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New Water Mist Solutions according to Annex B of CEN TS 14972 – "*Guidelines for developing fire test procedures for Water Mist Systems*"

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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
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NFPA 750 - Water Mist Fire Protection Systems

- Latest Edition: 2010
- Annex C (for information) “Examples of Fire Test Protocols”
- Water mist systems must be listed for specific hazards and protection objectives
- New potential applications of water mist arise continuously, for which ad hoc test procedures have been developed
- Test protocols should be developed, carried out and interpreted by internationally recognized fire testing laboratories

Listing and Approvals for the Water Mist technology

- Factory Mutual (Class Number 5560) LH, Machinery spaces, GT, other
- Underwriters Laboratories, UL 2167 (Nozzle Tests, Residential, OH1,OH2)
- VDS (Cable tunnels, OH1, OH2, transformers, etc.)
- IMO (type approvals for applications equivalent to LH, OH)
- CEN TS 14972

Testing Procedures For the Water Mist technology

CEN TS 14972 : Water Mist Systems- Design and Installation

Annex A (Normative) ACTUAL TEST PROTOCOLS

Annex B: Guidelines for developing new fire test procedures for watermist systems

Watermist systems shall be tested in accordance with **Annex A** and certified in conformity to this document by a recognized authority. For scenarios **where Annex A is not applicable**, it is recommended to test watermist systems in accordance with **Annex B** by a recognized third party laboratory. In this case the results of the test protocol should be acceptable to the authority having jurisdiction, responsible for the acceptance of the system. **Annex A** describes fire test protocols for a variety of hazard groups. Watermist systems shall be successfully tested in accordance with these test protocols.

Annex B provides guidelines for defining representative fire test protocols based on a proper fire protection engineering evaluation of the fire hazard, the compartment conditions, and the performance objectives for the system.

Testing Procedures For the Water Mist technology

CEN TS 14972 : Water Mist Systems

Annex B: Guidelines for developing new fire test procedures for watermist systems

-in accordance with scientific and engineering principles of fire protection that incorporate widely accepted methods

-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

When there's a lack of a proper water mist fire test in the standards:

-manufacturers now have a tool to develop, to test and to certify new systems and also, Fire Brigades and AHJs have a standard they can approve systems on.

-In the past water mist systems acceptance was based on water mist standards like NFPA 750 or marine IMO standards

These protocols in the future could be base for the technical committees to become part of the European Standard, so leading to spread the water mist technology, also via IWMA

Process Flow Chart

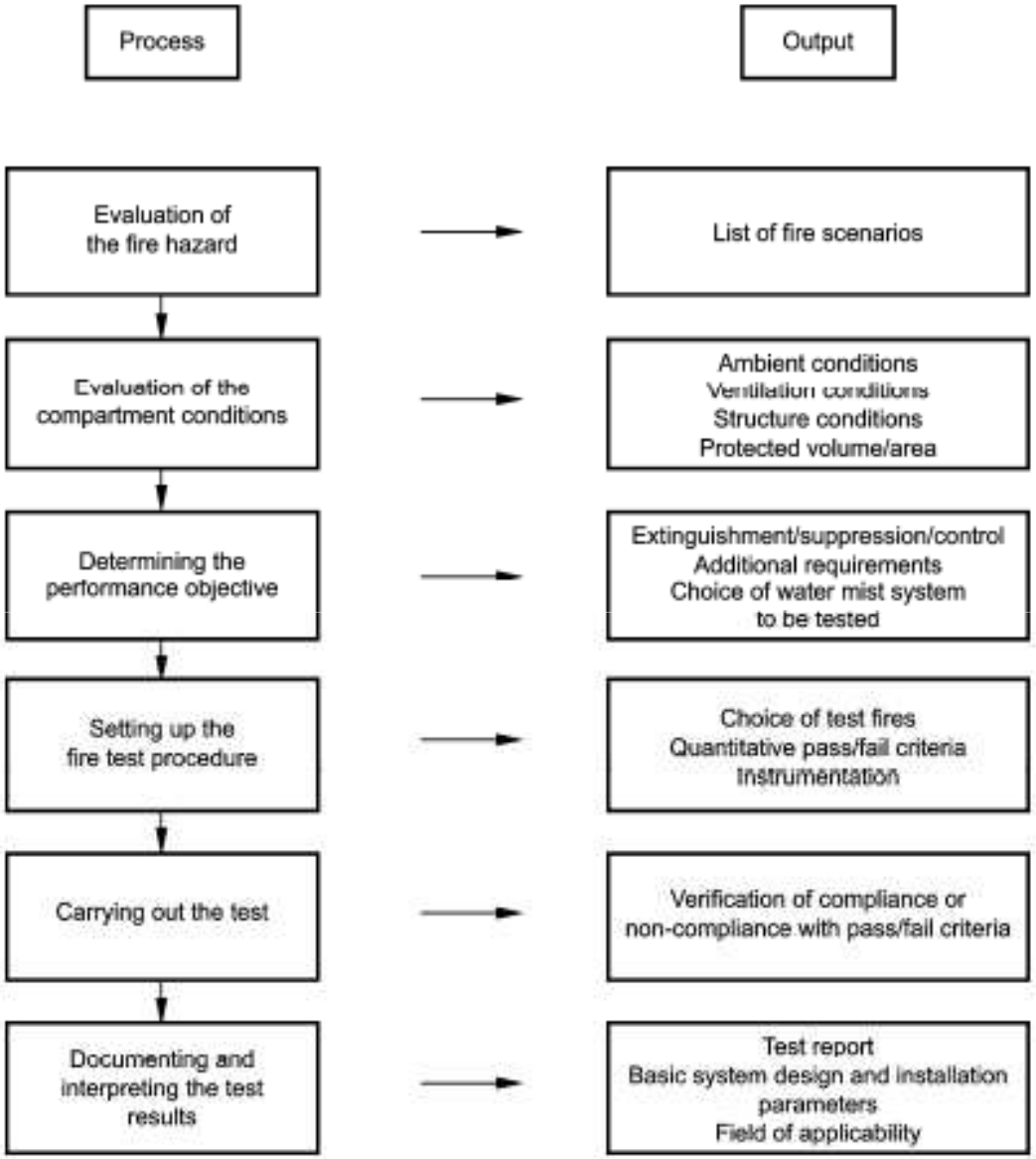
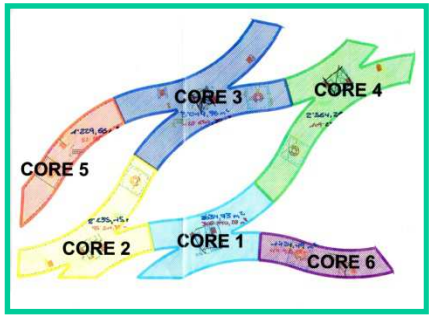


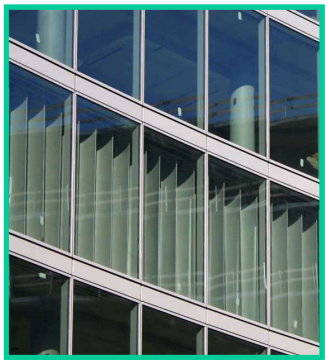
Figure B.1 — Process of developing a fire test procedure

A NEW BUILDING

- High rise building: divided in 6 cores.
- Each core is a fire compartment

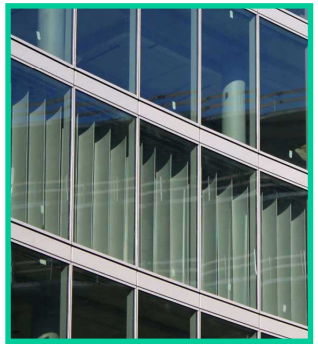


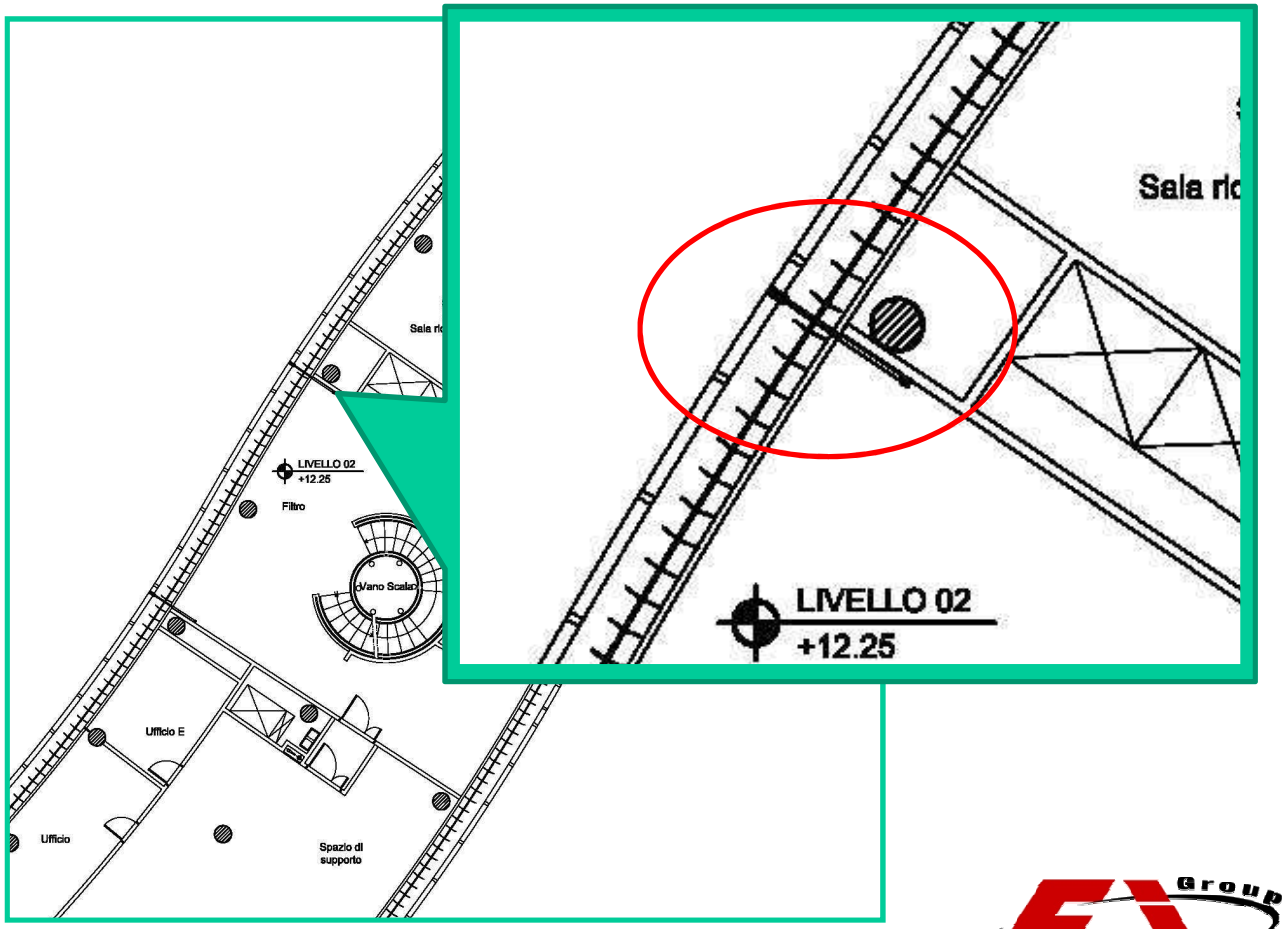
- Climatic wall, has a glass exterior wall with adjustable sun screens



BASIC DESIGN

FIRE DOOR LOCATED IN THE CLIMATIC WALL





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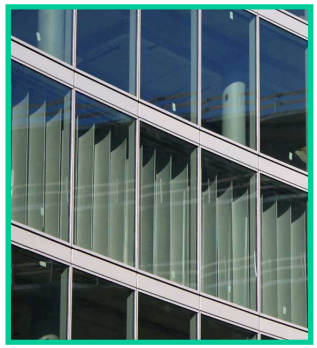


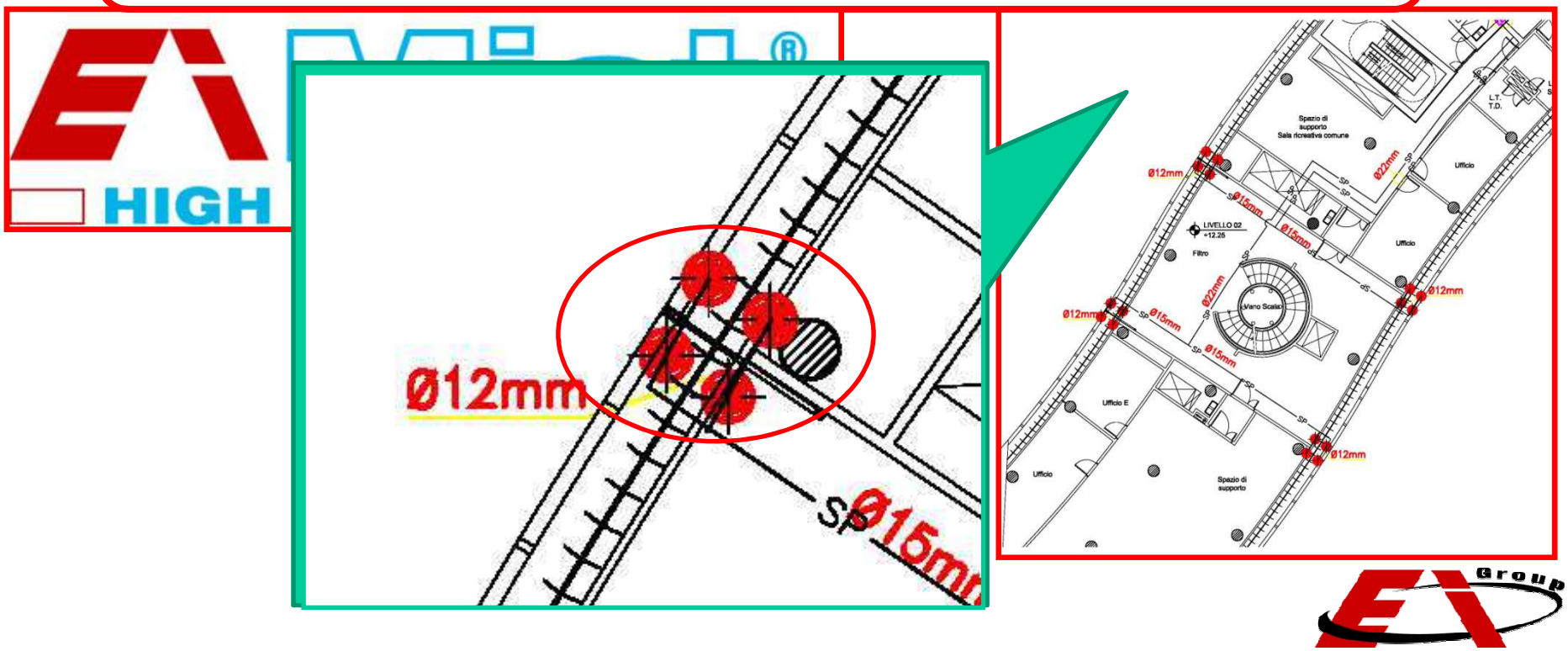
- PROBLEMS: SEVERAL MODIFICATIONS IN THE SUN SCREEN FRAMES AND ARRANGEMENT

- PROBLEMS: FIRE DOORS WITH POOR RELIABILITY DUE TO COMPLICATE INSTALLATION

EI MIST AS ALTERNATIVE MEASURE

➢SMALL DIMENSION OF NOZZLES AND PIPING, LOW IMPACT ON SUN SCREENS ARRANGEMENT

➢ NO PROBLEM OF FIRE DOOR MOVEMENTS IN THE SUN SCREEN AREAS



FIRE TESTS

✓**TEST PERFORMED IN ORDER TO VALIDATE AN ALTERNATIVE MEASURE TO "STANDARD" WATER CURTAINS**

✓**SAME MATERIALS AND SCREEN BLADES HAS BEEN INSTALLED IN ORDER TO CREATE A MOCK-UP AS REAL AS POSSIBLE**

✓**RESULT: VALIDATION OF THE WATER MIST AS A "TESTED" WATER CURTAIN**

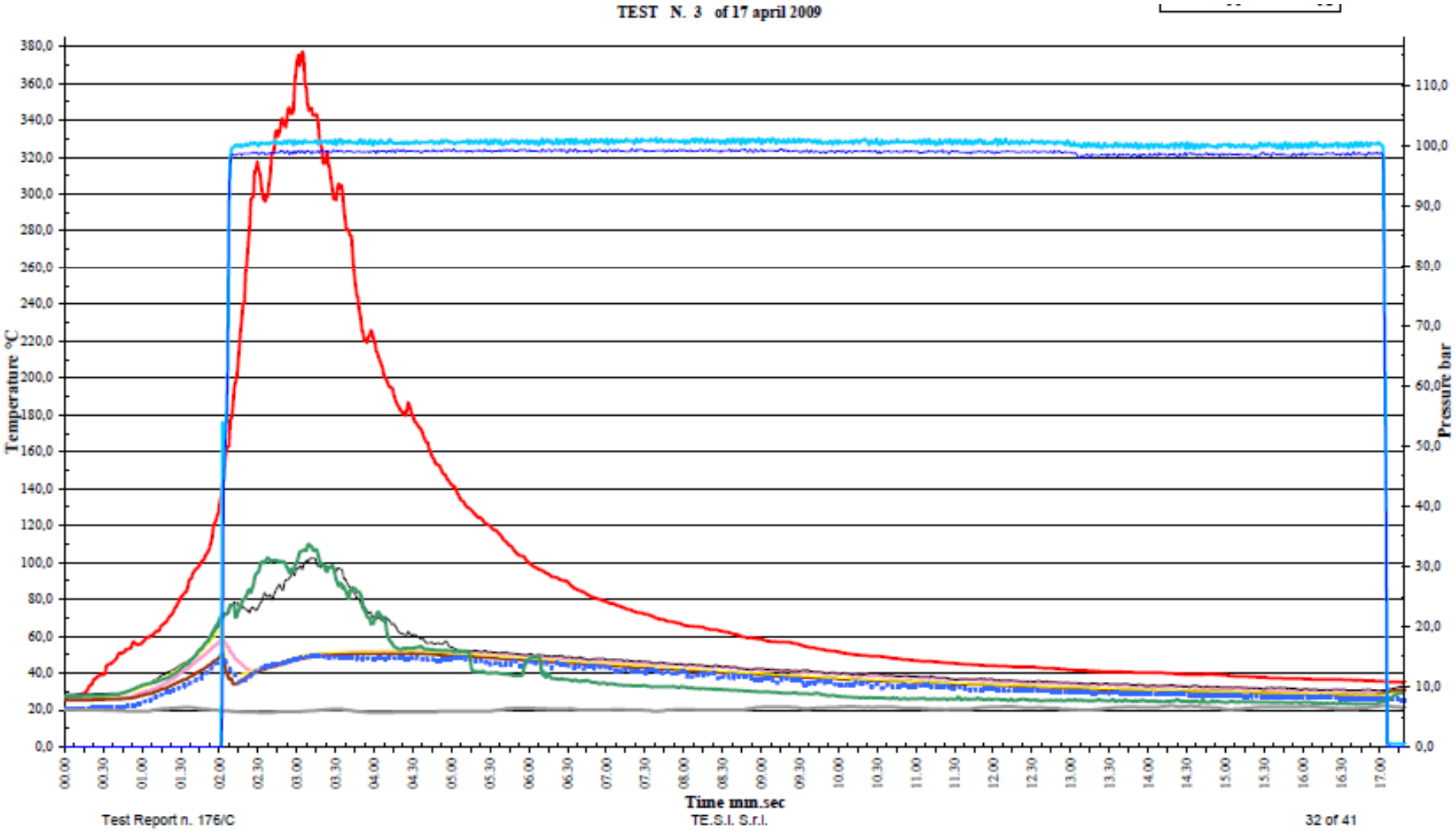
FIRE TESTS

✓FIRE TEST IN ACCORDANCE TO IMO A.800, SIMULATING FIRE STARTED FROM A CORRIDOR/OFFICE

✓TEMPERATURES AT THE ENTRANCE OF THE CLIMATIC WALL 380°C

✓TEMPERATURES IN THE CURTAIN AREA FROM 48°C DOWN TO AMBIENT TEMPERATURE

✓SMOKE JUDGED BY SPECIAL CAMERAS AND VISUAL FINDINGS

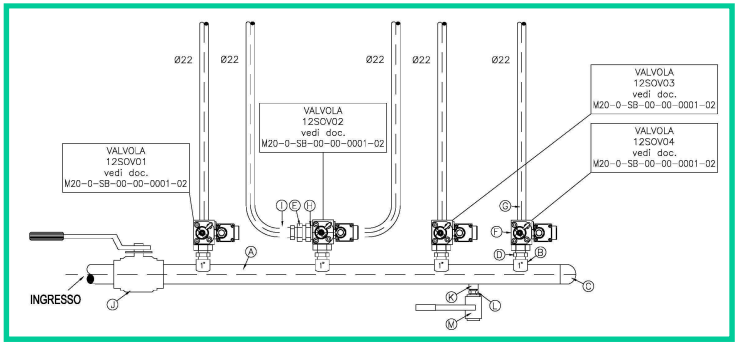


THE INSTALLED SYSTEM

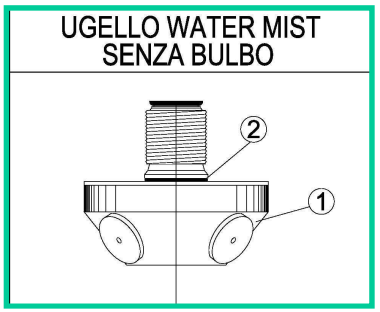
✓**WATER STORAGE AND PRESSURIZATION:**

- o No. 2 WATER TANKS, 5 M3 EACH
- o 2+1 PRESSURIZATION DIESEL SYSTEM

✓**NETWORK: AISI 316 l PIPING WITH AUTOMATIC VALVES**

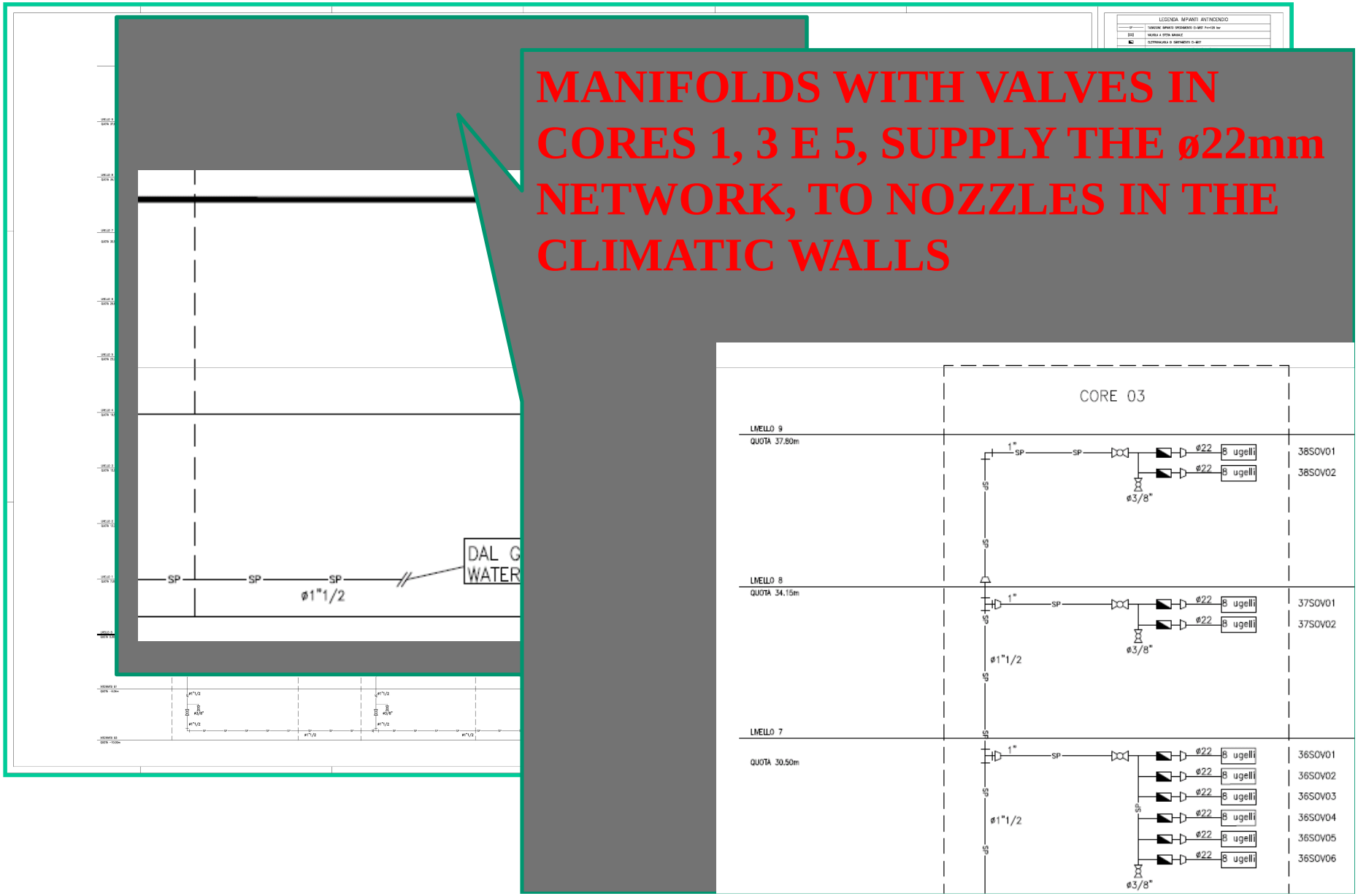


✓**OPEN NOZZLES**

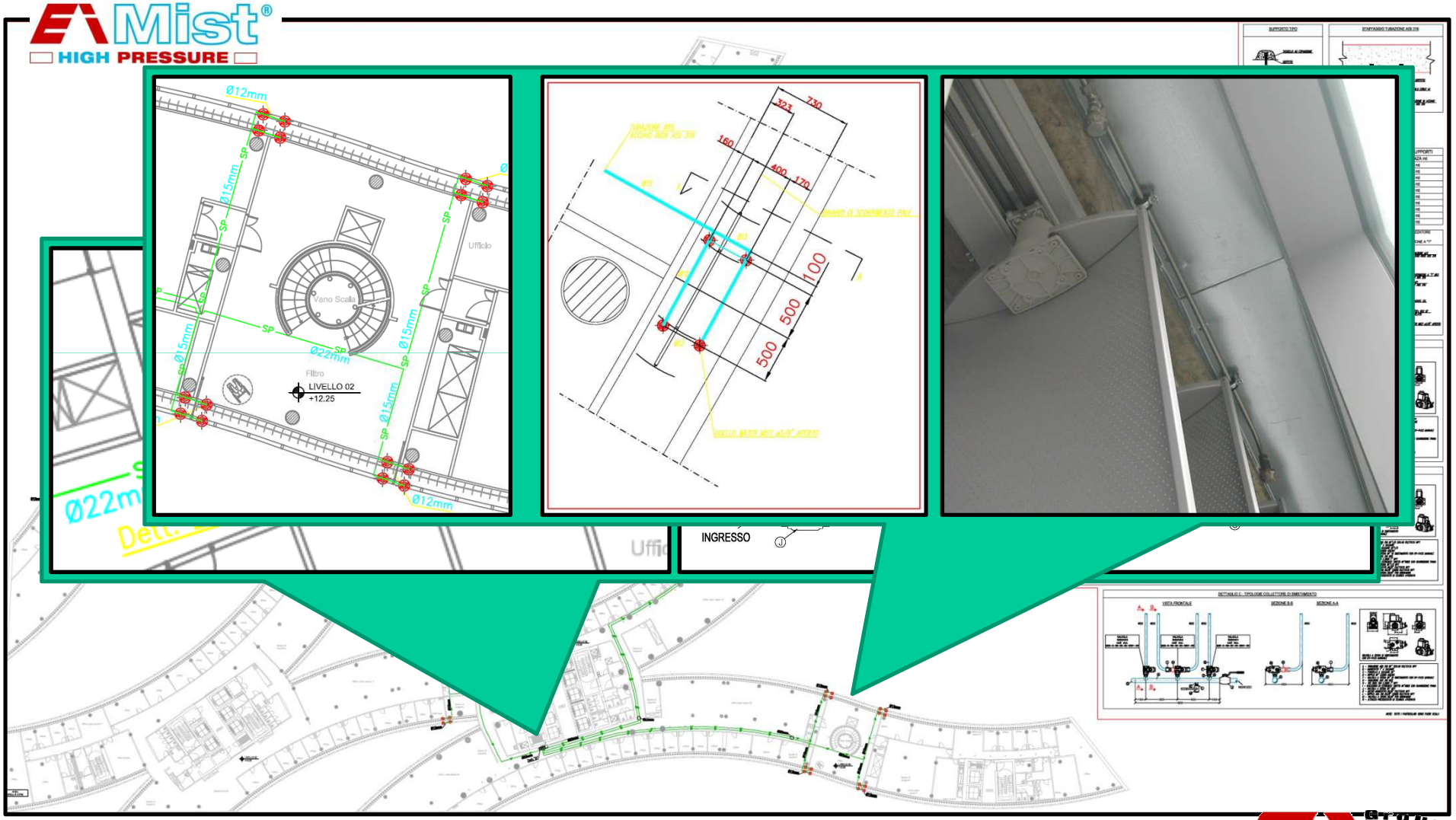


THE INSTALLED SYSTEM

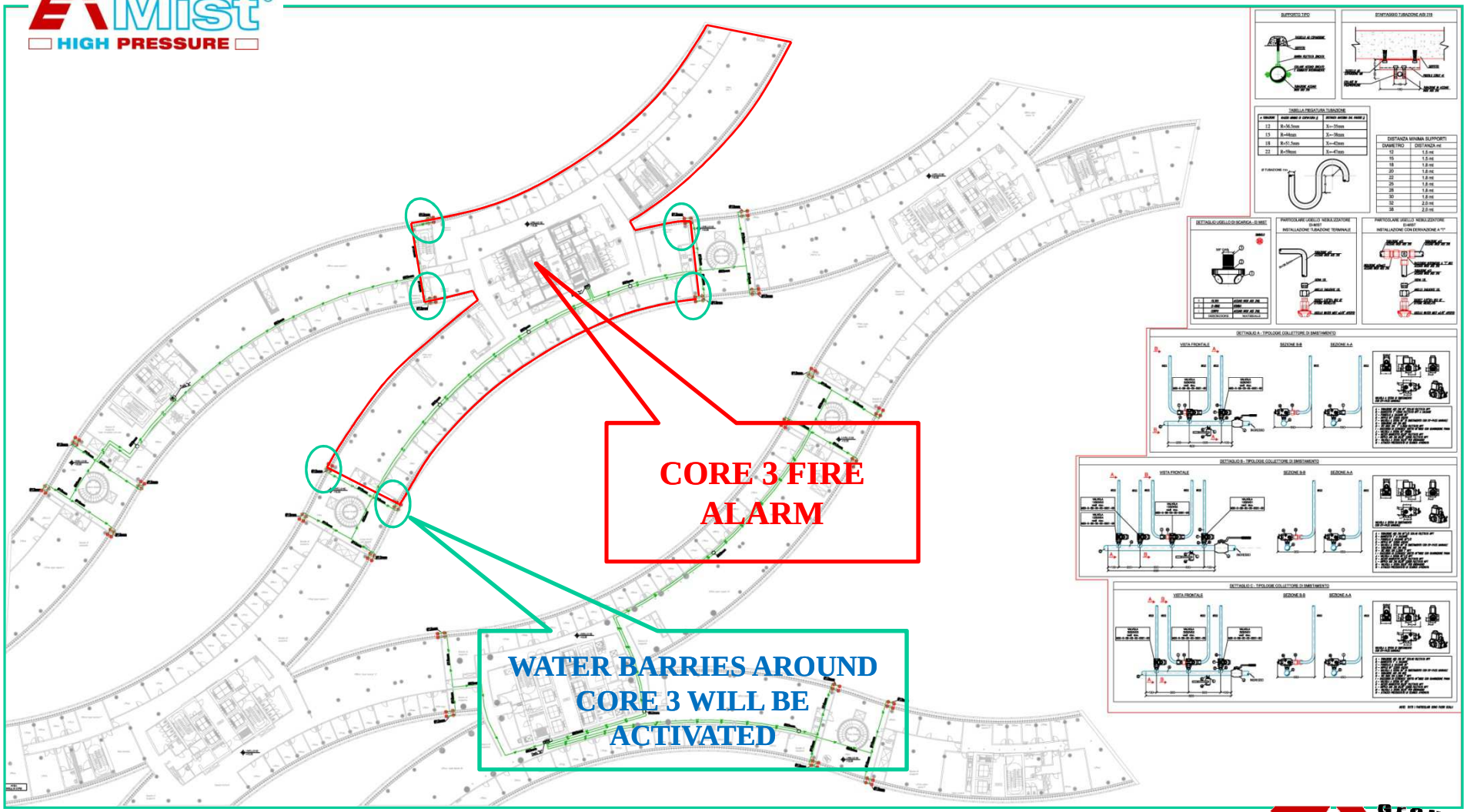
MANIFOLDS WITH VALVES IN CORES 1, 3 E 5, SUPPLY THE ø22mm NETWORK, TO NOZZLES IN THE CLIMATIC WALLS



PIPING NETWORK



ACTIVATION LOGIC



Installation of the EI Mist System

Other consolidated Fire test procedures

OH2 (car parks) – OH3 (storages)

Atrium Protection

DFF Friers, cooking equipment (similar to UL 300)

OH4 Cinemas and theatres ,Concert Halls

OH4 as for EN 12845

OH4

Cinemas and theatres

Concert Halls,

Exhibition Halls

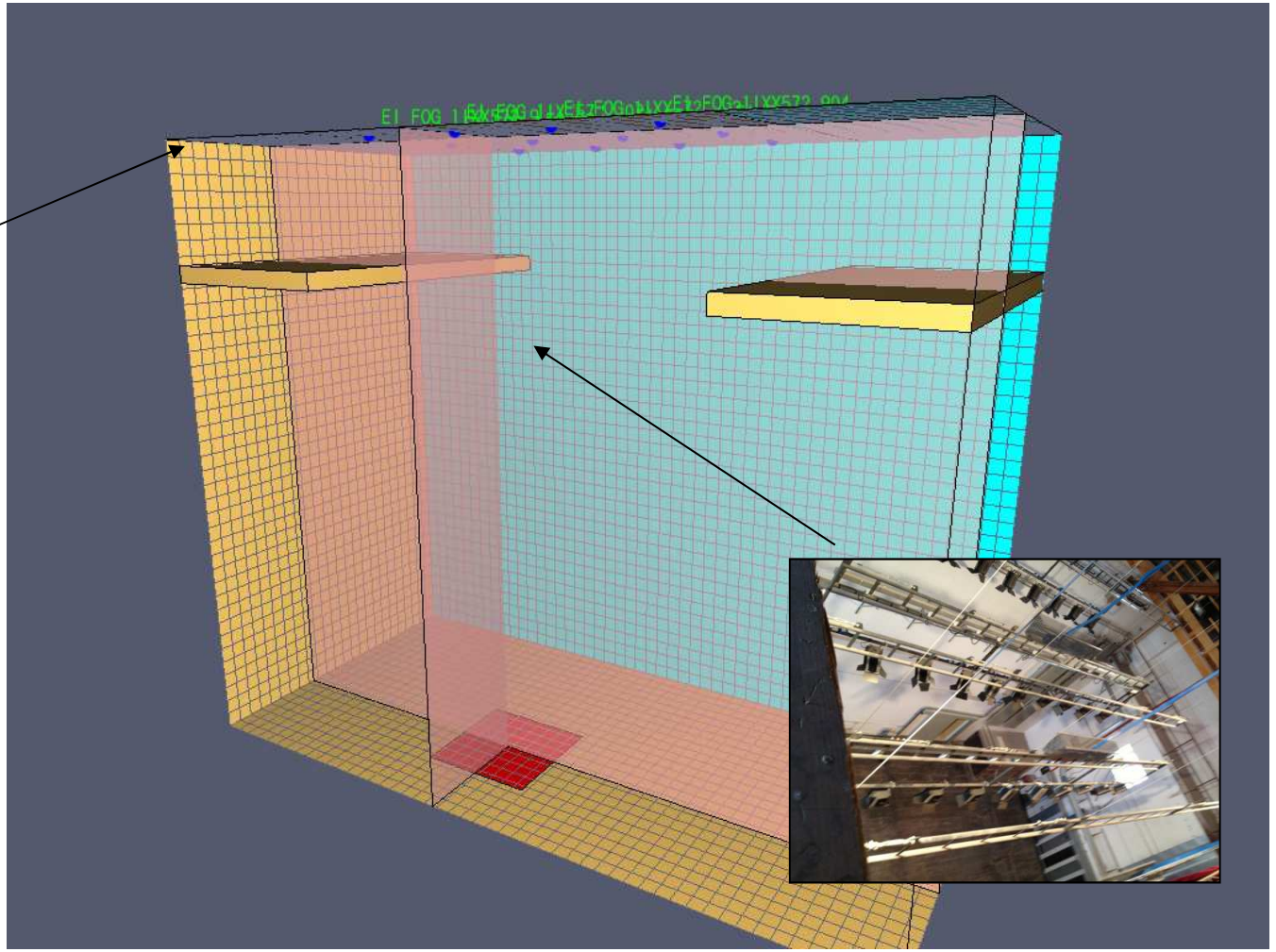
Recording Studios

Plus:

OH1 risk with relevant ceiling highs, over the ones tested with available standards

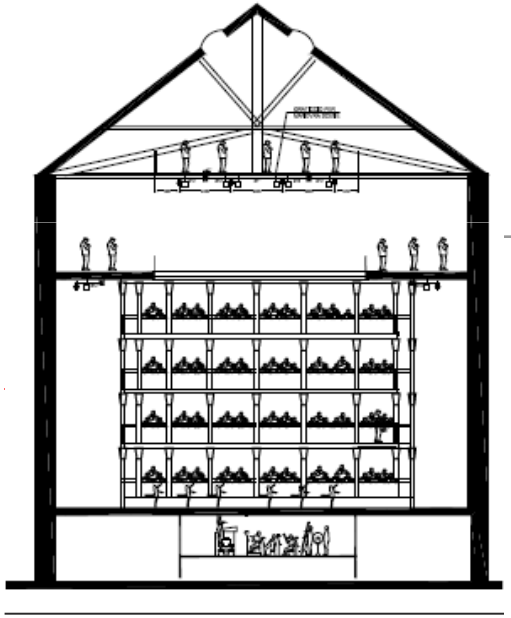
Some examples ⟶

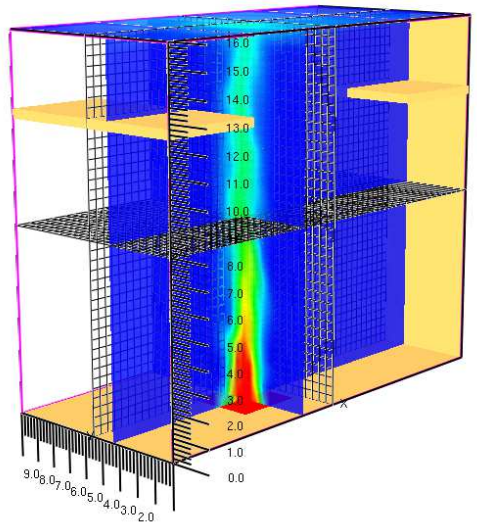
Theatres: *stage protection*

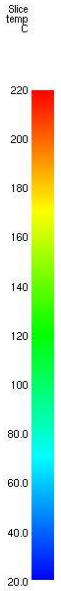


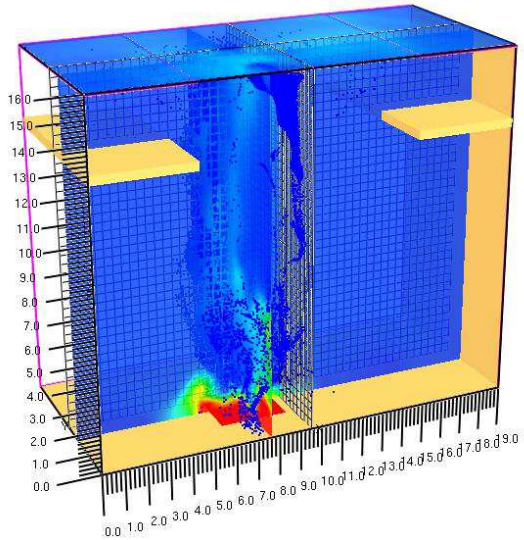
- Oct 29 2010

CFD Simulations:



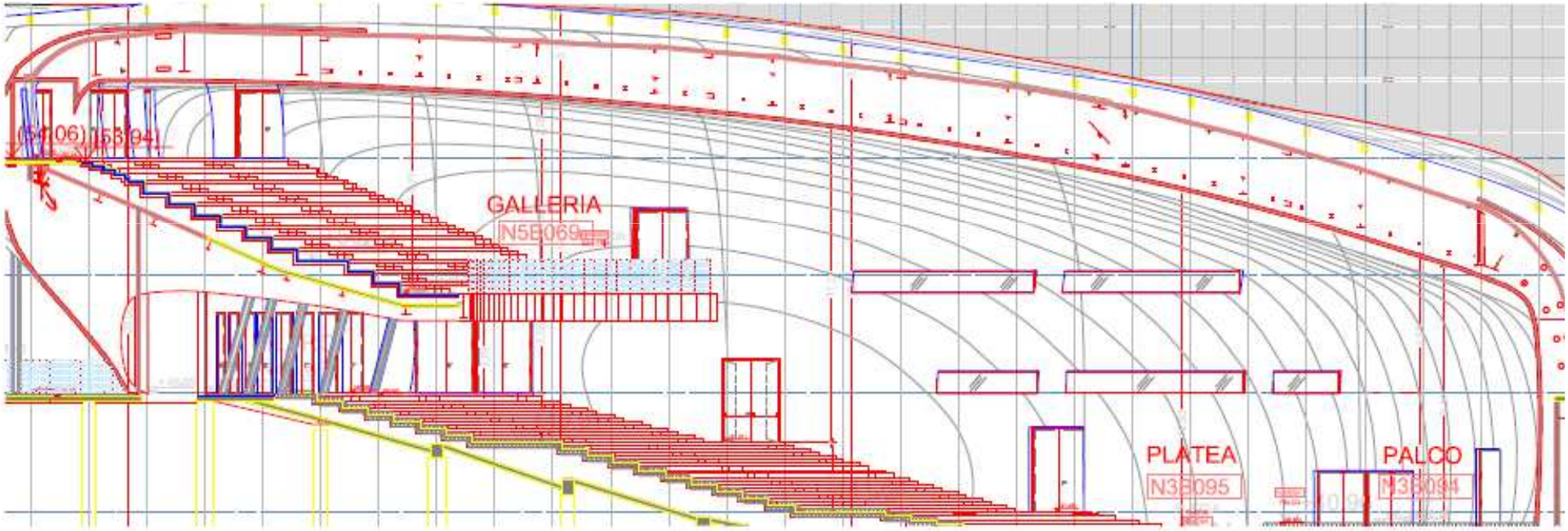




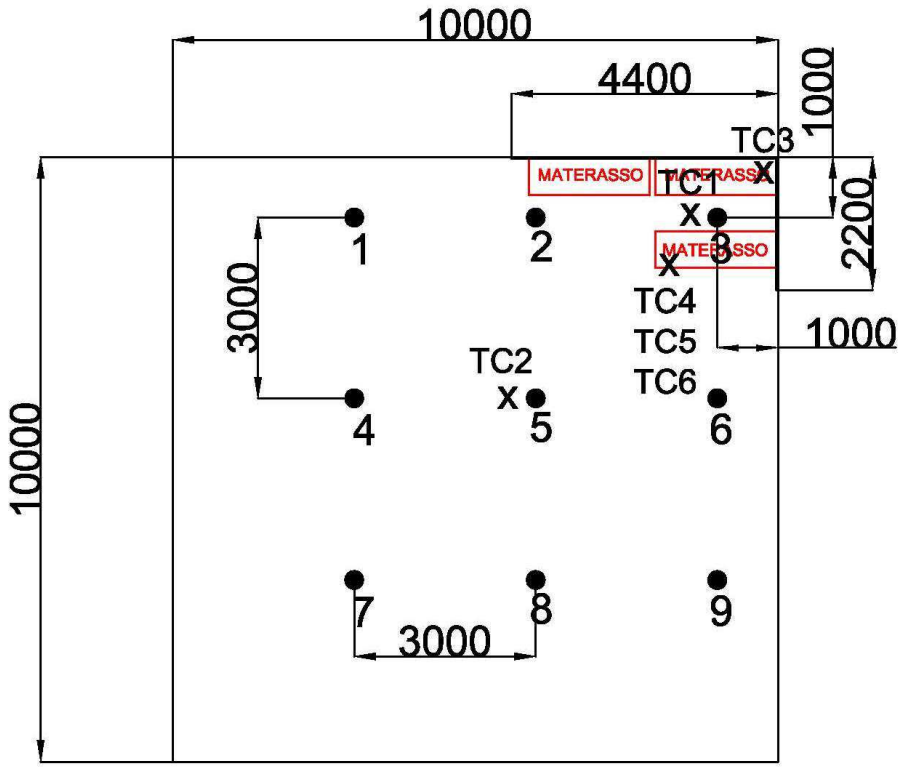


HRR: 1.7 MW
Time: 66.1

OH4- 14 meters



Fire Test Procedure and Full Scale Fire Tests



TC1 1x1x14m
TC2 4x4x14m
TC3 0.5x0.5x14m
TC4 1.8x1.8x4m
TC5 1.8x1.8x8m
TC6 1.8x1.8x12m

- TC1 close to nozzle 3
- TC2 close to central nozzle 5
- TC3 ceiling over ignition
- TC4 tree at position **1.8x1.8x4m***
- TC5 tree at postion1.8x1.8x **8m***
- TC6 tree at position1.8x1.8x**12m***

Fire Test Procedure and Full Scale Fire Tests

-Fire Source very similar to IMO A 800 – public space test

-Two target sofas, one on the same side , the other one opposite to the ignition

- Acceptance Criteria:

Max 30 s average ceiling surface temperature (°C)	Max 30 s average ceiling gas temperature (ºC)	Maximum acceptable damage in mattresses (%)
360	220	75 (ignited sofa). No Charring on target sofas

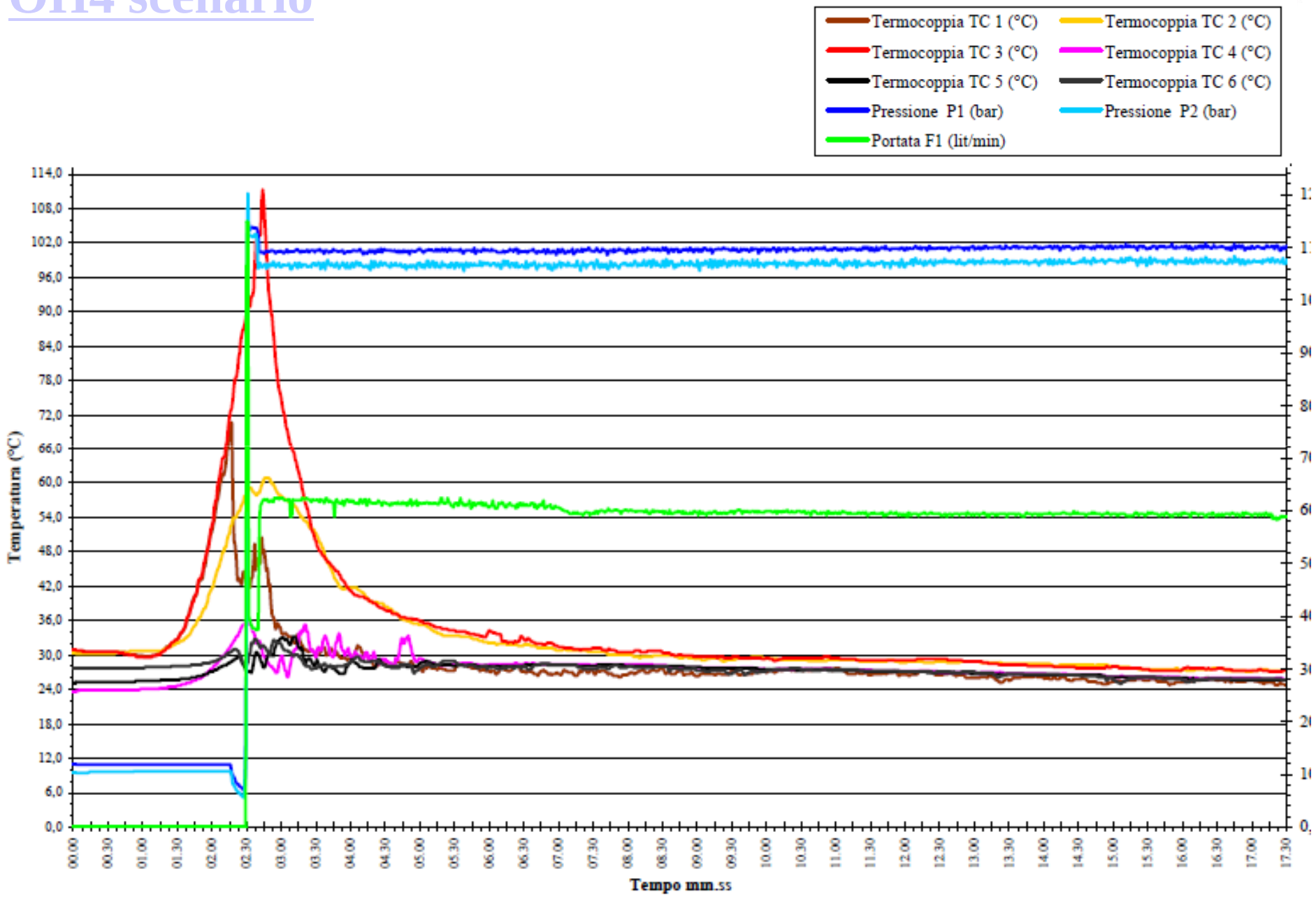
OH4 scenario

CEN TS 14972 : Water Mist Systems
Evaluation of test results: damage and ceiling average

Sprinkler System
5 lpm/m2 (on 360 m2 area)

Water Mist System 3lpm/m2

OH4 scenario



Conclusions and Remarks:

-Annex B is a very important tool: further developments in the European standard are expected : the technical committee CEN/TC 191 WG3 (EN 14972) is working to revise and update the current water mist standard EN 14972, with more fire test procedures, but annex B will remain. High Pressure water mist systems have demonstrated that they can be **sprinkler equivalent** and in many cases (water curtains, high ceilings) to have **better** performances.

Conclusions and Remarks

OH4 scenario:

-Smaller flow rates (5 to 3 ratio) comparing EI Mist to sprinkler systems.

-Only one nozzle activated in most of the tests.

-Good repeatability in the various tests performed so OH4 scenario can be an interesting fire test for the future standards.

-Test performed ad heights of 5, 8 and 14 m with same fire source validated the expected development as for the fire simulations.

-Further fire test procedure would be needed: **for testing HV cables** and demonstrate cables can still work after the fire ..and others.

Thank you for your attention!

QUESTIONS??

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EMist® HIGH PRESSURE

IWMA International Water Mist Association