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
Fire Fighting In Civil Applications

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, not 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 same 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
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- Factory Mutual (Class Number 5560) LH
- Underwriters Laboratories, UL 2167
- VDS
- IMO
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- 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
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**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
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**CEN TS 14972 : Water Mist Systems**

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

- Unlimited volumes
- Demand area of 72 m2 or 4 nozzles (most unfavourable)
- No limit on the tested height
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CEN TS 14972 : Water Mist Systems
A.3.2 office fuel package:
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CEN TS 14972 : Water Mist Systems
A.3.3.2.2 Reference sprinkler tests
Classification:OH1
Water Density: 5 lpm/m2
Protected area per spk:12 m2 (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
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CEN TS 14972 : Water Mist Systems
A.3.3.2.3 watermist system tests

Water Density: 1 lpm/m²
Protected area per spk: 12 m² (3,5 x 3,5 m)
Nozzle type: water mist High Pressure
Spk thermal sensitivity:
K-factor = 1
Pressure: min pressure 100 bar
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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/m2 Water Mist System 1 lpm/m2
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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
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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
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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 m² 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!

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