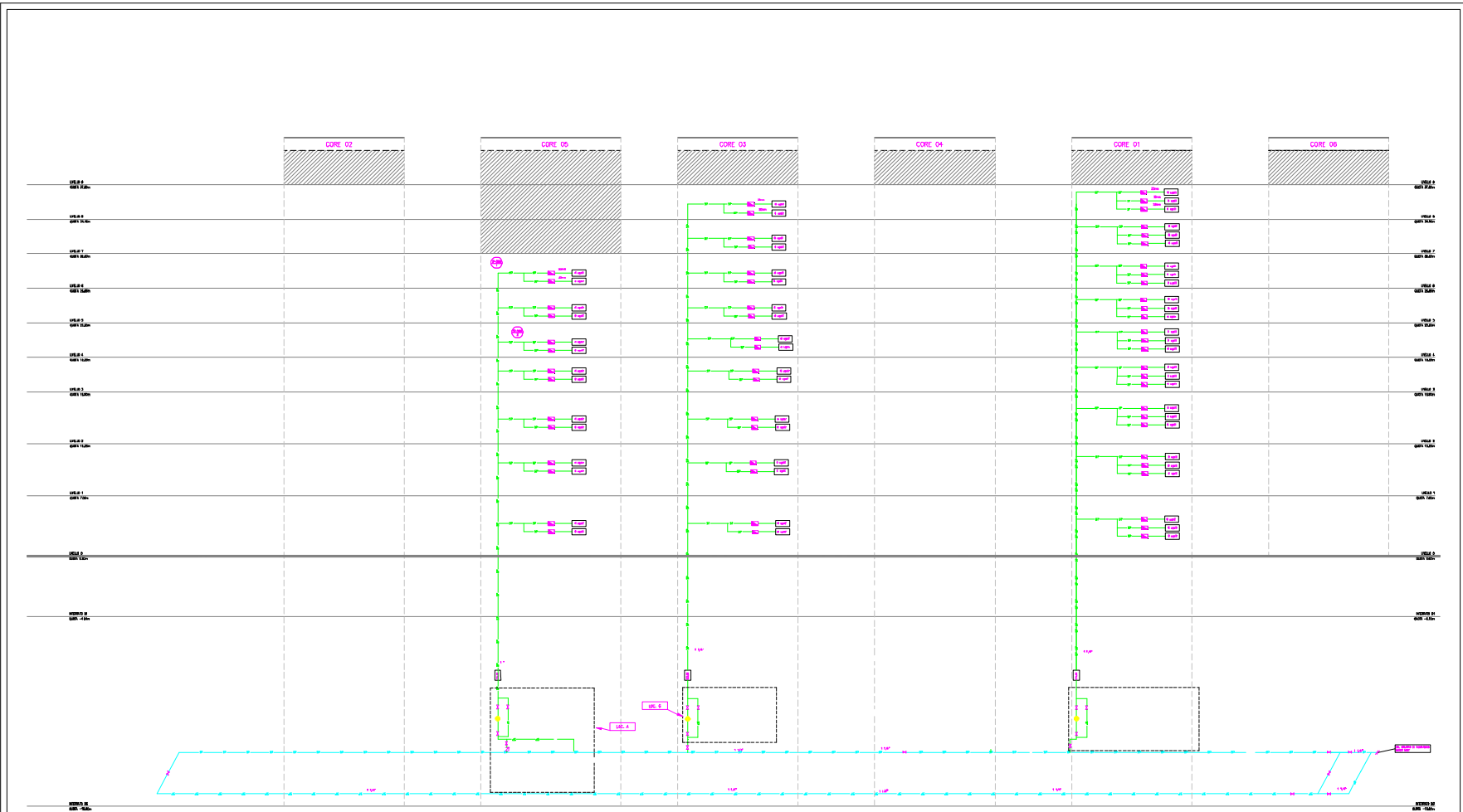
Special applications for ductwork or utilities openings, heating ventilation, air-conditioning. Inadequately sealed spaces between building internal front face and floor slabs





		<b>EUSEBI IMPIANTI S.p.A.</b> ARONA (VA) - VIA M. NEGRI, 6 Tel. 0322 - 40 01 00 - Fax 0322 - 40 01 01		<b>M   C   O   S</b>	
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# Civil Applications: Listing and Approvals For the New Water Mist technology



## **CEN TS 14972 : Water Mist Systems**

### **Annex B: Guidelines for developing fire test procedures for watermist systems:**

*CEN/TC 191 WG3* document will amend CEN/TS 14972:2008 with Annex F (Fire test procedure for occupancies Ordinary hazard group OH3). Fire performance of water mist fire protection systems for the following occupancies:

- archives, file rooms, libraries, book stores;
- selling rooms, store areaways, stores (except for selling rooms for furniture with expanded plastics);
- shops, shopping centres, consumer markets with “storage” up to the limits as given in the reference table of the standard;
- radio and TV communication studios;
- technical centres, service rooms.



## CEN TS 14972 : Water Mist Systems

### **Annex B: Guidelines for developing fire test procedures for watermist systems:**

*CEN/TC 191 WG3* document will amend CEN/TS 14972:2008 with Annex F (Fire test procedure for occupancies Ordinary hazard group OH3).

The following conditions shall be fulfilled:

-the maximum storage heights shown in Table F.1 shall not be exceeded (max 3,5-4 m);

-the maximum storage areas shall be 50 m<sup>2</sup> for any single block, with not less than 2,4 m clearance around the block

-The first commodity is called the EUR standard plastic commodity . It consists of empty polystyrene cups without lids, placed upside down, in compartmented cartons, 120 cups per carton.

-The second commodity is made up of empty, lightweight, cardboard boxes (thickness nominally 4 mm; type “C-flute”)placed on wooden europallets in accordance with ISO 6780



# Conclusions and Remarks:

- **CEN TS 14972** : is a significant improvement in the application of Water Mist Systems to a variety of civil applications
- Major aspects: First and Main Technical document to develop fire tests and relevant report consistent with real civil installations, so widely accepted by AHJ, reluctant to accept IMO certificates
- tests carried out according to **CEN TS 14972 demonstrates equivalency between sprinkler and watermist systems in an enormous variety of EN 12845 hazards and more:**

# Conclusions and Remarks



- Water mist minimizes damage caused by the extinguishing agent using densities of  $1/5$  compared to standard sprinkler systems
- Allow critical protections to be solved by watermist installation through fire test and relevant reports carried specifically by recognised fire testing laboratories.



Thank you for your attention!

Eusebi Impianti srl