



# Data Centre Water Mist Solutions

*IWMA Conference  
Amsterdam, 28<sup>th</sup> October 2015*

*Dr T R Nichols CPhys MIFireE*

 AquaMist  
ULF

**tyco**  
Fire Protection Products

# Agenda

---

## Data Centre Overview

- What we are protecting
- Current Options

## New AquaMist ULF for Data Centre

- New FM solution for data processing areas
- FM solution for other areas within data centre
- Key features and advantages

## Component Overview

- Discharge Nozzle: AM-29
- Deluge Valve DV-5
- Pump Skid Unit
- Discharge Nozzle: AM-30
- G-Press Pipe System
- Flexible Hose Connection

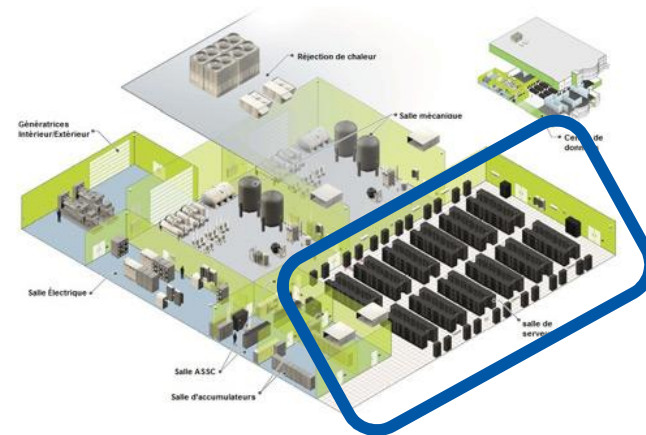
## Summary



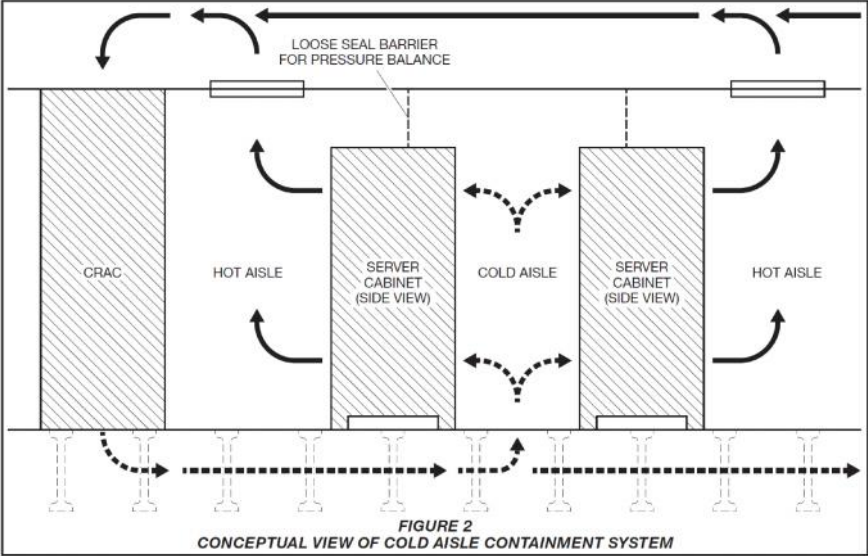
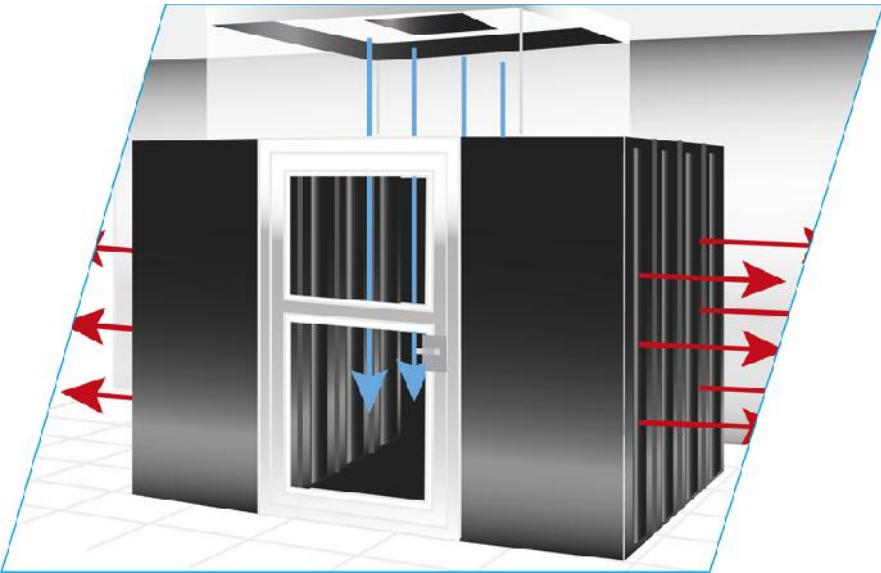
# Data Centre Overview

# What are we protecting?

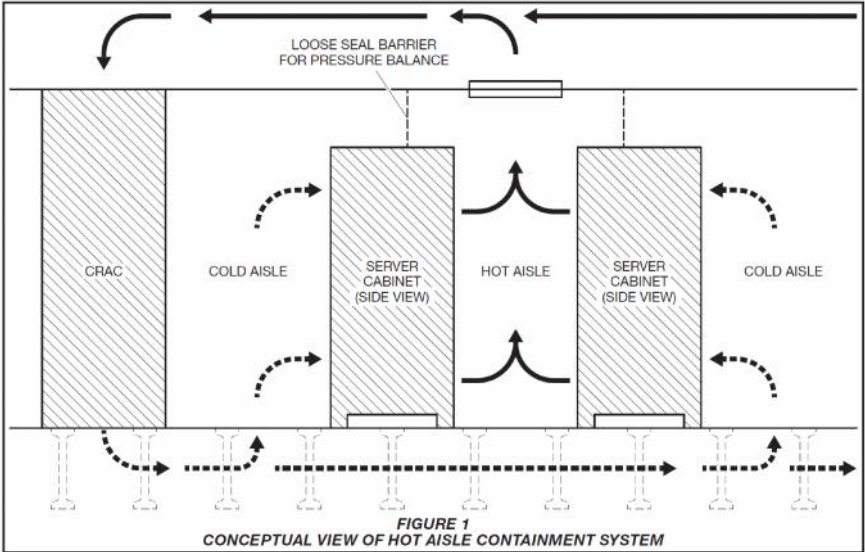
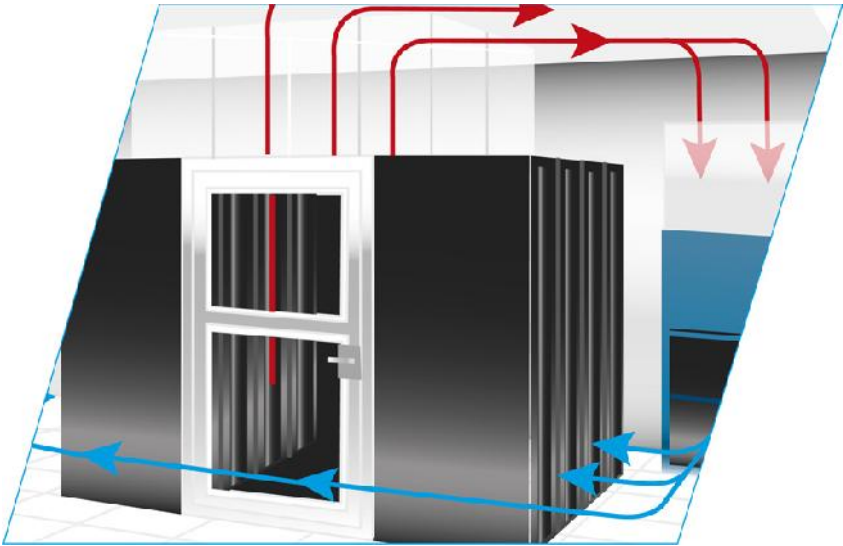
- Data Processing equipment rooms / Halls
  - Large above-floor areas containing a high density of computers and energized cables. Multiple ventilation strategies.
  - Highly ventilated below-floor areas containing a high density of energized cables.
  - Concealed space protection
- Surrounding facilities with different hazard using also FM approved solutions
  - Offices & Corridors (HC1)
  - Generator Rooms (Machinery Spaces)
- Areas not covered by FM water mist approvals
  - Storage Areas
  - Electrical Risks (HV, LV, Battery)



# Containment System Design – Cold Aisle



# Containment System Design – Hot Aisle



# Data Processing Equipment Room

---

## Prior Options:

### Sprinkler Pre-action System

- Water damage
- Large water tank size

### Clean Agent System

- Large footprint
- Room integrity
- Pressure relief
- Collateral damage

### Water Mist System

- Performance not proven in this environment

.... some limitations exist...

# Risk Assessment

---

- What is the fire suppression system there to achieve?
  - Protect cabinets?
  - Protect Facility?
  - Extinguishing and refill? OR
  - Control and re-instate
- Considerations
  - Ventilation
  - Data Hall configuration
  - Installation Cost
  - Storage Space of protected equipment
  - Maintenance Obligations & Cost
  - Discharge
    - Cost to renew
    - Collateral damage



# Data Centre Overview

---

-The most challenging risk to cover is **Data Processing Equipment Rooms** due to:

- Delay system response because Pre-action systems are required
- Impact of ventilation
- Cables that can propagate fires into other areas

- Until now, no Water Mist system was FM Approved to achieve this

# Previous options with Water Mist

## Water Mist System

.... with some limitations...

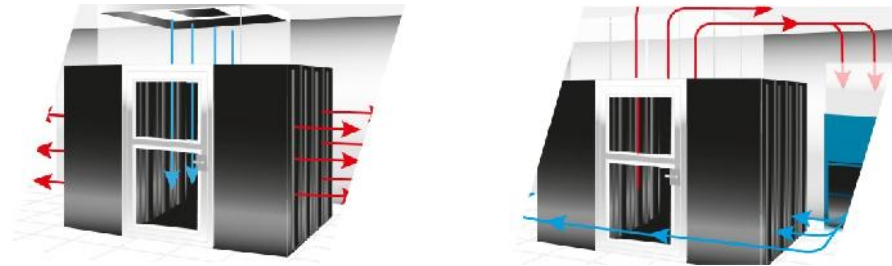
System Limitation	Risk Limitations	Classification	Design Area
<ul style="list-style-type: none"> <li>Only Wet Pipe Systems</li> </ul>	<ul style="list-style-type: none"> <li>Limited to non fire-propagating cables</li> <li>Limited to non ventilated</li> </ul>	<ul style="list-style-type: none"> <li>HC-1</li> </ul>	<ul style="list-style-type: none"> <li>140 m2 (minimum 9 nozzles)</li> </ul>

**FM will no longer allow HC-1 to be used in any Data Processing Equipment Room**

# Market Desirable solution

---

- Avoid the use of Wet Pipe System to reduce the risk of damaging electrical equipment
- Maintain ventilation during system discharge to reduce the impact on the operational efficiency on the Data Processing equipment Room



- Flexibility to Use Fire Propagating cables



# Fire Test Overview

# Test: Above-Floor Protocol

---



# Test Protocol – Below Floor

---




Company Confidential



New FM Approved Low Pressure Water Mist System, designed for modern Data Centres

# Main Advantages

## Propagating Cables Considered

- A Data Processing Equipment Rooms contains a high density of cables in trays located above servers and below the raised floors.
- New  AquaMist <sup>ULF</sup> solution for Data Processing Equipment Rooms protect against the increased hazard inherent to fire-propagating cables. Above Floor and Below Floor.

Above Floor Fire Test



Below Floor Fire Test



- This allows greater flexibility in cable selection

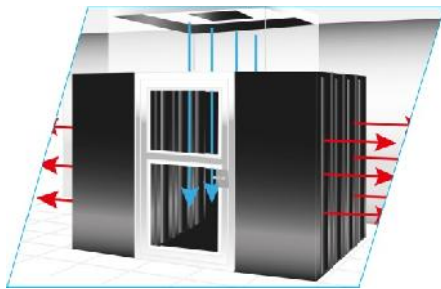


# Main Advantages

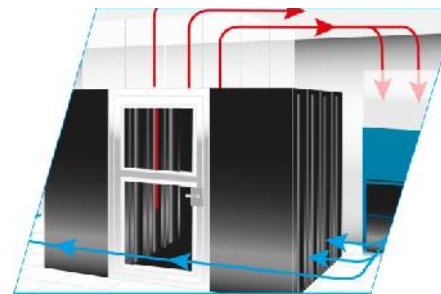
---

## Ventilation is no longer a problem


- Ventilation is one of greatest challenges for a fire system



Cold aisle

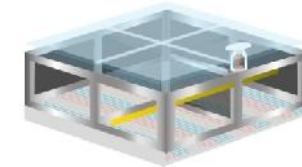


Hot aisle

- The new  AquaMist<sub>ULF</sub> for Data Processing Equipment Rooms has been tested and approved to operate in a range of ventilated conditions.
- It guarantees rapid detection and discharge in a range of ventilated conditions
- Tyco offers two temperature rated solutions fully approved (57°C/135°F and 68°C/155°F).

# Main Advantages

## Suitable for Below-Floor installations



- **AquaMist ULF** provides design flexibility for different layouts including local applications.

AM-30



- Full protection and local application of Below-Floor installation with upright nozzle AM-30

AM29




- Pendant nozzle AM-29 for Below-Floor local application

# Main Advantages

---

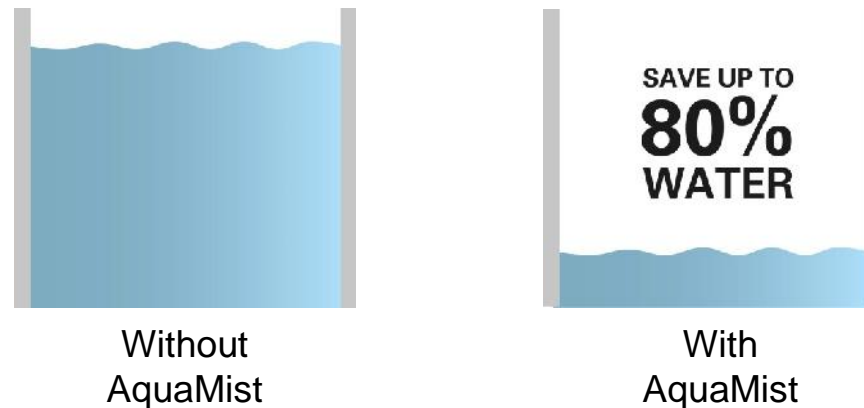
## Pre-action System

- To reduce the risk of damaging electrical equipment as compared with traditional Wet Pipe Nozzle system.
- Water doesn't enter the piping network until a fire has been detected by the associated fire alarm and detection system.
- The new  AquaMist ULF for **Data Processing Equipment Room** has been tested with discharge delay permitting a pre-action configuration

# Additional Advantages

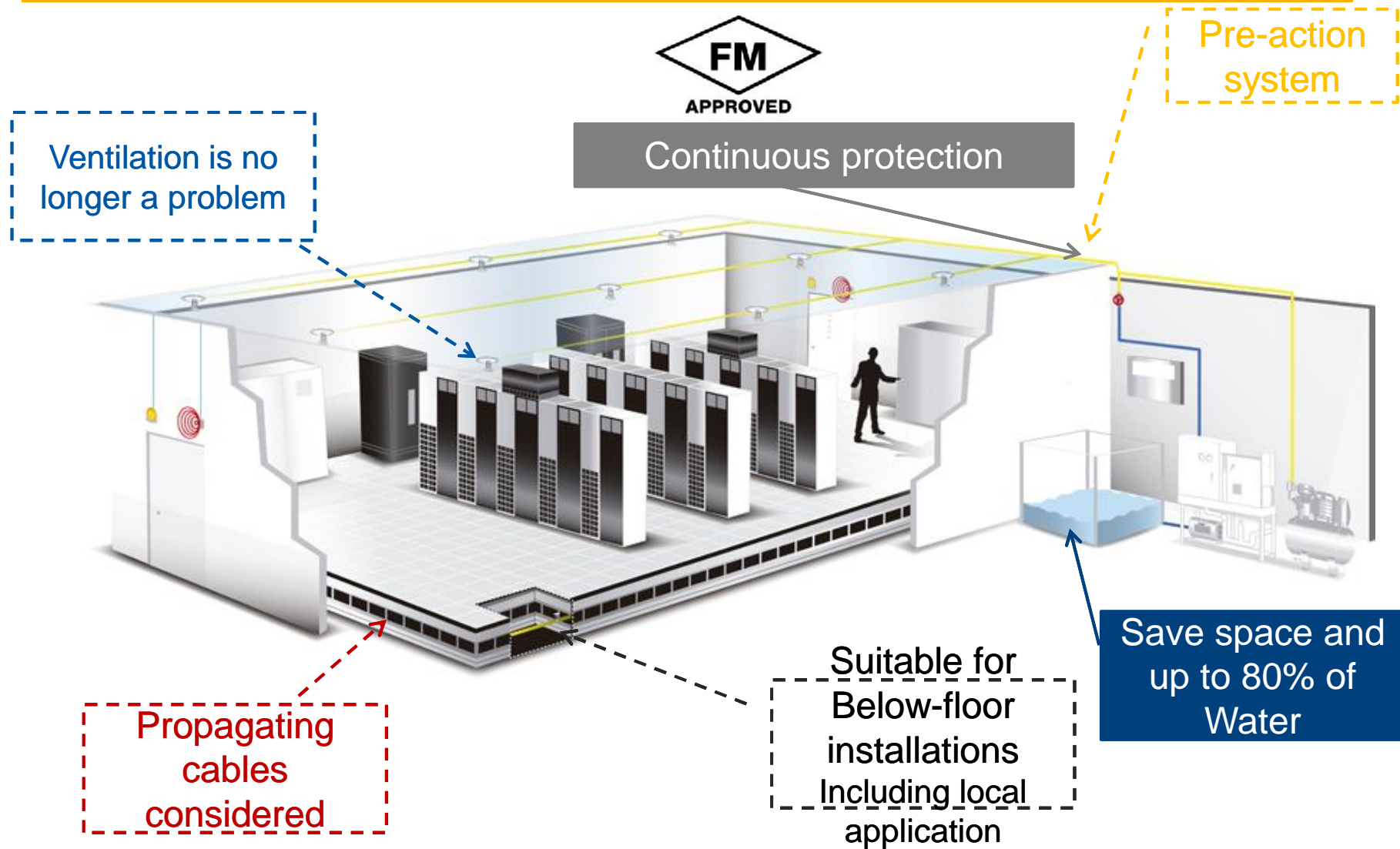
## Save space and up to 80% of Water

- Water Mist system alternative to equivalent designed pre-action systems can reduce the demand by up to 80% making it possible to reduce piping and water storage tank size



- Design area is based on quantity of nozzles therefore the amount of water doesn't change if nozzle spacing is reduced

# Main Advantages



# Today's Design for Water Mist

## Water Mist System

Configuration	Risk Coverage	Classification	Design Area
<ul style="list-style-type: none"> <li>• Pre-action</li> </ul>	<ul style="list-style-type: none"> <li>• Fire-propagating cables</li> <li>• Ventilated</li> <li>• Non-storage</li> </ul>	<ul style="list-style-type: none"> <li>• HC-2</li> </ul>	<ul style="list-style-type: none"> <li>• Based on fire test results</li> </ul>

**FM now class Data Processing Equipment Rooms as HC-2**

# FM Approved Solution



## Certificate of Compliance

This certificate is issued for the following:

System Designation:	AQUAMIST Water Mist Systems for the Protection of Data Processing Equipment Rooms/Halls
Design, Installation, Operation and Maintenance Manual:	Ultra Low Flow AQUAMIST Systems for the Protection of Data Processing Equipment Rooms/Halls, Document No.: TFP2233, Revision: May 2015

**Prepared for:**  
TYCO FIRE PRODUCTS, LP  
1467 ELMWOOD AVENUE  
CRANSTON, RI 02910  
UNITED STATES

**Manufactured at:**  
TYCO FIRE PRODUCTS, LP  
1467 ELMWOOD AVENUE  
CRANSTON, RI 02910  
UNITED STATES

FM Approvals Class: 5560

Approval Identification: 3053169      Approval Granted: May 29, 2015

To verify the availability of the Approved product, please refer to [www.approvalguide.com](http://www.approvalguide.com) or [www.roofnav.com](http://www.roofnav.com)

Said Approval is subject to satisfactory field performance, continuing Surveillance Audits, and strict conformity to the constructions as shown in the Approval Guide, an online resource of FM Approvals.

Richard B. Dunne  
Manager – Fire Protection Group  
FM Approvals  
1151 Boston-Providence Turnpike  
Norwood, MA 02062





## **AquaMist ULF for Other Areas within Data Centre**



# Offices, Corridors.....

**Hazard Category 1 – HC-1** “Lightly loaded non-storage and non-manufacturing areas with ordinary combustibles. Expect fires with relatively low rates of heat release in these occupancies”

*FM3-26 Fire protection water demand for non storage sprinklered properties*

*Table 1. Hazard Categories Based on Occupancy*

<i>Occupancy</i>	<i>Description of Occupancy</i>	<i>Exceptions</i>	<i>Hazard Category</i>
<ul style="list-style-type: none"> <li>- Apartments</li> <li>- Atriums</li> <li>- Churches</li> <li>- Concealed spaces</li> <li>- Gymnasiums</li> <li>- Hospitals and hospital laboratories</li> <li>- Hotel rooms</li> <li>- Institutions</li> <li>- Kitchens</li> <li>- Libraries</li> <li>- Meeting rooms in convention centers and hotels</li> <li>- Metalworking shops with non- hydraulic cutting operations</li> <li>- Mineral processing such as: glass, cement, ore treating, gypsum processing, etc.</li> <li>- Museums</li> <li>- Nursing or convalescent homes</li> <li>- Offices</li> <li>- Restaurant seating areas</li> <li>- Schools and universities classrooms</li> <li>- Unused attics</li> </ul>	<p>Lightly loaded nonstorage and nonmanufacturing areas with ordinary combustibles.</p> <p>Expect fires with relatively low rates of heat release in these occupancies.</p>	<p>Libraries with stack rooms larger in size than defined in Appendix A; Facilities with storage of electronic and plastic media (see DS 8-9 ).</p> <p>Hospital laboratories where exposed storage and processing of flammable liquids is considered excessive (see the applicable flammable liquids data sheet).</p> <p>Facilities with operations involving hydraulic fluid or flammable liquid, see DS7-32, DS 7-29, and DS 7-98; and for storage, see DS 7-32, DS 7-29, and DS 7-98.</p>	HC-1

# Generators (DRUPS), Transformers.....

---

## Machinery Spaces:

- Enclosures with machinery such as internal combustion engines (excluding engine test cells), oil pumps, oil tanks, fuel filters, generators, transformer vaults, gear boxes, drive shafts, lubrication skids, diesel engine driven generators, and other similar equipment using liquid hydrocarbon fuel and/or hydraulic, heat transfer, and lubrication fluids with volatilities less than or equal to heptane;
- Enclosures with incidental use or storage of hydrocarbon ignitable liquids (also known as flammable liquids) of not more than two 55 gal (208 L) drums.

## FM 5560 Approval Standard for water mist Systems

# Main Advantage for



## Light Hazard

- Offices
- Corridors

## FM Approval HC-1

## Machinery Spaces

- Generator rooms (DRUPS)
- Transformer Rooms

## FM Approval Machinery Spaces



### Certificate of Compliance

**FIXED EXTINGUISHING SYSTEMS, WATER MIST SYSTEMS**  
This certificate is issued for the following product:

System Designation:	Tyco Fire Suppression & Building Products Model AM27 Aquamist® Water Mist Nozzle for Use with Aquamist® System
System Type:	Water Mist System for Protection of Light Hazard Occupancies
Provisions:	Use of FM Approved fire detection equipment is required. Use of FM Approved water delivery hardware (pump packages, valves, etc.) is required.
Design, Installation, Operation, and Maintenance Manual:	Tyco Fire Suppression & Building Products <i>Aquamist System (FM) Using Type AM27 and AM29 Aquamist Nozzle For Protection of Light Hazard Occupancies</i> , P/N TFP2230, Rev. June, 2009

**Approved for:** TYCO FIRE SUPPRESSION AND BUILDING PRODUCTS  
451 NORTH CANNON AVENUE  
LANSDALE, PA 19446  
UNITED STATES

FM Approvals confirms that the products above have been found to comply with the following standards:  
FM 5560 – Approval Standard for Water Mist Systems

Project Identifier: 3029412

Date of Approval: June 26, 2009

6/26/09

Richard B. Dunne  
Manager – Hydraulics Group, FM Approvals

Date



# How to solve limitations of Water Mist

---

- FM do not approve water mist for
  - Electrical Risks (HV/LV Switch, Battery Rooms)
  - Storage areas
- Approvals have limitations (e.g. height)

## HOWEVER

- Can be combined with an FM designed sprinkler system
  - Saving costs (against separate system required for high pressure water mist)
  - Design hydraulics consistent
- Therefore all areas can be protected and follow FM requirement



# Components

# Components



**Discharge  
Nozzles  
AM-29**



**DV-5 Deluge Valve  
Pre-action system**



**Detection  
equipment,  
FM Approved**



**Tyco Flexible Hose  
Connection and G-  
Press Piping**



**Discharge  
Nozzles  
AM-30**



**Pump Skid Unit**



# Discharge Nozzle: AM-29

---

- Low Pressure Nozzle
- Pendent Nozzle
- 2 activation temperatures
  - 135°F (57°C)
  - 155°F (68°C)



# Deluge Valve: DV-5

---

- Pre-action system
- Single & double Interlock versions
- Suitable system to protect areas where there is a risk from water damage
- One-piece, diaphragm-style design





# Pump Skid Unit

---

- Pre-assembled, self-contained control centre for the AquaMist ULF system
- Pre-wired and pre-piped
- Variety of configurations, water flow rates from 50 gpm (189 lpm) to 150 gpm (568 lpm)

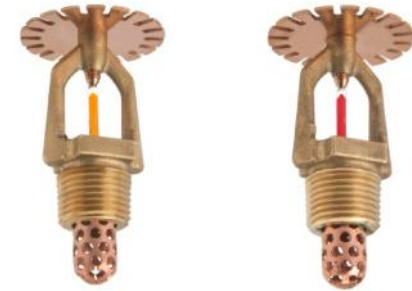


\* MMC FM Approved

# Discharge Nozzle: AM-30

---

- Concealed Space Protection
- Low Pressure Nozzle
- Upright Nozzle
- 2 activation temperatures
  - 135°F (57°C)
  - 155°F (68°C)



# G-Press Pipe Work

- Light Weight
- Installed quickly with single tool
- 10 Year Warranty



# Flexible Hose connection

---

- Complete flexibility
- Installed quickly without large and expensive tools



(\* Image is referred at Tyco Flexible hose designed agree with FM Design Criteria



## Summary

# New AquaMist ULF for Data Centre

- FM Approved
- Continuous protection
- Protection against **Propagating Cable** fires
- Suitable for **Below-Floor** installations
- **Pre-action System**
- Can be **combined with other solutions to protect beyond the area of installation:** generator room, offices, circulation spaces, etc.



Thank You