Water Mist Fire Protection for Historic Sites

IWMC 2019, Oct 23-24, Berlin, Germany

WATER MIST FIRE PROTECTION FOR HISTORIC SITES

Agenda

Recent fire incidents

Fire safety challenges & fire risk assessment

Regulatory framework - codes, standards & guidelines

Case studies & sharing experience

Summary & key take away

RECENT FIRES

2018: Brazil's National Museum, Rio de Janeiro

The fire destroyed 90% of the largest anthropological collection in Latin America consisting of about 20 million artifacts including the earliest human remains found in the continent.

April 15, 2019: Notre Dame, Paris

Several hypotheses have caught the attention of the investigators, including a malfunction of electrical devices that could have started the fire.

April 15, 2019: Al-Aqsa Mosque, Jerusalem

The third holiest site in Islam. The flames engulfed the Marwani Prayer Room, also known as Solomon's Stables. The fire at the mosque received minimal attention by international media.

According to UNESCO; ***"Many World Heritage properties do not have any established policy, plan or process for reducing risks associated with disasters".*** *"As a result, hundreds of sites are critically exposed to potential hazards."*

FIRE SAFETY CHALLENGES

- Every historic building is unique and requires unique and creative fire protection solutions
- Historic buildings were not designed or built to meet modern building codes, rules and regulations with regards to modern standards of fire safety
- Lack of proper building standards, documentation, drawings etc.
- Various types of spaces, e.g. atriums, cupolas, stairs, heights, lobbies, voids, attics, etc.
- Historic buildings usually don’t have proper fire compartmentation
- Sometimes the historic sites are in remote and/or inaccessible locations where firefighter access and water supply may be an issue
- Fire protection should be of high standard without destroying the historical value or high value assets
- The building might be strictly controlled by museum authorities

FIRE RISK ASSESSMENT

HI-FOG® water mist fire protection

For historic sites, particular attention should be given to the broad categories of **cause of fire** and **fire spread**.

Cause of fire	Cause of fire spread
Electric faults	Open and/or ill-fitting doors
Open fires/defect flues	Thin wall construction
Restoration/maintenance work	Structural discontinuty
Vandalism	Unknown wall and floor voids
Arson/deliberate ignition	Unstopped ventilation
Smoking	Undivided roof voids
Lightning strike	Lack of compartmentation
Accident	Bad housekeeping

WM CODES & STANDARDS

Water mist is a **performance based** fire suppression technology, there is always full scale fire testing and component testing behind **type approved** systems.

Design & installation standards and guidelines:

NFPA 750: Standard on Water Mist Fire Protection Systems

VdS 3188: Guidelines for Water Mist Sprinkler Systems and Water Mist Extinguishing Systems (High Pressure Systems), **Planning and Installation**

BS 8458/BS 8489: Residential and domestic / Industrial and commercial water mist systems. **Code of practice for design and installation**

FM5560 – Ref: relevant FM Global Loss Prevention Data Sheets

prEN 14972 - Fixed firefighting systems – Water mist systems – **Part 1: Design, installation and maintenance**

Fire test protocols (standards):

VdS 3188: Guidelines for Water Mist Sprinkler Systems and Water Mist Extinguishing Systems (High Pressure Systems), Planning and Installation

FM5560: Approval standard for water mist systems

BS 8458/BS 8489: Residential and domestic / Industrial and commercial mist systems. Code of practice for design and installation

UL 2167 - Standard for Water Mist Nozzles for Fire Protection Services

prEN 14972 - Fixed firefighting systems – Water mist systems – **Part 2-17**

CODES & STANDARDS

Specific for historic sites

Hazard category	NFPA 750	FM5560	VdS 3188	Typical application or areas
	Light hazard (LH)	Hazard category 1 (HC-1)	Light hazard (LH) or Ordinary hazard 1 (OH1)	Apartments, atriums, churches, conceled spaces, hospitals, hotel rooms, libraries, meeting rooms, museums, offices, classrooms, unused attics etc.
	Ordinary hazard 1 (OH1)	Hazard category 2 (HC-2)	Ordinary hazard 2 (OH2)	Car parks, casinos, convention centers, laundries, sport arenas etc
	Ordinary hazard 2 (OH2)	Hazard category 3 (HC-3)	Ordinary hazard 3 (OH3)	Storage areas, archives

Codes specific for historic sites:

NFPA 909 and **NFPA 914**

VdS 2171: Brandschutz in historischen Gebäuden, Empfehlungen zur Schadenverhütung

CFPA-E Guideline No 30:2013 F: Managing Fire Protection of Historic Buildings

CFPA-E: Confederation of Fire Protection Associations in Europe

CODES & STANDARDS

NFPA 909

Definition & Scope

Code for the Protection of Cultural Resource Properties; **museums**, **libraries**, and **places of worship**, their **contents**, and **collections**, against conditions or physical situations with the potential to cause damage or loss.

The code covers **ongoing operations and rehabilitation** and acknowledges the need to preserve culturally significant and character-defining building features and sensitive, often irreplaceable, collections and to provide continuity of operations

Principles and practices for **life safety** in cultural resource properties **are not in the scope** of this code.

Purpose

To prescribe a **comprehensive program** that protects the cultural resource property and the contents and collections from conditions having the potential to cause damage or loss.

Objectives

Building preservation: preserve unique building characteristics, and their fabric against conditions with potential to cause damage or loss.
Collection preservation: protect/preserve original qualities of collection and structural integrity of the site
Continuity of operations: Minimize disruption of operations consistent with property's mission and protection goals

"Water mist can provide performance similar to traditional sprinkler systems using less water; smaller pipe sizes than sprinkler systems"

NFPA 914

Definition & Scope

Code for the protection of **historic structures**.

Historic structures: a building, bridge, lighthouse, monument, pier, vessel, or other construction that is designated, or deemed eligible for such designation, by a local, regional, or national jurisdiction as having historical, architectural, or cultural significance.

The code describes principles and practices of **fire safety** for historic structures and for those who **operate, use, or visit them.**

Purpose

The code prescribes **minimum requirements** for the protection and recovery of historic structures from vulnerabilities while preserving the elements, spaces, and features that make these structures historically or architecturally significant.

Objectives

Life safety: An egress system shall be designed, implemented and maintained. Structural integrity during a fire shall be maintained to enable evacuation.

Historic preservation: preserve original qualities or character of building, structure, site, or environment. Minimize removal or alteration of historic features. Distinctive features treated with sensitivity. Encourage compatible use with minimal alteration.

NFPA 909 and 914 promotes installation of sprinklers, and permit water mist as an alternative where approved by the authority having jurisdiction.

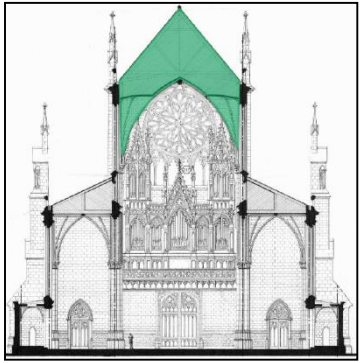
CASE STUDY

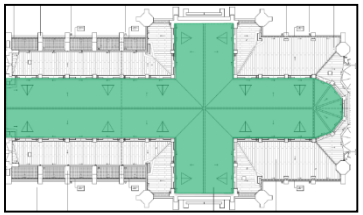
St. Patrick's Cathedral

St. Patrick's Cathedral
New York, NY, USA
-Kurt Schebel

ARUP

https://iwma.net/fileadmin/user_upload/IWMC_2012/ARUP_Schebel_IWMC_2012.pdf





Protecting St. Patrick's

Why a landmark cathedral in New York City chose a water mist system as part of a comprehensive restoration project

BY JESSE ROMAN

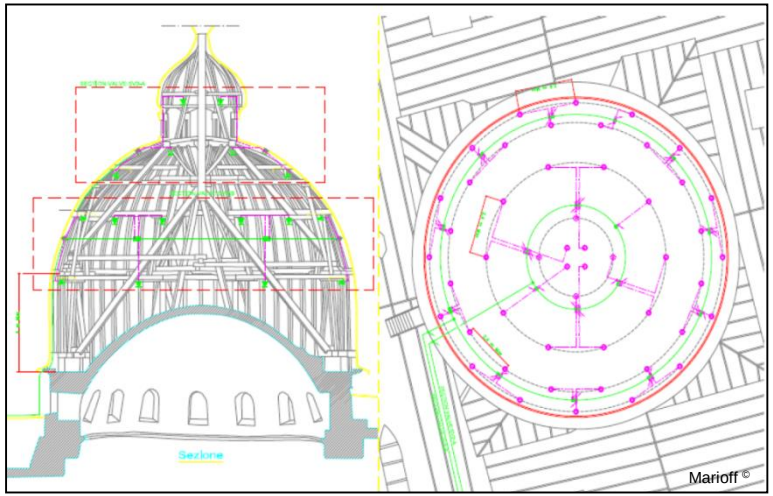
NFPA Journal 2014

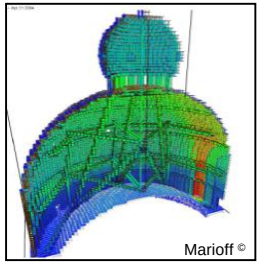
https://www.nfpa.org/News-and-Research/Publications-and-media/NFPA-Journal/2014/September-October-2014/Features/St-Patricks-Cathedral

CASE STUDY

St. Mark's Basilica

https://iwma.net/fileadmin/user_upload/IWMC_2017/Marioff_Frisina_IWMC_2017.pdf





SHARING EXPERIENCE

Hotel Gabrielli, Venice, Italy

Celle castle, Germany

Tudor House Museum, Southampton, UK

Duchess Anna Amalia Library,
a UNESCO World Heritage Site,
Weimar, Germany

Built back in 1873, St. Pancras, London, UK, is
a Victorian building listed by English Heritage.

Historic buildings were built in a different era under different rules and without any regard to modern fire standards.
The materials they are made from are readily combustible, often incorporating features which can assist the rapid development and hidden spread of fire.
They are used and occupied in ways very different to their original purpose and design, with modern installations and equipment fitted in many of them.
Without the right level of protection, this leaves the buildings and their visitors vulnerable to fire.

SUMMARY & KEY TAKE AWAY

High-pressure water mist systems are highly effective with **very low water use**. Subsequently, post-fire water damage is considerably lower than it would be with a comparable sprinkler system, which means **lower recovery cost**.

Pipe sizes are considerably smaller than sprinkler piping, which makes **pipes easier to conceal** and **less intrusive** on historic fabric.

The **cooling effect** of high pressure water mist **minimizes fire spread** and support **fast evacuation** of the historic site.

Water mist systems are **tested** and **type approved** for building hazards.

Several existing installations are proof of **unique and successful experience** in Germany, in Europe and in the rest of the world.

There should be no great concern in **accepting water mist** as fire protection solution in **historical sites**.

THANK YOU FOR YOUR ATTENTION

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