Water Mist Fire Protection Systems for Local Protection

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AGENDA

Definition of Local Protection

Fire Test Protocols Overview

Application Overview

Real Life Local Protection

Summary & Key Take Aways

Video Clip

Q & A

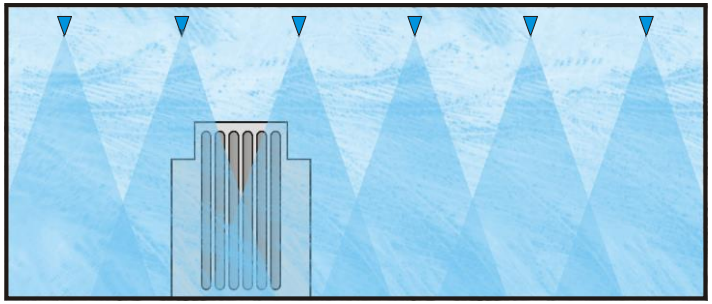
DEFINITION

Local Protection

A machinery **local protection system** is one where a fixed supply of extinguishing media is discharge into a defined area that has either **no enclosure** surrounding it, or is only partially enclosed.

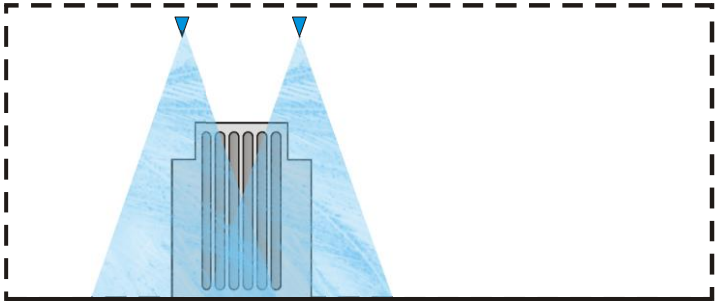
Local application systems protect equipment using **flammable liquids** in **open areas**.

Total flooding



Total flooding systems are designed to fill up the protected enclosure with water mist and the firefighting performance relies largely on enclosure effects.

Local protection



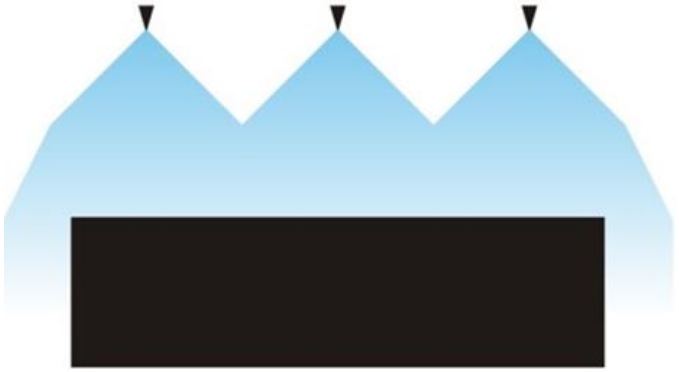
Local application systems fight fires locally in a tentatively large space and do not rely on enclosure effects.

Local protection = object protection, i.e. the fire suppression system is activated only **at and around** the protected object.

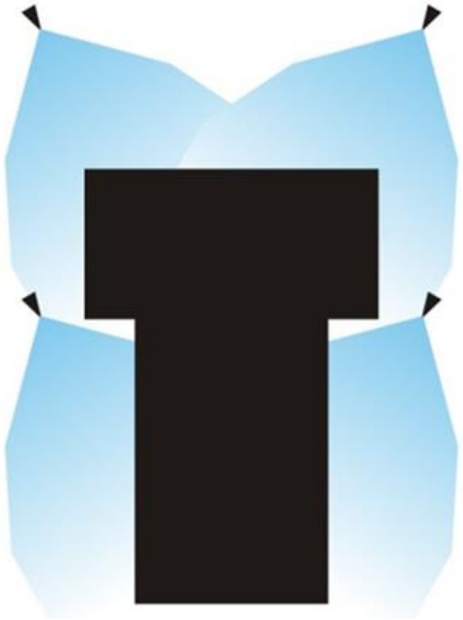
OBJECT PROTECTION

Typical Local Protection Systems

Overhead protection



Surrounded protection



Point protection

FIRE TEST PROTOCOLS

FM Approval Standard Class 5560 includes a test protocol for the approval of **local application** systems to be used as a **primary** protection system.

Other local application fire test protocols are:

IMO 1387 - only spray fires, **secondary system**, control flammable liquid spray fires

CNPP TD2 - based on actual object mock up

BS 8489-4:2016 - similar to FM

VdS no existing test protocol

UL no existing test protocol

FM 5560 TEST PROTOCOL

Appendix I

General Testing Requirements

The water mist system shall be capable of **extingushing** the fire scenarios in this Appendix that are required based on the type of local application being requested by the water mist manufacturer. It is the responsibility of the water mist manufacturer to inform FM Approvals of the type(s) of local application in which FM Approval is being requested.

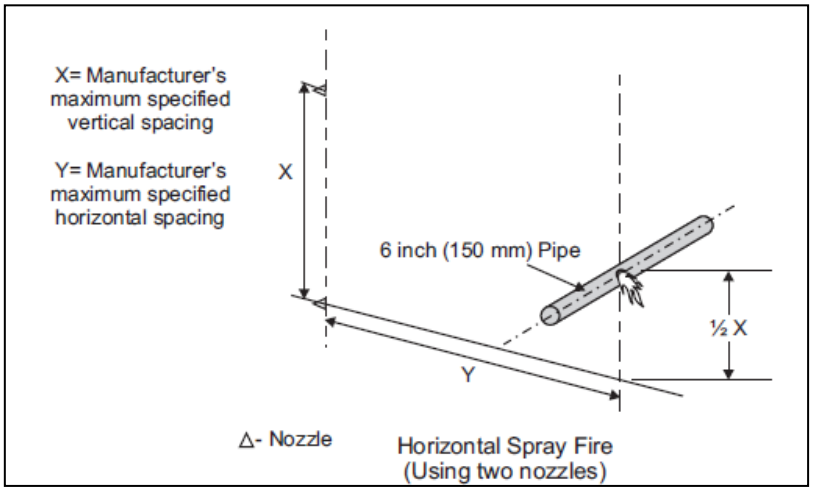
Fire Test Scenarios

(1) Square Pool Fires (4 off including min/max nozzle height)
(2) Channel Pool Fires (4 off including min/max nozzle height)
(3) Spray Fires (4 off including min/max nozzle height)
(4) Combined Pool and Spray Fires (5 off including min/max nozzle height)
(5) Obstructed Pool Fires (2 off including min/max nozzle height)
(6) Offset Pool Fires (2 off including min/max nozzle height)
(7) Combined Pool and Spray Fire
w/ External Ignition Source (2 off including min/max nozzle height)

FM 5560, Appendix I contains a total of 23 full scale fire tests scenarios
Approval criteria: Extinguishment

FIRE TESTING

Spray Fires



Fuel package diesel or heptane
Maximum nozzle distance from spray
Pressure at nozzle
k-factor
Type of pump unit

Extinguishment should be registered by thermocouples located in front of the spray fires.
Registration by means of thermal imaging equipment is strongly recommended.

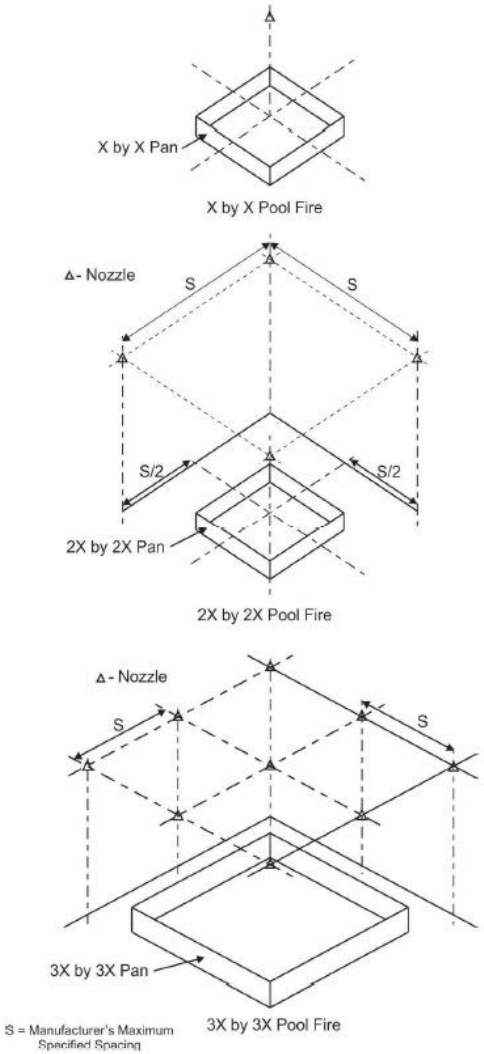
FIRE TESTING

Pool Fires

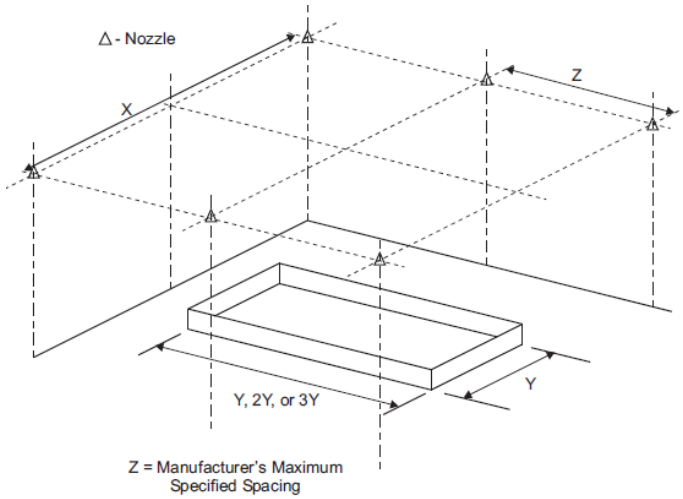
Square Pool Fire

Fuel package diesel or heptane
Maximum nozzle height
Pressure at nozzle
k-factor
Type of pump unit

Square Pool



Channel Pool



Extinguishment should be registered by thermocouples located above the pool.
Registration by means of thermal imaging equipment is strongly recommended.

FM APPROVAL TESTING

9 m² Diesel Pool

FM APPROVAL TESTING

6 MW Spray Fire

APPROVAL TESTING

Combined 4 m² Pool and 6 MW Spray Fire

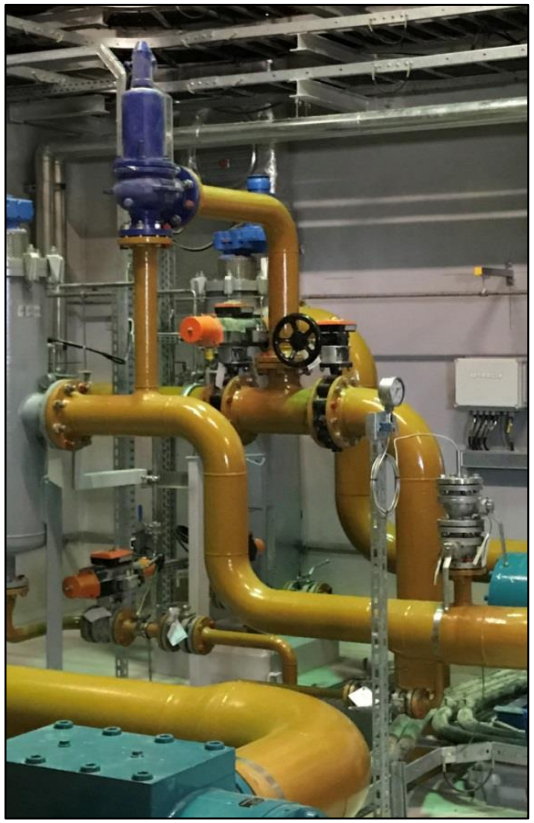
APPLICATION OVERVIEW

HI-FOG® water mist fire protection

Sub segments

Applications

”Flammable liquids”



Pressurized oil and/or fuel lines. Hydraulic and lubrication systems etc.

CHALLENGES FROM REAL LIFE

Steam Turbine

MACHINERY LOCAL PROTECTION

Manufacturers Challenge

Sample from real life

Turbine bearing including pressurized lubrication oil

Spray fire

Pool fire

?

System design

Out of the 23 full scale fire tests, which would represent this particular case?

CODES & STANDARDS

NFPA 750 recognizes protection of **local applications** as its own fire hazard as well as a suppression system type.
NFPA 850 gives guidance on power plant fire protection **best practices**.

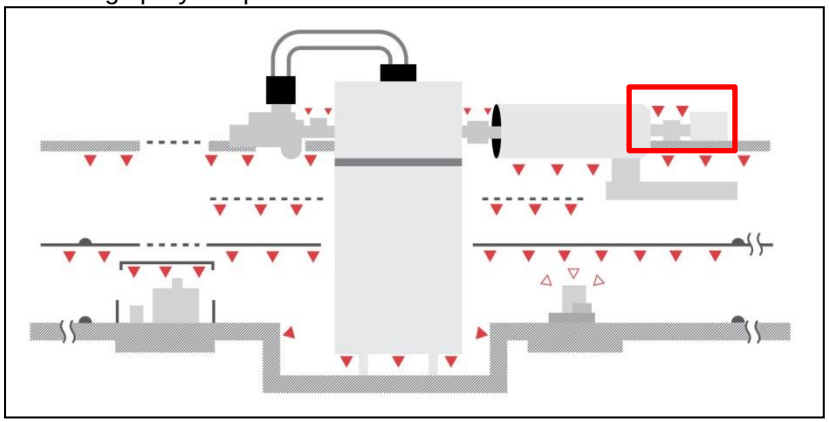
FM Approval Standard for Water Mist Systems, Class Number 5560 Appendix I gives the **performance criteria** for local application protection with water mist systems. FM issues also **type approvals**.
Property Loss Prevention **Data Sheet 7-101** gives information on the total fire protection concept and best practices for **steam turbines**

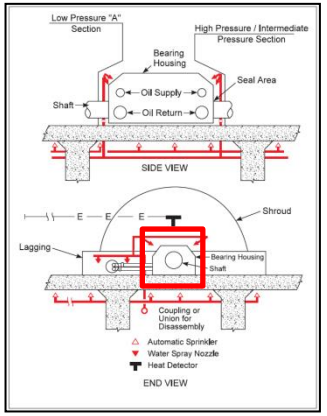
VdS 3188 recognizes the local application protection for the hydraulic units, but does not provide a test protocol.
VdS 2109 recognizes the **steam turbine bearings** and hydraulic systems to be protected with local application

MACHINERY LOCAL PROTECTION

Applying local protection design

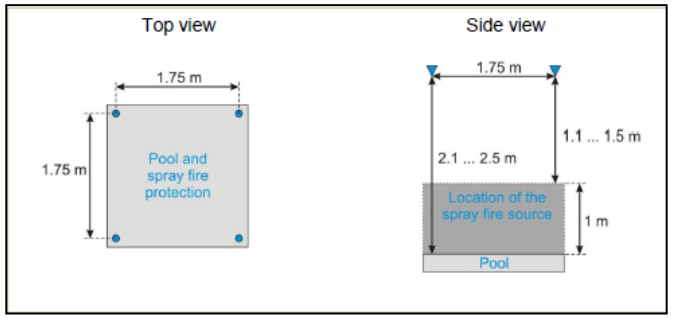
Protection of medium size turbine generator with floor openings near mineral oil systems needing spray fire protection.





Source: FM Global Property Loss Prevention Data Sheet, 7-101 Steam Turbines and Electric Generators

Design for the combined pool and spray fire protection



Marioff local protection DIOM

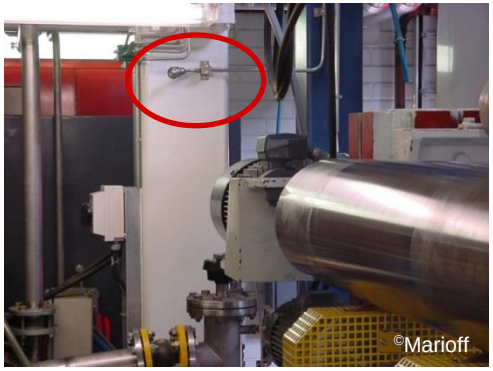
Application type	HI-FOG system	Generic fire hazards	Example objects
Pool fire protection	5.1.4	Flammable liquid pools of all shapes	Containment pools, chemical process pools
Pool and spray fire protection		Flammable liquid systems (pumps, lines, connections and actuators) under pressure with **spill containment**	Lubrication oil modules, hydraulic units, engines, oil skids etc.
Channel fire protection	5.1.5	Longitudinal flammable liquid pools with no option to install spray heads overhead	Containment pools and dip/quench tanks
Spray fire protection (point protection)	5.1.6	Points in flammable liquid systems (pumps, lines, connections and actuators) under pressure and close to ignition sources (e.g. hot surfaces)	Lubrication and fuel lines, bearings, gears, engines, burners, transformers

LOCAL PROTECTION

Application Samples

Surrounded protection

Overhead protection



Point protection

In real life, installation limitations might force you to remove obstructions and/or apply optimized nozzle layout.

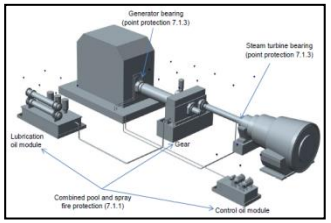
SUMMARY

Key Take Away

Water mist fire suppression systems are always performance based. System design parameters are defined based on full scale fire tests.

Local protection based on FM 5560 fire test protocol covers a wide range of applications having flammable liquids and no enclosure.

Challenge is to apply a certain performance based design on a real world application. Assessment of the fire scenarios and identification of heat sources are critical.



The water mist manufacturer, the end customer as well as local AHJ need to share understanding of proposed local protection design.

LOCAL PROTECTION VIDEO

The video is showcasing the flammable liquid fire risks in power generation and industrial machinery, the concept of FM Local Application water mist fire protection and how water mist systems are full scale fire tested to prove the performance

https://www.youtube.com/watch?v=cs1P5lGG2KI

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