

# St. Patrick's Cathedral

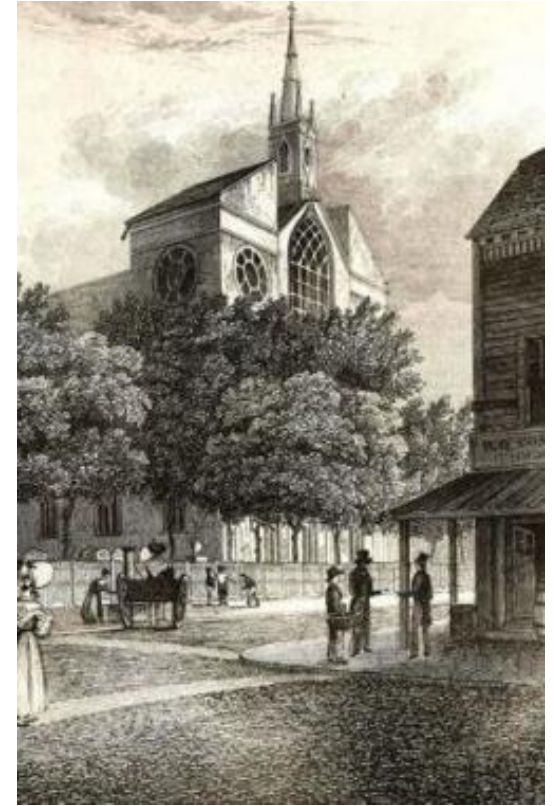
New York, NY, USA

-Kurt Schebel



# St. Patrick's Old Cathedral

- Opened in 1809
- The old, historic St. Patrick's Church was destroyed by fire in 1866, during the construction of the "new" St. Patrick's Cathedral.





# Other Cathedral Fires

*“from 1987 to 1998, according to a recent NFPA study of fires in the United States, an average of 1580 churches, chapels, and synagogues were seriously damaged or destroyed by fire every year, an average of four properties per day.” – NFPA 909*

*la Sagrada Família*



# Agenda

- Goals & Objectives
- Typical Fire Strategy
- Site Survey
- Proposed Strategy
- Design Challenges
- Overview

# Limited Code Guidance

*“provides minimum requirements to safeguard the public health, safety and general welfare of the occupants of new and existing buildings and structures.”* – International Building Code

- Limited direction in historic/cultural significant buildings
- Code requires various fire protection features without assessment of hazards
- “grandfathered”

# Fire Safety Goals and Objectives

- To provide an environment in which occupants are reasonably protected from death or injury resulting from fire.
- Minimize fire-related damage to the building, its contents and its historical features and attributes.
- Minimize undue loss of operations due to fire-related damages.

# Typical Fire Strategy

- Ignition
- Fire Development & Spread
- Detection & Alarm
- Suppression
- Compartmentation
- Fire Fighting



# Site Survey – Ignition Sources



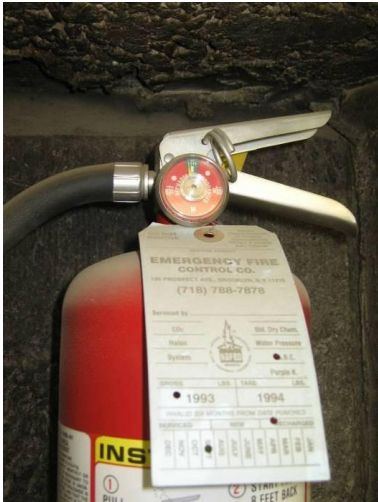
# Site Survey – Fire Development & Spread



# Site Survey – Detection & Alarm



# Site Survey – Suppression



# Site Survey – Compartmentation



# Site Survey – Fire Fighting



# Why Water Mist for St. Patrick's Cathedral

- Ignition
- Fire Development & Spread
- Detection & Alarm
- Suppression
- Compartmentation
- Fire Fighting

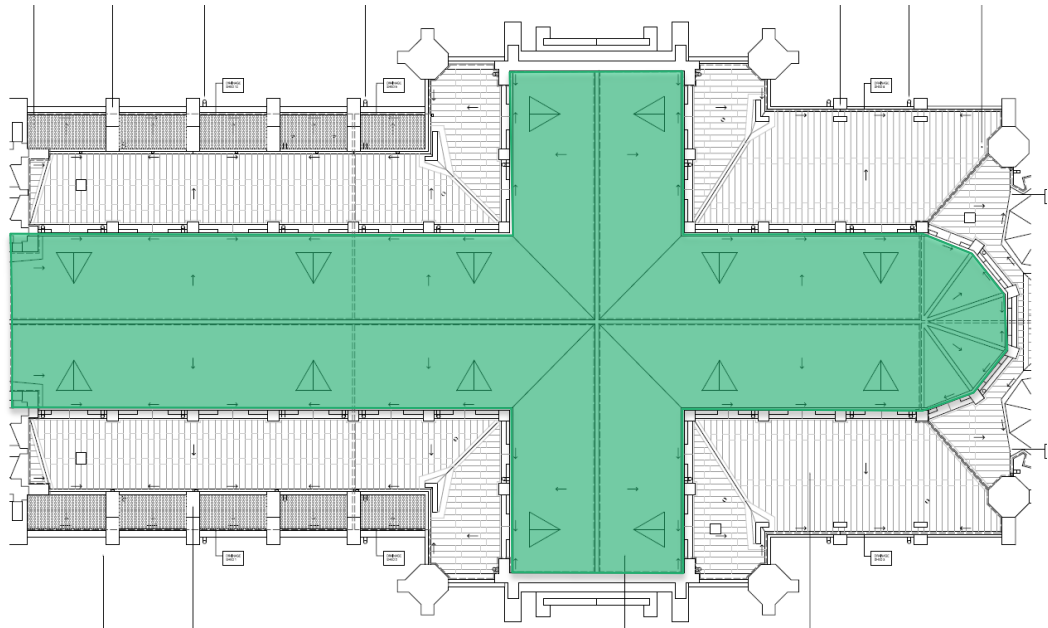
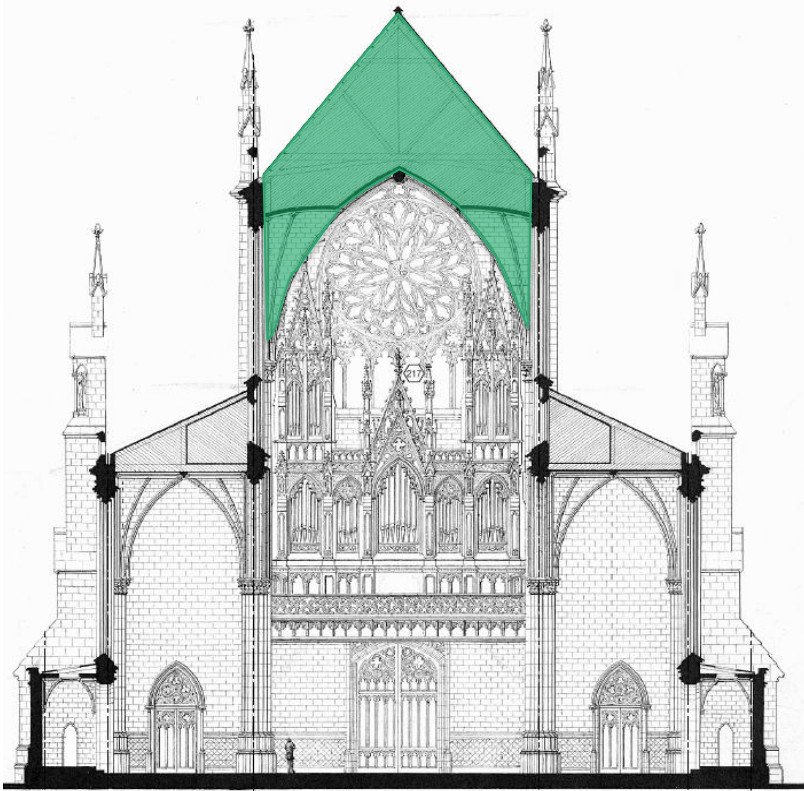
# Proposed Strategy

*“More than three-fourths of fires in places of worship occur while the building is unoccupied; almost all of them occur in structures lacking automatic sprinkler protection or automatic fire detection and alarm systems. Nearly half of them happen between 11 p.m. and 7 a.m., when few people pass by the area. These statistics, coupled with simple logic, highlight the urgency and prudence of providing places of worship with effective fire detection and protection equipment that automatically notifies the fire department and begins fire extinguishment.” – NFPA 909*



# Proposed Strategy

- Water mist fire suppression system in the Cathedral attic

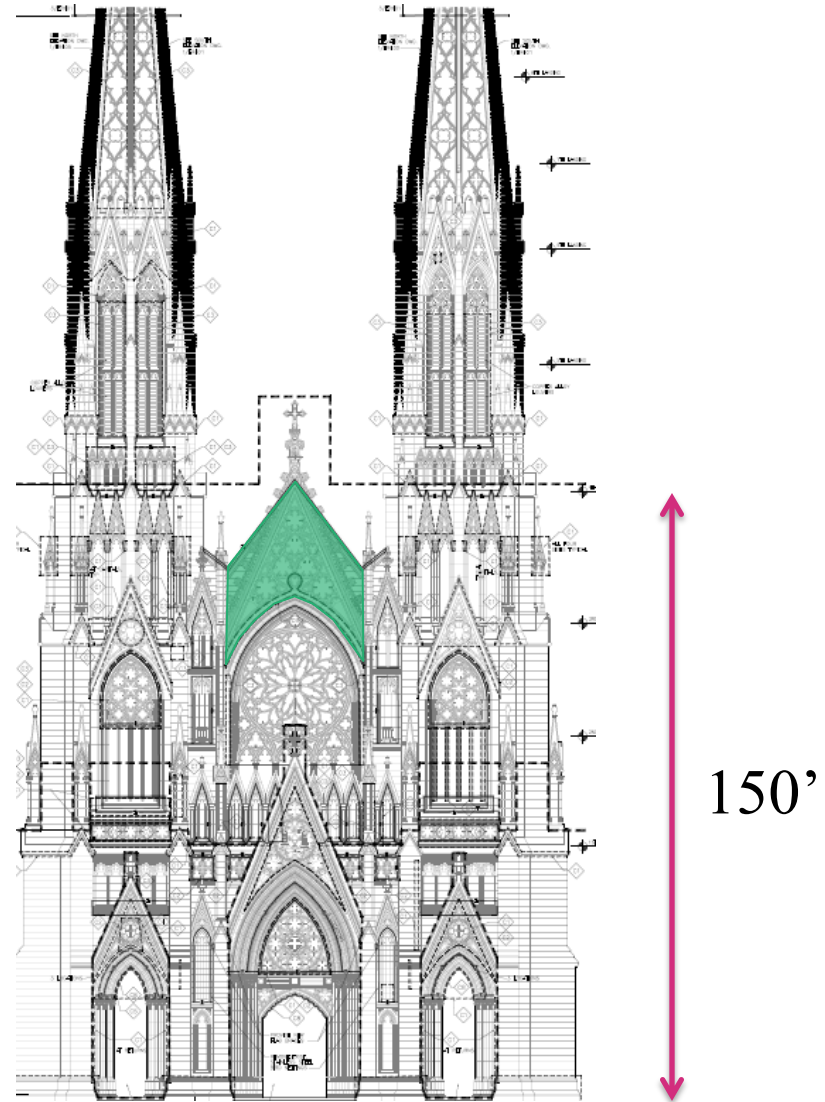


# Design Challenges

- Elevation of protected areas;
- Primary and secondary power supply;
- Limited mechanical space;
- Installation and maintenance in confined historic areas;
- Unconditioned space; and
- Authority approval

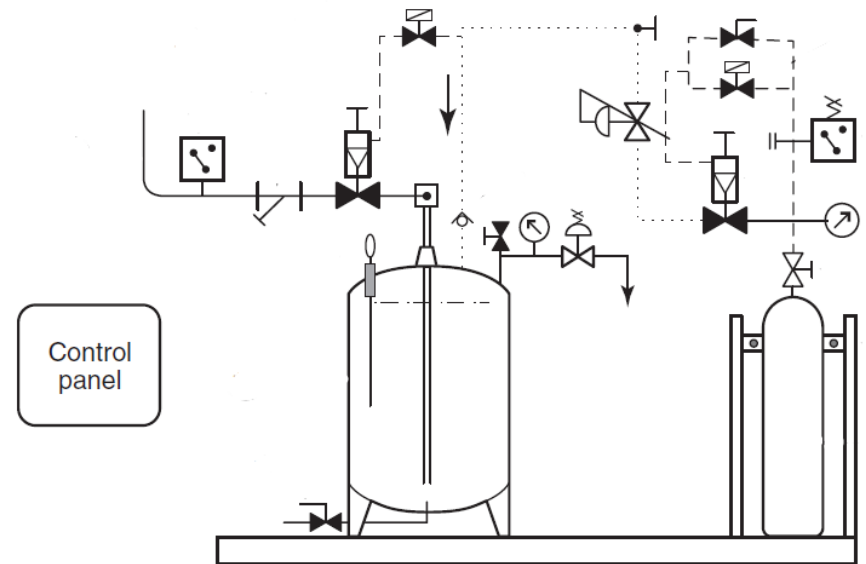
# Elevation of Protected Areas

- Peak of attic up to 150'
- Mechanical pump required based on city water supply
- Water vaporization

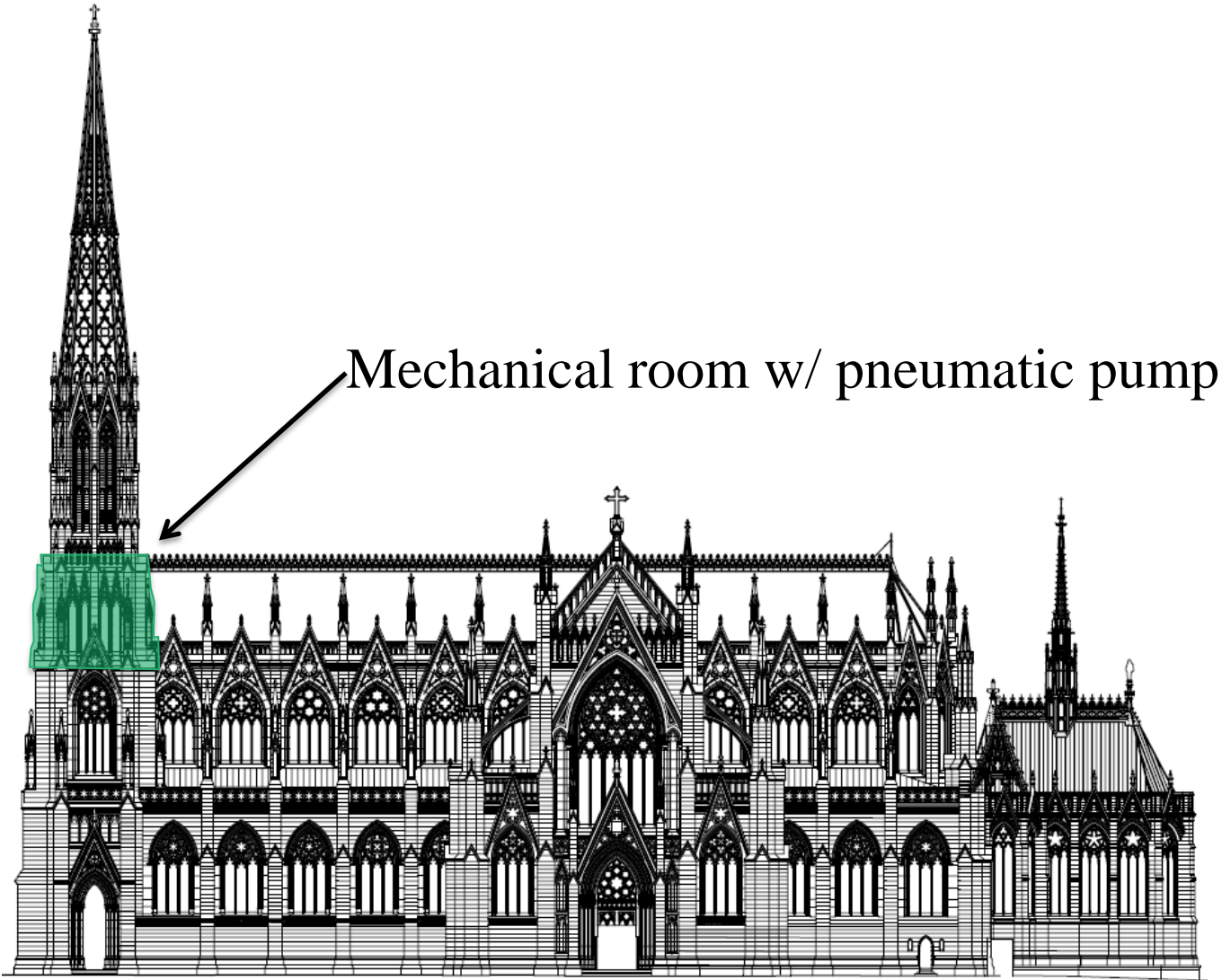


# Primary and Secondary Power Supply

- An electric mechanical pump connected to grid requires a primary and secondary power supply.
- No space for generator or additional battery backup
- Utilize a pneumatic pump driven by compressed gas cylinders.



# Limited Mechanical Space

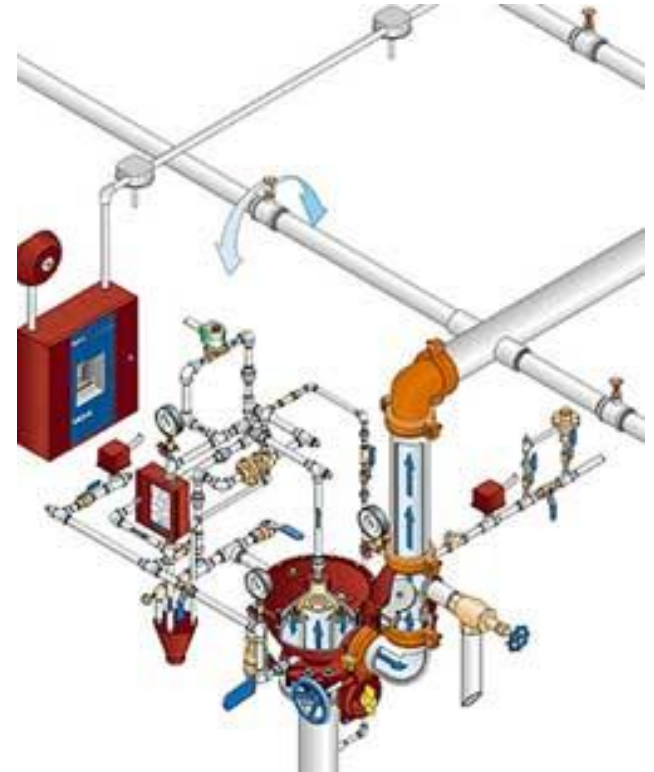


# Installation and Maintenance



# Unconditioned Space

- Cathedral attic subject to freezing (unusually cold temperatures)
- Options:
  - Temperature control attic
  - Heat tracing
  - Dry-pipe system
  - Engineering calculations
  - Additives/antifreeze?
- Utilize pre-action water mist suppression system



# Authority Approval

- *“Alternative automatic fire-extinguishing systems ... shall be permitted in lieu of automatic sprinkler protection where recognized by the applicable standard and approved by the fire code official.”* – International Building Code
- *“All persons who might be expected to inspect, test, maintain, or operate water mist systems shall be trained thoroughly in the functions they are expected to perform.”* – NFPA 750





# Overview

- Control or extinguish fires in the attic where there is large combustible loads (e.g., combustible wood ceiling) that interconnect the Cathedral with limited compartmentation.
- With significantly less water used compared to standard sprinklers and/or active firefighting, there would be far less water damage in the event of a fire.

# Overview

- Due to the large volume of protected areas, water mist proved to be more appropriate than gas. Gaseous suppression systems would require high volumes of concentrations, compartmentation separations, sealed areas and enclosure testing.
- By activating a water mist system it can dually serve as a detection system, part of the fire alarm system itself therefore notifying occupants and responders at the same time.
- Reduced notification time will enhance response time, which may lead to a reduction in the overall system operation hence less water used.

Thank You for Your Time!

QUESTIONS?

This concludes the St. Patrick's Cathedral Case Study.

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