

ENGINEERING
TOMORROW



Fire Protection of Data Centers

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Characteristics of droplet sizes



Sprinkler

1000-1200 μm



**Low-pressure
water mist**

200-700 μm



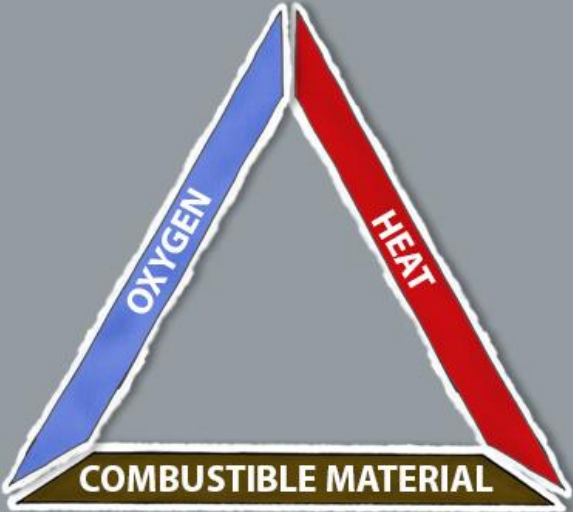
**High-pressure
water mist**

100-200 μm

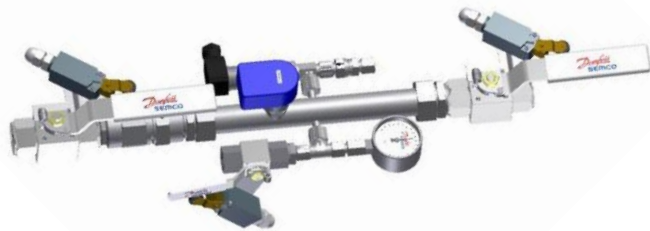
SEM-SAFE® in short



Total Solution Provider of Certified Fixed Fire Fighting Systems



SEM-SAFE® key components



- Compact pump
- Highly-corrosion proof valves
- Unique nozzle design



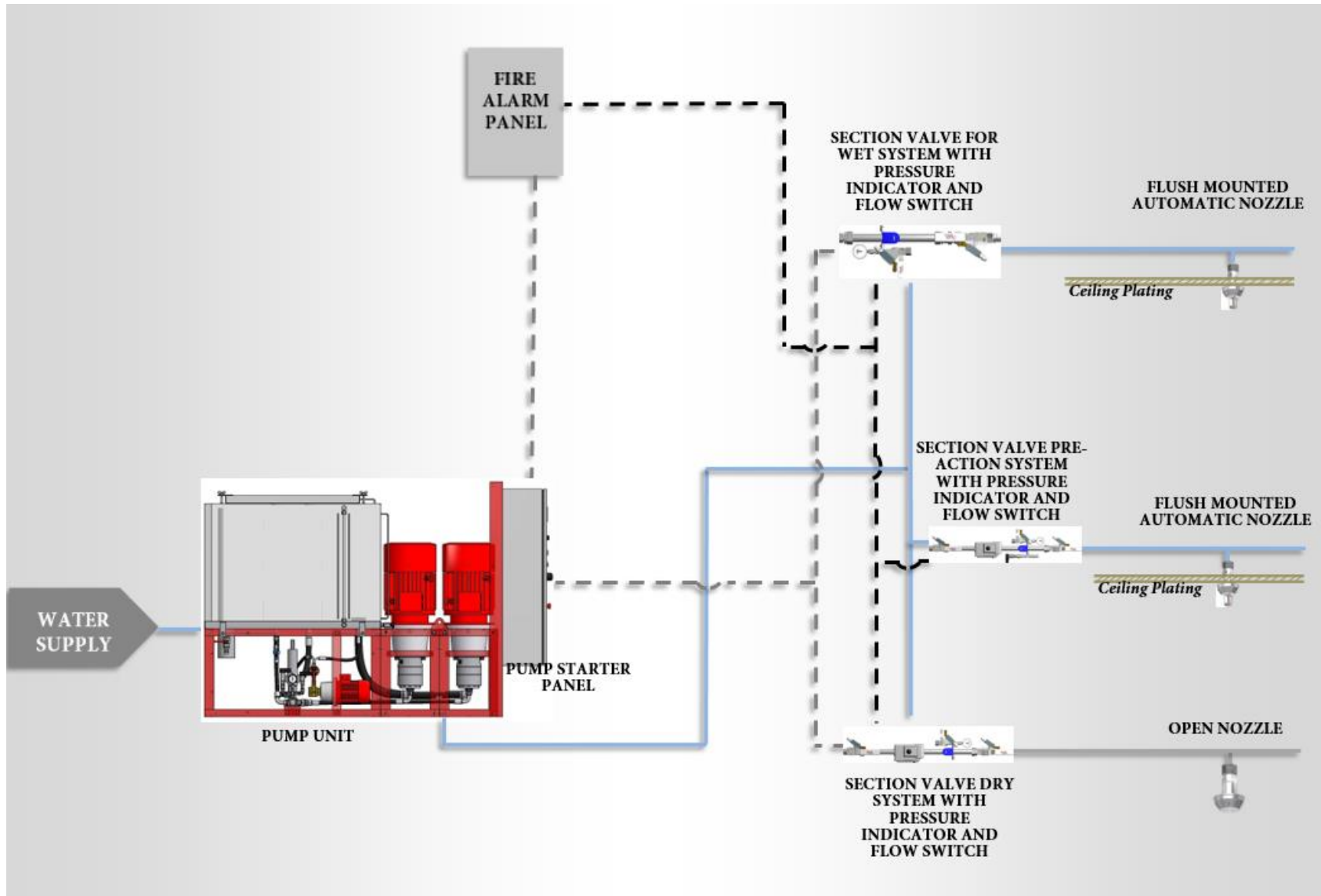
SEM-SAFE® high-pressure water mist pump

- Light and compact high-pressure pump design
- Danfoss pumps are multi-axial piston pumps made in corrosion resistant stainless steel
- Water is used as a lubricant, making the pumps virtually maintenance free
- Up to 160 bar and 112 LPM



Click to see video

Principle diagram

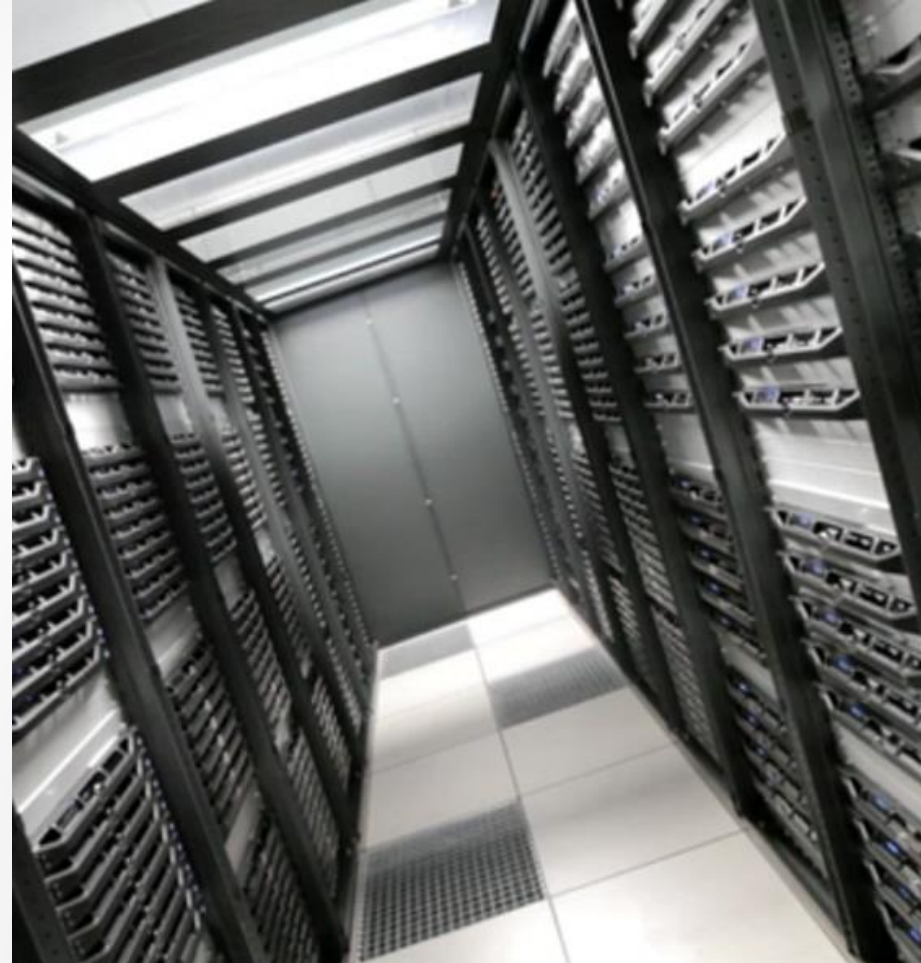


SEM-SAFE® the **fire fighting solution** for any data center

Need a fire fighting system that:

- Allows you to keep your data centre running while suppressing a fire?
- Provides instant cooling in the fire zone?
- Allows you to keep ventilation running?
- Has no need for shutting fire dampers?
- Permits you to keep doors to protected space open?
- Is not harmful to people?

SEM-SAFE® is up for the challenge



Benefits of SEM-SAFE®

Tackles fire swiftly and efficiently

- No need to seal off and/or evacuate the area
- Immediately cools the fire
- Harmless to electrical equipment
- No over-pressurization of the fire-affected area when the SEM-SAFE® system is activated

Money-saving solution

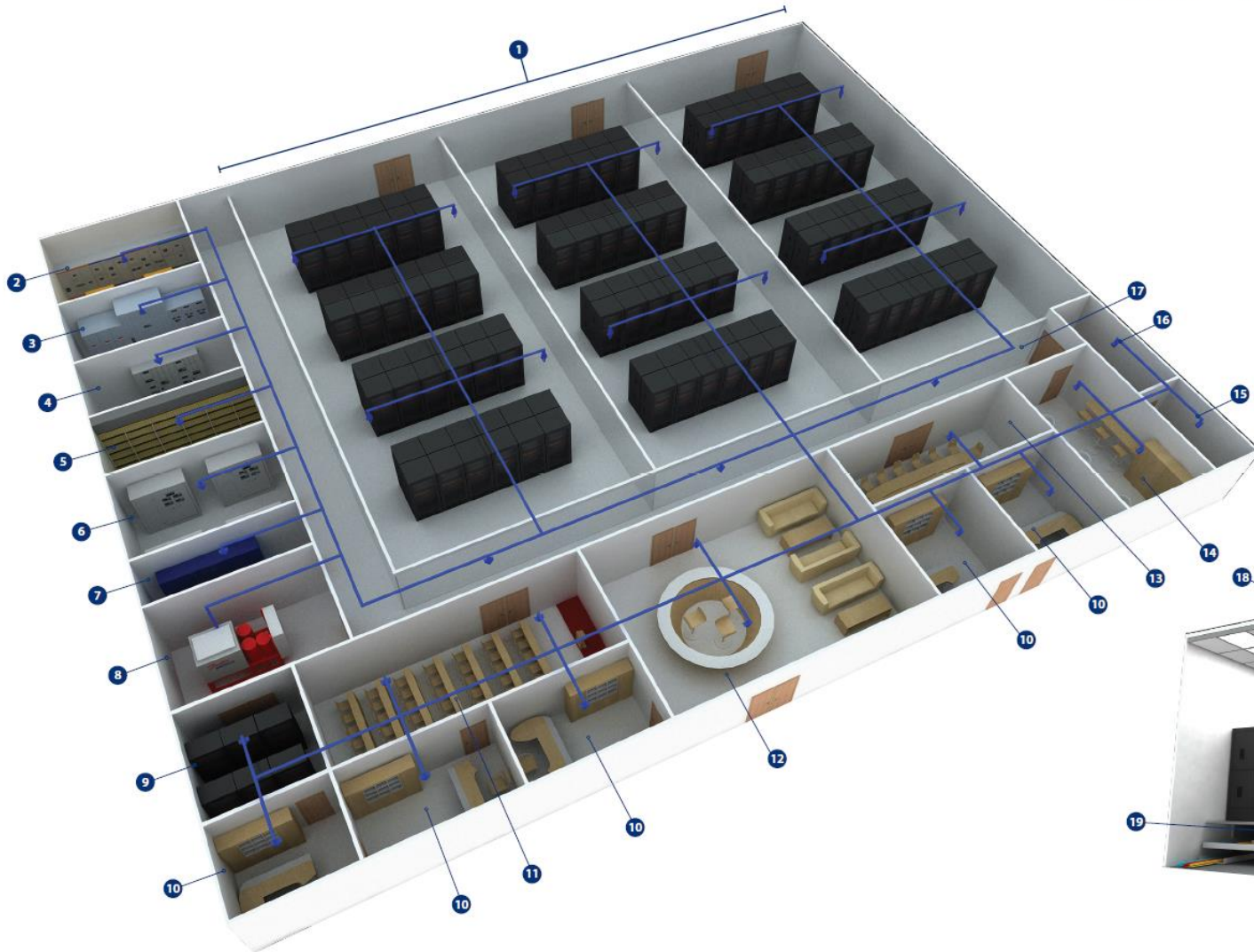
- Fewer nozzles required and only one system for all applications=>installation cost is reduced
- The pumps are lubricated by water=> virtually maintenance free
- Water droplets evaporate immediately=>minimal water damage=>reduced operational down-time

Data Centre fire protection

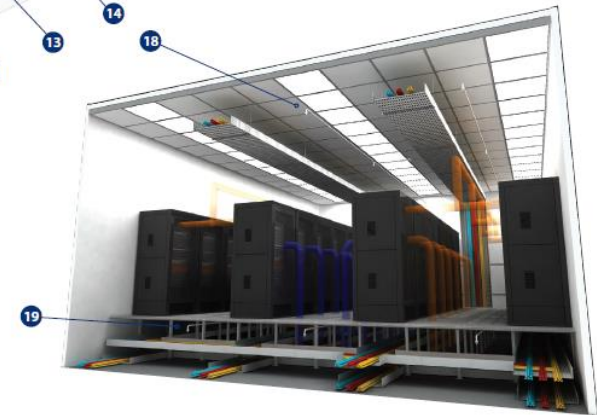
Specific for data centers	Objective HPWM	Principle of protection
<ul style="list-style-type: none">• One could consider three major areas of protection of the Data Room:<ul style="list-style-type: none"><input type="checkbox"/> Floor void<input type="checkbox"/> Ceiling void<input type="checkbox"/> Data Hall	<ul style="list-style-type: none">• Data Rooms :<ul style="list-style-type: none"><input type="checkbox"/> Extinguishing fire<input type="checkbox"/> Minimum duration of the system 60 minutes• Machinery spaces :<ul style="list-style-type: none"><input type="checkbox"/> Extinguishing fire<input type="checkbox"/> Minimum duration of the system 30 minutes	<ul style="list-style-type: none">• Public Spaces :<ul style="list-style-type: none"><input type="checkbox"/> Offices WET system<input type="checkbox"/> Corridors WET system• Data Rooms :<ul style="list-style-type: none"><input type="checkbox"/> Pre-action system with single or double interlock detection system.• Machinery spaces :<ul style="list-style-type: none"><input type="checkbox"/> Total flooding or local application system with a detection system

Why is SEM-SAFE® so **efficient** in data center?

Danfoss Semco provides fire fighting solutions for areas such as:



- 1 DATA HALL
- 2 TRANSFORMER ROOM
- 3 GENERATOR SPACE
- 4 SWITCHGEAR ROOM
- 5 BATTERY ROOM
- 6 UPS ROOM
- 7 TECHNICAL ROOM
- 8 WATER MIST PUMP ROOM
- 9 DATA CENTRE ROOM
- 10 OFFICES
- 11 AUDITORIUM
- 12 RECEPTION AREA
- 13 CONFERENCE ROOM
- 14 CANTEEN
- 15 KITCHEN
- 16 STORAGE ROOM
- 17 CORRIDOR
- 18 ABOVE FLOOR APPLICATION
- 19 BELOW FLOOR APPLICATION

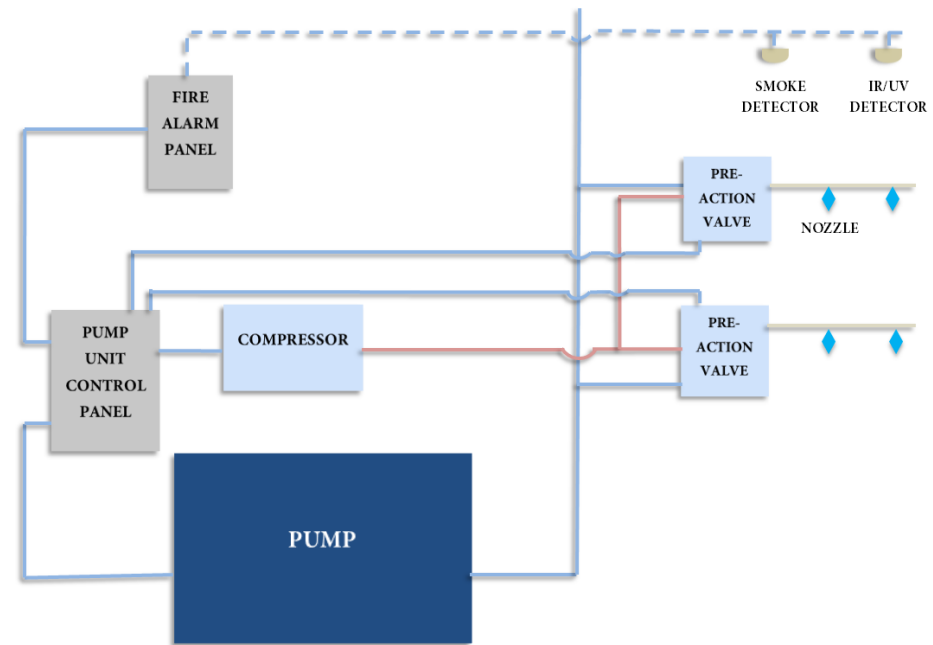


Cross section – a zoom on a part of the data hall

Added safety for your data center

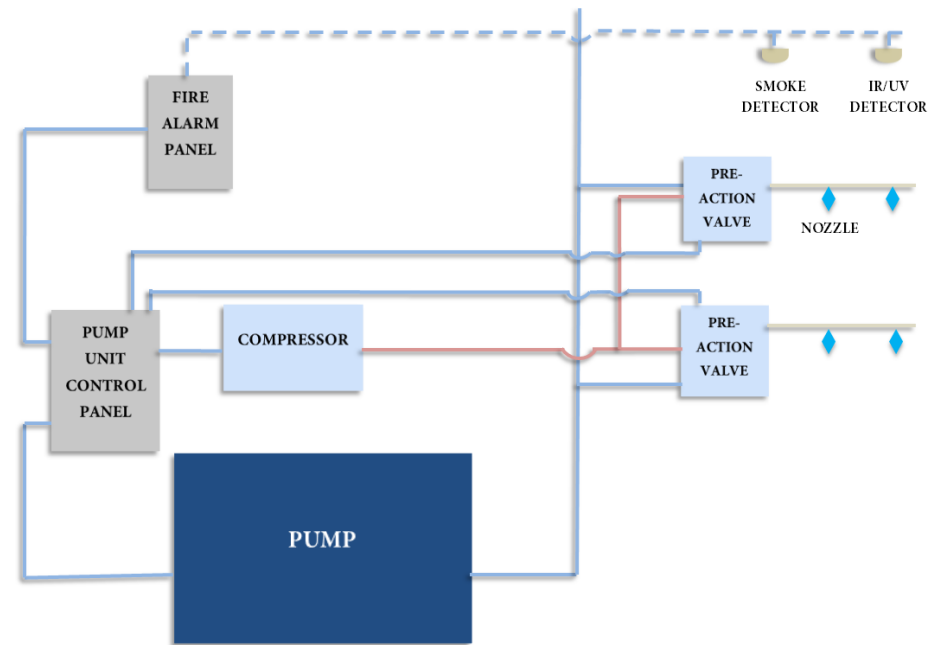
- Single Interlock pre-action system
- Piping is wet from pump unit up to the section valve, all pipe work down stream of the section valve is dry and system integrity is monitored by air.
- How does it work:
 - Fire is detected by the fire alarm system:
 - One detector operates alarm only
 - Two detectors operate:
 - Section valve opens
 - Pumps start and flood pipework
 - Manual intervention can still take place!

Conclusion : fire alarm operate the section valve



Added safety for your data centre

- Double Interlock pre-action system
 - Piping is wet from pump unit up to the section valve, all pipe work down stream of the section valve is dry and system integrity is monitored by air.
 - How does it work:
 - Fire is detected by the fire alarm system:
 - One and two detector operates alarm only
 - One nozzle operate, air pressure drop into the system :
 - Section valve opens
 - Pumps start and flood pipework
 - Manual intervention can still take place!
- Conclusion : fire alarm **AND** air pressure drop to operate the section valve

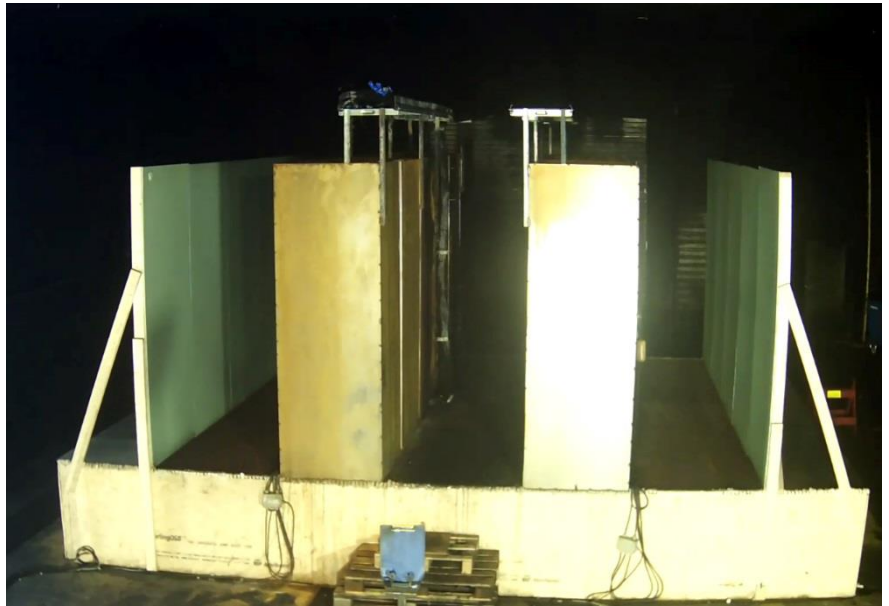


FM test 5560 Appendix M:

Fire test for water mist system for protection of data processing equipment rooms/halls above raised floor

General requirements and acceptance criteria:

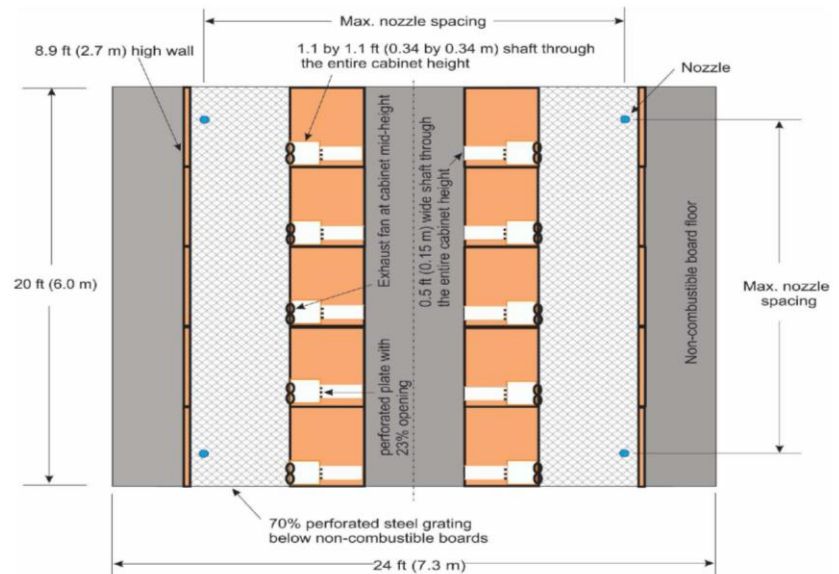
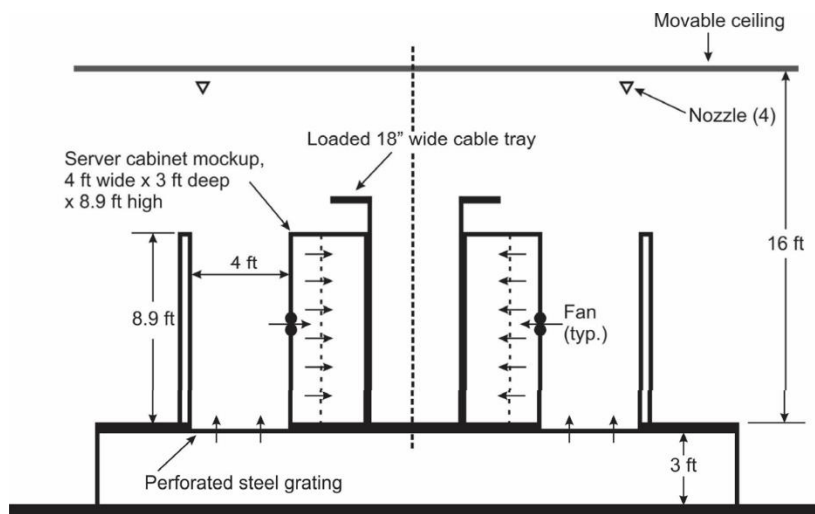
- Fire does not reach end of cable tray
- The system shall operate without manual intervention
- Fires extinguished in less than 30 minutes
- Max. spacing 5 m.
- Air velocity minimum 1 m/s
- Maximum 30-s water delivery transit time
- Movable ceiling with length and width of 4 nozzle spacing



FM test 5560 Appendix M:

Fire test for water mist system for protection of data processing equipment rooms/halls above raised floor

Test configuration in Elevation and Plan View



FM test 5560 Appendix N:

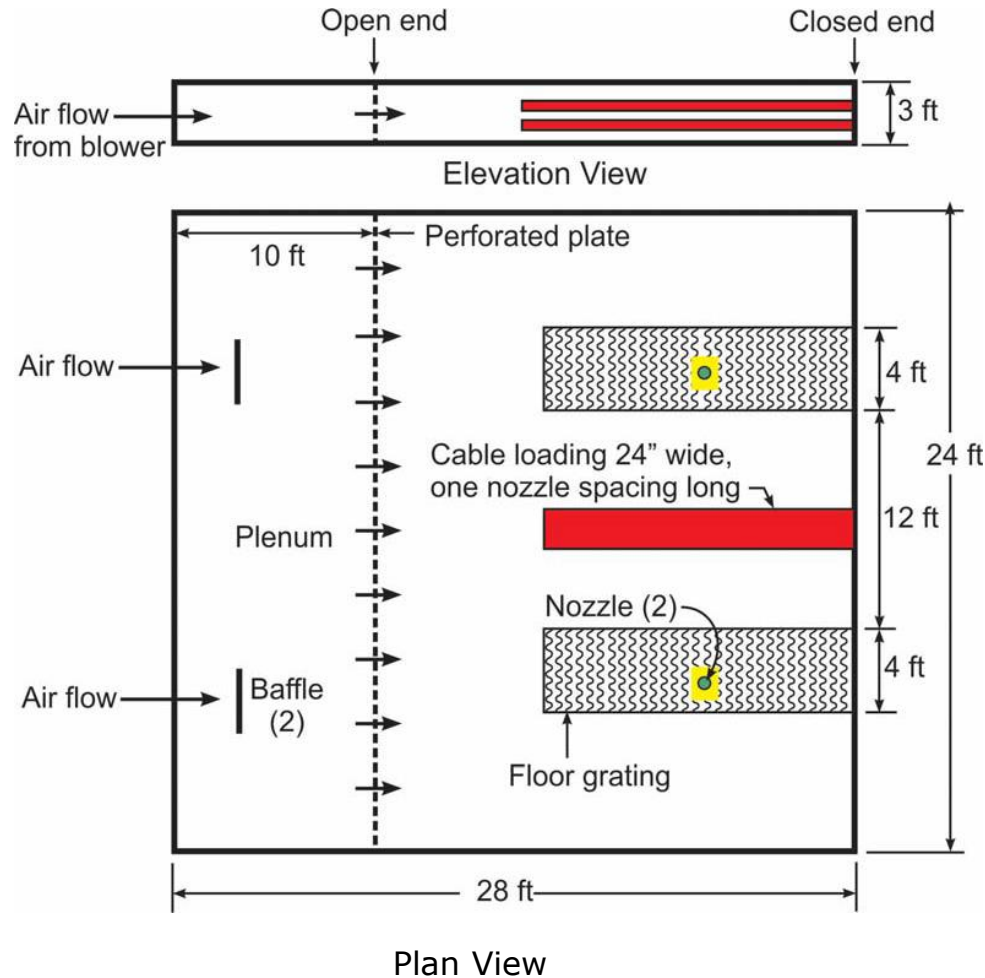
Fire test for water mist system for protection of data processing equipment rooms/halls below raised floor

General requirements and acceptance criteria:

- Same requirement as appendix M but
- A raised floor test enclosure shall be counteracted with width 2 x nozzle spacing and length 1,5 x nozzle spacing and one m height
- Single tier with 0,3 m. height and 0,6 m. for double tier
- Cable tray (s) consisting of 700 cables



FM test below floor



FM data sheet 5-32

DATA CENTERS AND RELATED FACILITIES

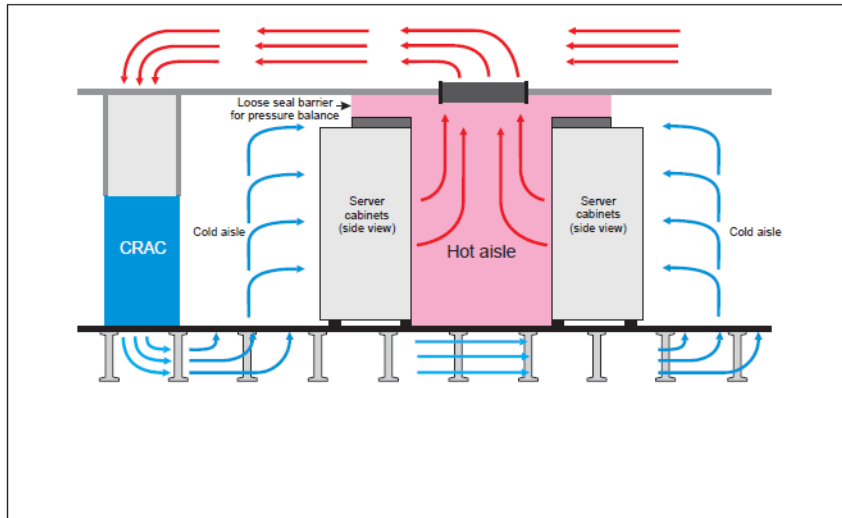


Fig. 6. Conceptual view of hot aisle containment system

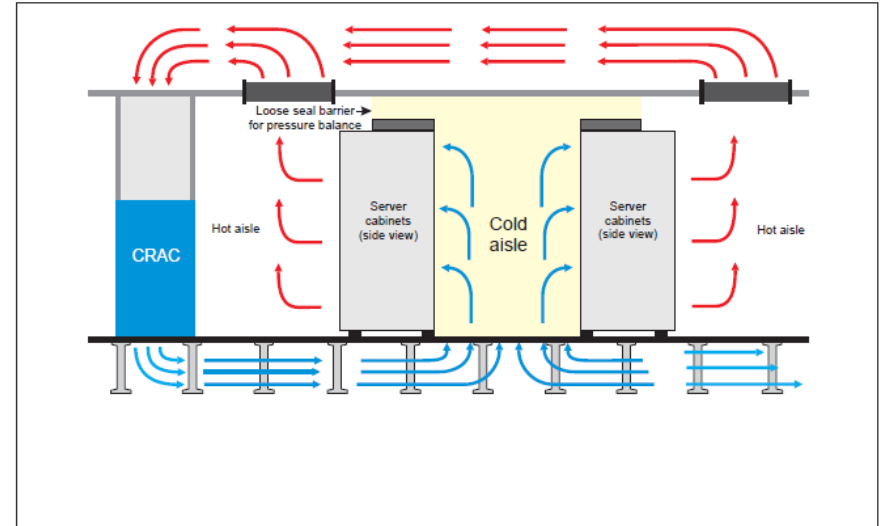


Fig. 5. Conceptual view of cold aisle containment system

FM tests conclusions

Above floor

All fires extinguished

Maximum two nozzles activated

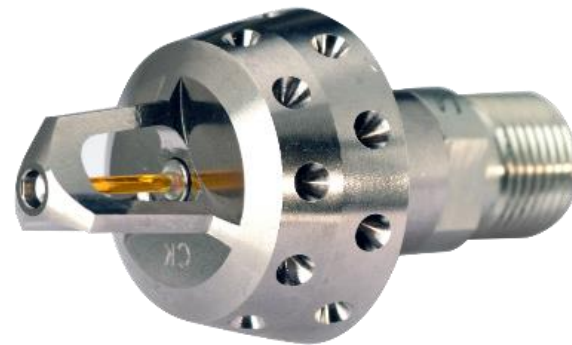
Two rated temperature glass bulb approved : 57°C / 68°C
60 bar- 5 m. meter height

Below floor

All fires extinguished

Maximum two nozzles activated

Two rated temperature glass bulb approved : 57°C / 68°C
60 bar- one meter height



FM tests conclusions

FM Machinery spaces FM5560 E

All fires extinguished

Maximum 8 m. height

Open nozzle with minimum 66 bar pressure



FM Machinery spaces FM5560 E

All fires extinguished

Maximum 6 m. height

Open nozzle with minimum 60 bar pressure



SEM-SAFE® benefits

- Keep the ventilation running during discharge → time and money saving
- No risk of false discharge with pre action system → added safety
- Save up to 59% water storage compared to low pressure systems → space saving
- The only solution approved for two cable trays protection below floor → protect any area in the data centre with SEM-SAFE®
- Local protection → activation only in the areas where fire is detected
- No expensive refill costs in comparison with gas systems → money saving
- Compact pumps → space saving compared to gas systems



Key reference list



Project Name	Partner	Country	Year [Delivery]
University College of London	Fireworks	UK	2017
RTE	Sonatech	France	2017
DGA (French Army)	Sonatech	France	2017
PM2239 MICROSOFT SINIMAENTIE	Promist OY	Finland	2017
Equinix in Slough	Fireworks	UK	2017
NDN-2016-008-RMB Yiyang Furong Cloud Datacenter phase 1	Nan Di Noer International	China	2017
PROJECT AIRBUS	SONATECH	France	2016
SONATECH "ETERA"	SONATECH	France	2016
EQUINIX AM1.3	Unica	Holland	2016
NDN-2016-005-RMB	Nan Di Noer International	China	2016
SONATECH DGA CF15-0041	SONATECH	France	2015
ATOS DATACENTER HURK	Unica	Holland	2015
PRO BTB	S.A.PROFOG	France	2015
NDN-2015-004-EUR. Beijing BaiDu Data Center Phase 1	Nan Di Noer International	China	2015
Tour Esplanade	Profog S.A.	France	2014
Svanta Rosvald P0872 (Corromatic)	Dafo Brand AB	Sweden	2014
IBO ECO DATACENTER	Profog S.A.	France	2014
Telecity Aubervilliers	DEF/PROFOG	France	2014
Telecity Aubervilliers	DEF/PROFOG	France	2014
Yandex datacenter PMxxxx	Promist Oy	Finland	2014
Yandex datacenter PMxxxx	Promist Oy	Finland	2014
P1005 IntroXion	Dafo Brand AB	Sweden	2014
DATA CENTER (PYRONOVA S.R.O.)	PYRONOVA S.R.O.	Slovakia	2014
Telecity Amsterdam	Profog S.A.	Holland	2014
Wuhan Rural Commercial Bank Data Center (ICAN2014-007)	ICAN	China	2014
Datacenter Curacao "CETEX"	Unica	Holland	2013
Banque De France	Profog S.A.	France	2013
INFOMANIAC	VIANSONE	Switzerland	2013
Global Switch data centre	AI Group	France	2012
Hull 408 / Neva-Leader 8	Profog S.A.	France	2012
Telecity Data Centre, Frankfurt	Total Walther GmbH	Germany	2012
Equinix Data Centre	Unica	Holland	2012
GMF nr1.	Profog S.A.	France	2012
GMF nr2.	Profog S.A.	France	2012

Equinix AM3 Data Centre, The Netherlands

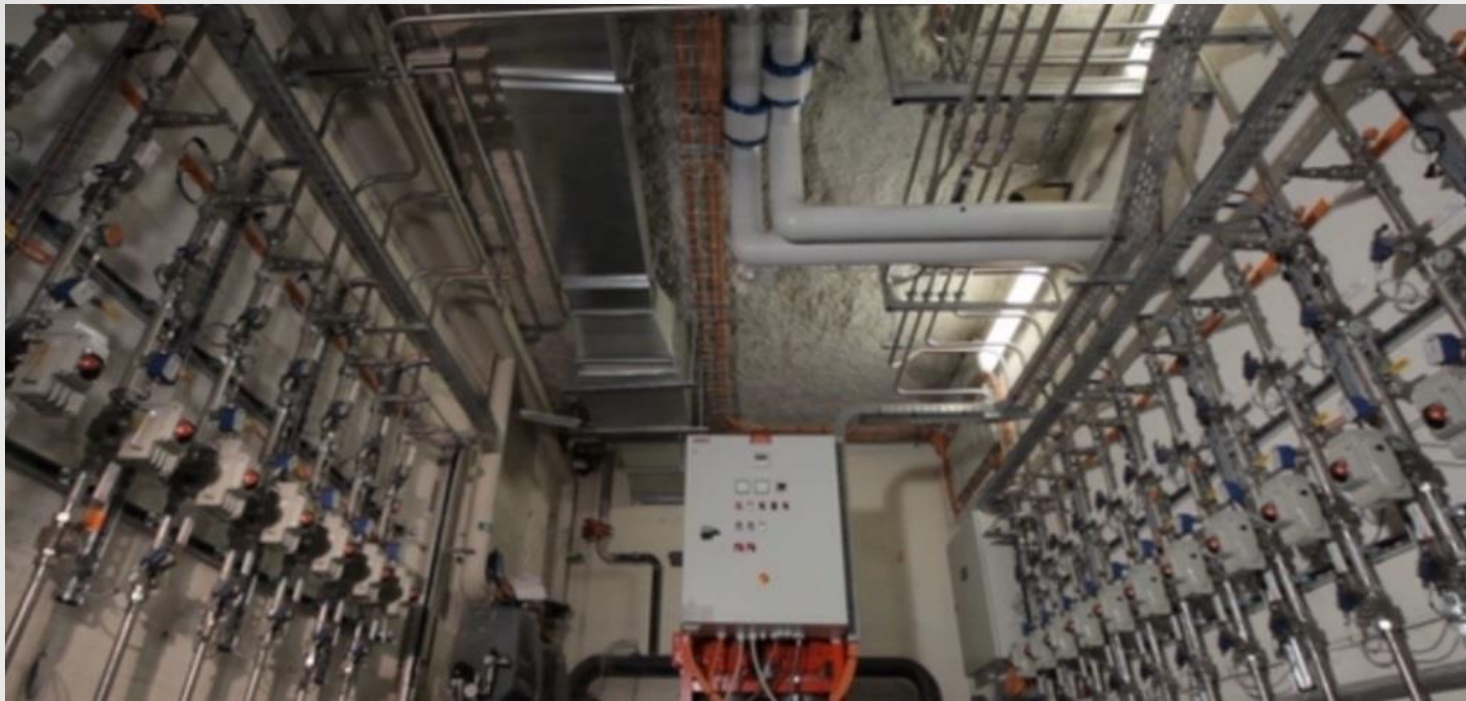


Equinix AM4 Data Centre, The Netherlands



Iliad/Free France

- 24 rooms protected
- 24 pre action valve
- More than 8,000 m² protected
- One pump unit 224l/min
- Control panel for 24 pre action valve



Saint Dennis Data Centre, France



Approval

- Approvals from the European guideline **CEN/TS 14973** and **DIFT, VdS and FM**
- For data centers in particular, we have carried out our “**below floor** for both single and double-tier cable trays and **above floor” test** according to FM 5560 Appendix M and N.
- FM HC-1 approval, can be used in corridors and offices approved for 5 m ceiling height for 57°C and 68°C
- Successfully passed FM fire test for machinery spaces.



The Danfoss logo is presented in a white, elegant script font, centered within a solid red rectangular background.

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