From Liquid Cooling to Li-ion Batteries: How water mist is enhancing the safety in Data Centers;

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FM Approved Fire Protection for Data Centers

VID FIREKILL®
LOW PRESSURE WATERMIST

Date: 12/2025

Agenda

01 Introduction

02 Why FM approval for Data Centers?

03 Classification of occupancies

04 Overcoming Challenges within FM DS

05 Q&A

06 Conclusion - announcement

Introduction to VID FIREKILL

Global leader in the Water Mist Technology with a wide and unique range of solutions

ISO9001 and **14001** accredited R&D, Production and Sales company

Yearly **+ 650.000** components (nozzle, valves, etc.) are manufactured and installed globally

Founded in **2002** and purely focused on water mist development

Quality and Approval Policy

Production Approvals

ISO 9001 and 14001 Accredited by **Bureau Veritas**

Factory Mutual **QC Approved**

DNV & GL MED-D Maritime production approved

All products are made in traceable batch system, and all components are 100% tested before shipment.

Samples from batches are fully component tested.

VID FIREKILL is audited 13 times per year to ensure continues high quality production.

Quality and Approval Policy

Product Approvals

13 x **FM Approval** to FM5560 & FM2025

9 x **DNV & LR MED** and **TA approvals** to IMO standards 1165, 265, 1387, 1430 & 15371

5 x **IBS approvals** to European standard EN14972

7 x **Civil Defense** approvals covering Middle East

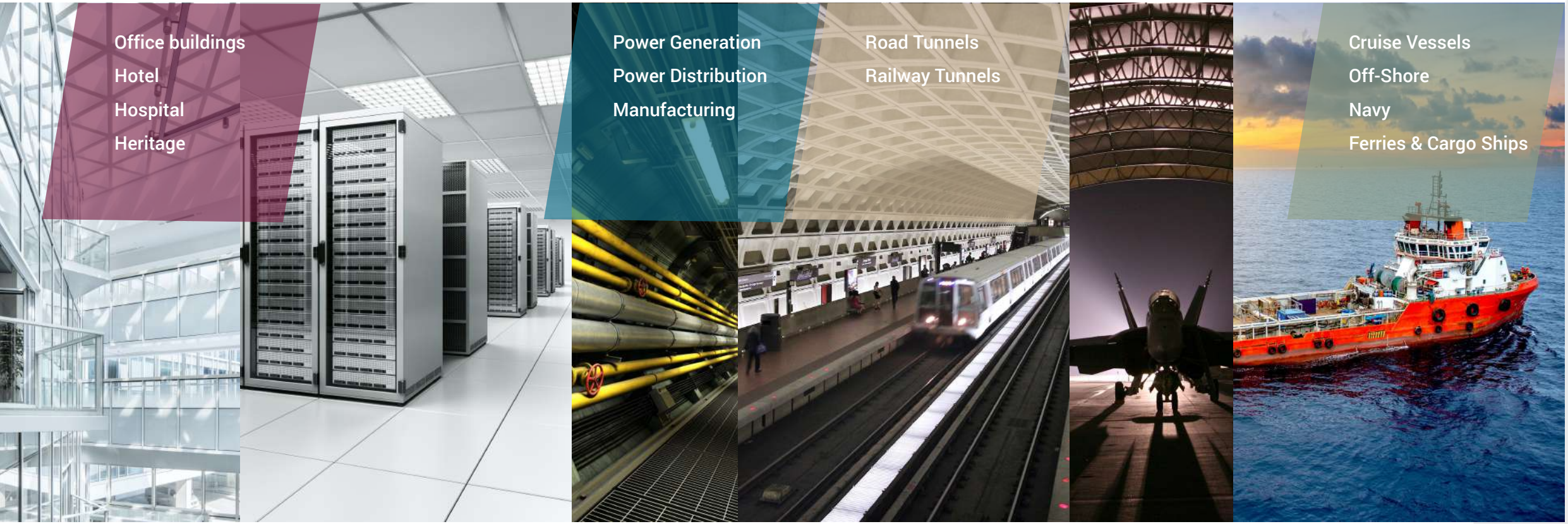
Committed to the industry

Investing in standardization

Investing in committees and associations

How we segment the market

Buildings	Data center	Industrial	Infrastructure	Aircraft Hangars	Marine & Off-shore
Office buildings Hotel Hospital Heritage		Power Generation Power Distribution Manufacturing	Road Tunnels Railway Tunnels		Cruise Vessels Off-Shore Navy Ferries & Cargo Ships



Global topics that can affect the design:

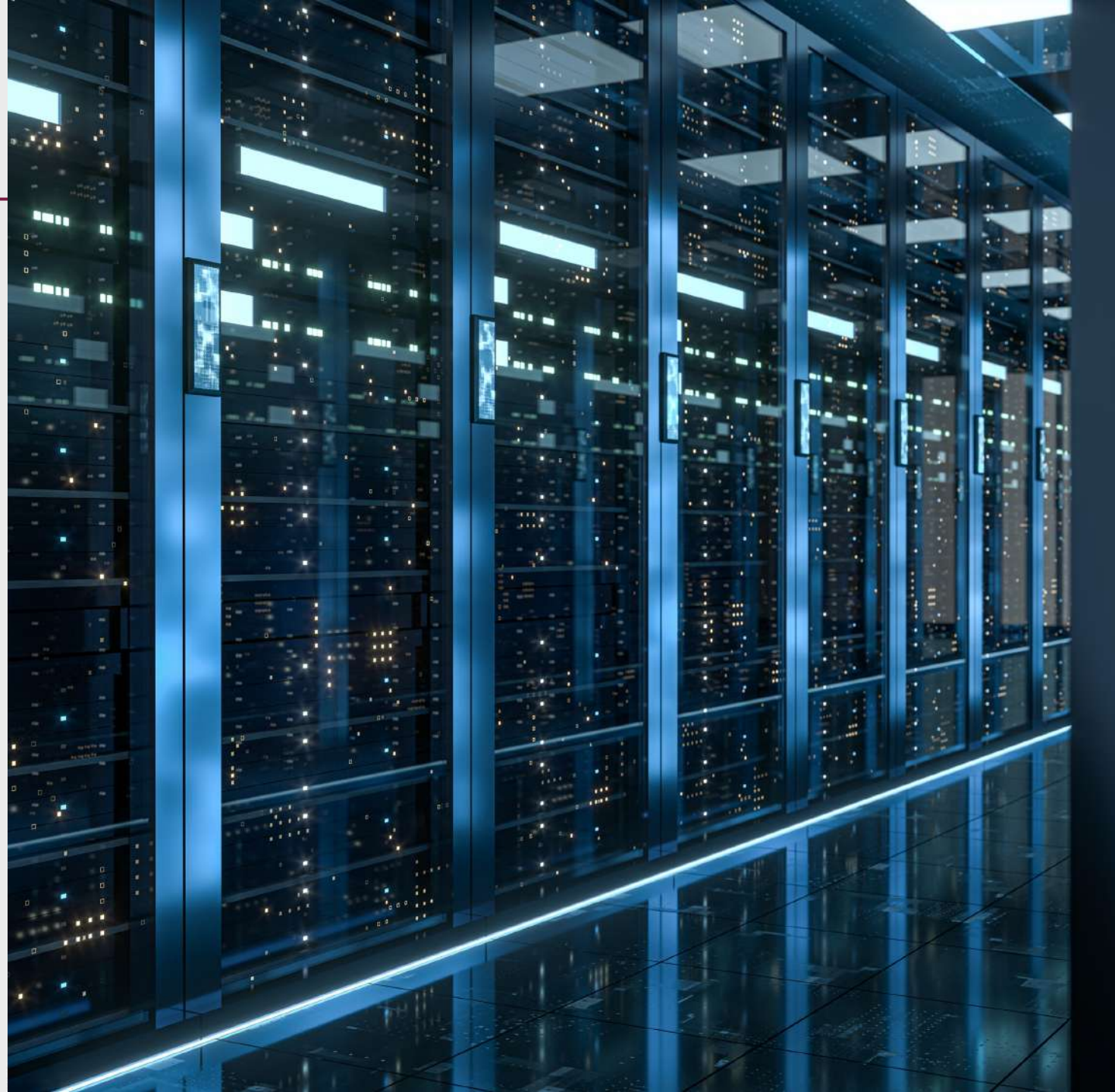
The use of lithium batteries

Business interruption

Flexibility

System activation temperature

Air velocity



The most complete available standard

FM 5560 Examination Standard for Water Mist Systems

FM DS 4-2 Water Mist Systems

FM DS 5-32 Data Center and Related Facilities

FM DS 3-26 Fire Protection for Non-Storage Occupancies

Strong compliance and reliability

Real Scale tested in FM laboratory

Component testing

Continuous audit

Worldwide recognized benchmark

FM DS 5-32 hazards

Occupancy	Hazard Classification	Fire Test Protocol	FM Approved Solution
UPS Battery rooms	HC-2 / HC-3	Water Mist: FM5560 Appendix P	OH-PX2
Data Halls with Li-ion BBU / Ceiling > 5m	HC-2 / HC-3	Water Mist: FM5560 Appendix P	OH-PX2
Office / Circulation spaces	HC-1	Water Mist: FM5560 Appendix G	OH-VSO
Transformer Rooms	HC-3 – dry Machinery space - Oil	Water Mist: FM5560 Appendices A to F, I	K6 (Total Flooding) LAK7 (Local Application)
Generator rooms	Machinery space	Water Mist: FM5560 Appendices A to F, I	K6 (Total Flooding) LAK7 (Local Application)
Technical Rooms	HC-2 / HC-3	Water Mist: FM5560 Appendix P	OH-PX2
Data Halls and MMR	Data Processing Room	Water Mist: FM5560 Appendices M &N	OH-DC1 (Ambient) OH-DC2 (RF and FC)

HC-1 Areas

Areas defined as HC-1 by FM DS 3-26

- Corridors;
- Offices;

2.3.5.5 Water mist nozzles of different hazard categories can be used on the same system if a water supply capable of supporting the greatest rate of flow and terminal nozzle pressure for the demand area is provided.

2.3.5.6 Determine the design area for water mist systems FM Approved for use in HC-1 occupancies with unrestricted enclosure areas using whichever of the following is **greater**:

A. The hydraulically most remote nine (9) automatic nozzles

B. All automatic nozzles within a 1500 ft^2 (140 m^2) demand area

2.3.5.7 Determine the design area for water mist systems FM Approved for use in HC-1 occupancies with specified maximum compartment area to supply all automatic nozzles within the compartment.

2.3.5.8. Determine the design area for water mist systems in corridors that can be protected by one row of nozzles, using whichever of the following is less:

A. A maximum of five (5) automatic nozzles for the demand area.

B. In an unrestricted enclosure area, all automatic nozzles within a 1500 ft^2 (140 m^2) demand area.

C. For corridors smaller than 1500 ft^2 (140 m^2) all automatic nozzles in the area.

Data Processing Room

FM 5560 Appendix M

Data Halls and MMRs with the following conditions:

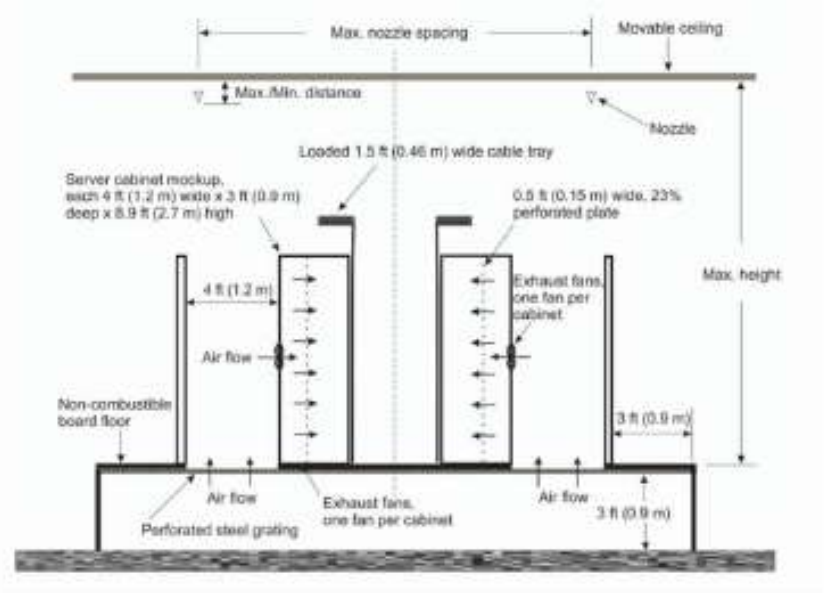
Ceiling height < 5m

No BBU with Li-Ion batteries

Single level of cable trays

Multiple trays non-propagating and/or cable trays/ raceways non-combustible equipped with automatic/ manual power isolation see 2.3.5.4.1

Non-combustible server racks, rack panels and hot/cold aisle containment



2.3.5.4.1 Power Isolation Method

2.3.5.4.1.1 Provide a power isolation method to achieve the following (separately or together):

A. De-energize all electrical power to the data processing equipment in the room or designated zone(s), except power to lighting, in the event of sprinkler, water mist system, clean agent fire extinguishing system and/or hybrid fire extinguishing system operation.

B. When appropriate, de-energize all dedicated heating, ventilation and air-conditioning (HVAC) systems for the data processing equipment serving the room or designated zone(s) in the event of sprinkler, water mist system, clean agent fire extinguishing system and/or hybrid fire extinguishing system operation. See Section 2.3.5.3 for further guidance on the impact of power isolation to HVAC equipment.

C. If abrupt power isolation will damage the data processing equipment, use a controlled shutdown of the data processing equipment prior to isolation of the power source.

HC-2 and HC-3 occupancies

FM 5560 Appendix P

Areas defined as HC-2 and HC-3 by FM DS 3-26 and FM DS 5-32:

Data Halls with ceiling >5m

Data Halls with BBU with Li-ion

Data Halls with multiple cable trays

Technical Rooms

Dry transformer

Battery room

UPS

MER

Storage (see FM DS 3-26 limitation)

Loading bay

2.3.5.9 Determine the design area for water mist systems FM Approved for HC-2 and HC-3 occupancies using whichever of the following is greater:

A. The hydraulically most remote nine (9) automatic nozzles.

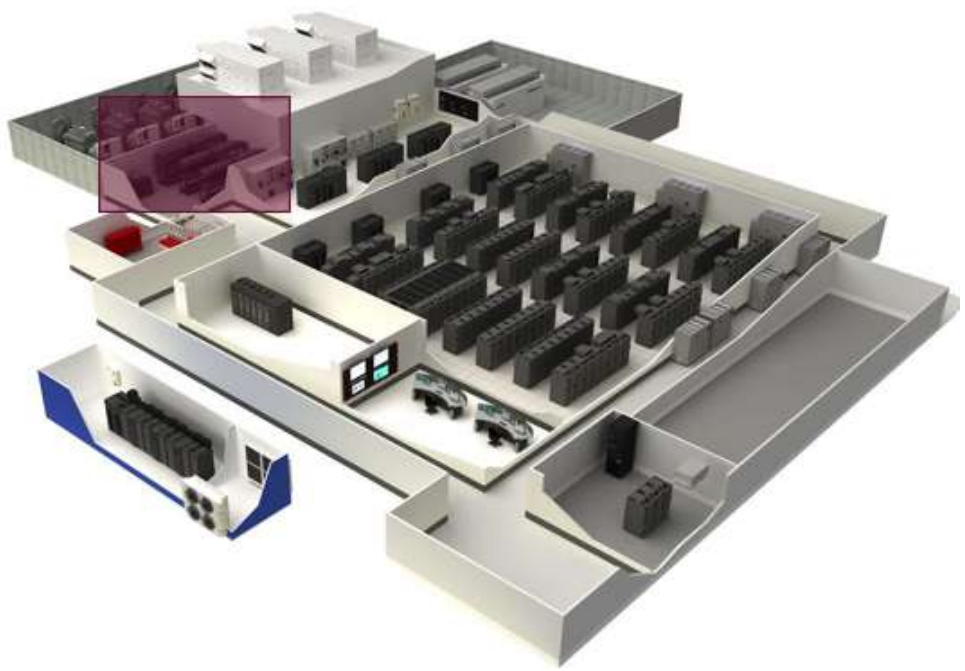
B. The hydraulically most remote number of automatic nozzles as specified in the FM Approval listing.

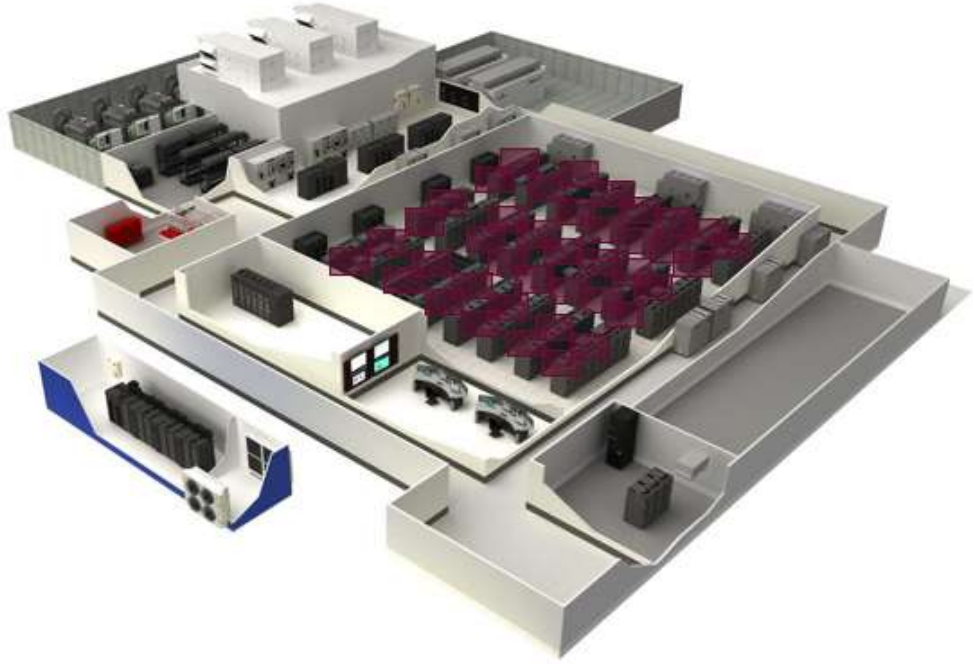
Li-ion batteries in data centers applying FM DS 5-32

Different ways in which li-ion batteries are used and installed in a data center facility today:

Installed in server racks as a distributed power system of data processing equipment

Installed in separate UPS rooms providing the necessary power backup





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2.4.4 Li-ion Battery Back-up Units for Distributed Power Systems

2.4.4.1 Where Li-ion battery back-up units (BBU) are installed in a server rack as a distributed power system, the recommendations in this section are to be applied if the following conditions exist:

A. Maximum power capacity of 20 kWh per server rack as a distributed power configuration. (Refer to Section 3.4.1.2 for calculating power capacity.)

B. No more than two shelves containing BBU modules located together in the same area of the rack. (See Figure 2.4.4.1 for typical configuration.)

C. Aisle spacing between server rows is a minimum of 4 ft (1.2 m).

D. Ceiling height is a maximum 30 ft (9 m). (Refer to Section 3.2.5.1.)

E. No limitation on the building/room size (area in ft^2/m^2).

2.4.4.1.1 Server racks with distributed Li-ion Battery Back-up Units (BBU) exceeding the maximum capacity of 20 kWh per rack should be considered Energy Storage Systems (ESS); and the recommendations identified in OS 5-33, *Energy Storage Systems*, should be followed.

2.4.4.3 Provide one of the following automatic protection options throughout all building areas associated with this hazard:

A. Use FM Approved quick-response (QR) sprinklers in accordance with Data Sheet 2-0, *Installation Guidelines for Automatic Sprinklers*, and the following specifications:

1. Minimum density 0.2 gpm/ft^2 (8 mm/min). Sprinkler deflector distance from the ceiling (min: 1.75 in. [44 mm]; max: 4 in. [100 mm]).

2. For wet, non-interlock or single interlock preaction systems, use a demand area of 2500 ft^2 (230 m^2).

3. For double interlock preaction systems, use a demand area of 3,500 ft^2 (320 m^2).

4. Provide a maximum linear spacing of 12 ft (3.6 m) and area spacing of 144 ft^2 (13.4 m^2), or a reduced spacing and area for clearance from obstructions, in accordance with Data Sheet 2-0, *Installation Guidance for Automatic Sprinklers*.

B. Use FM Approved automatic water mist systems with the following specifications:

1. Approved for protection of non-storage, Hazard Category (HC-2) occupancies

2. Provided in accordance with Sections 2.4.7.2.2 through 2.4.7.2.9

2.4.4.3 Provide a hose allowance of 250 gpm (950 L/min).

2.4.4.4 Provide a water supply duration of 60 minutes.

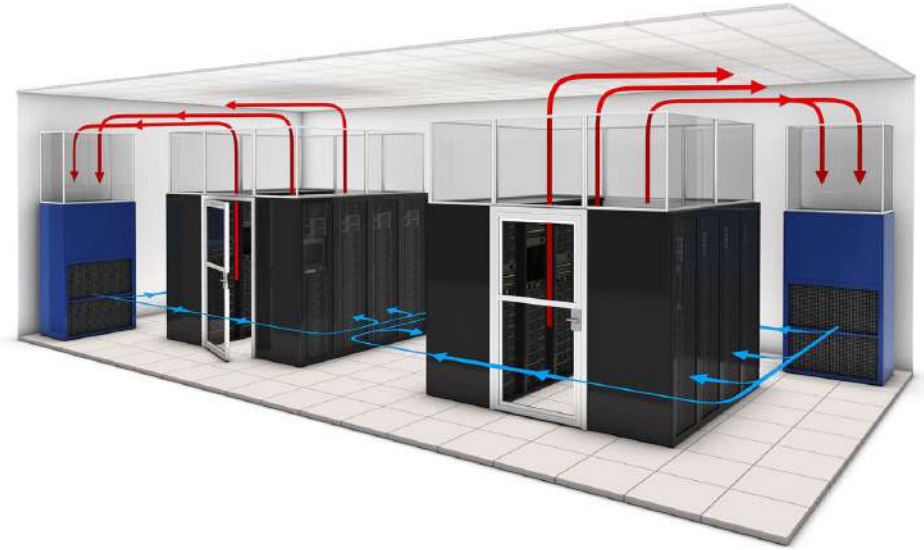
2.4.4.5 Do not use clean agent fire extinguishing systems to provide protection. (See Section 3.4.1.2.)

Air Velocity in Data Halls: is it affecting the spray?

Traditional sprinkler is limited to 1.5 m/s;

Water Mist to 1.2 m/s or whichever meets the provisions of the system's FM Approval listing; 1.7 m/s;

LPWM is performance tested up to 8 m/s air velocity;



Air Velocity in Data Halls: is it affecting the system activation?

The combination between heat and air can activate the wrong nozzle;

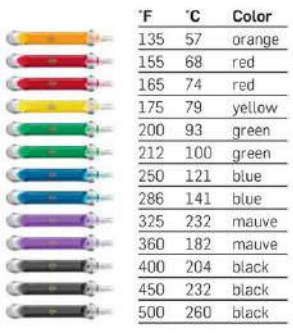
Bulbs temperature can be flexible according the data hall needs; Such as 57°C, 68°C or 93°C;

RTI – response time index for water mist glass bulbs is by far more efficient!

	Type	Length	RTI*		Strength				Temperature						
			Response Time Index		Average crush load		Lower tolerance limit		Additional temperatures available						
Response		mm	$ms^{1/2}$	$fts^{1/2}$	kN	lbs	kN	lbs	57°C 135°F orange	68°C 155°F red	79°C 175°F yellow	93°C 200°F green	141°C 286°F blue	182°C 360°F mauve	260°C 500°F black
Standard	G5	16/20	90	163	4,0	880	2,5	550							
	G5-XS	16/20	90	163	5,5	1210	4,0	880							
Inter-mediate	F5	16/20	68	123	4,0	880	2,5	550							
	F4	16/20	58	105	4,0	880	2,5	550							
Fast	F3-SP	20	32	58	4,1	900	2,3	500							
	F3	16/20	32	58	3,5	770	2,0	440							
	F3-XS	16/20	32	58	4,5	990	3,0	660							
	F3-F	16/20	24	43	4,1	900	2,3	500							
Super Fast	F2.5	16/20	24	43	2,5	550	1,25	275							
	F2.5-XS	16	24	43	4,0	880	2,1	460							
	F2	16	19	34	2,0	440	1,0	220							
Ultra	F1.5	16	14	25	1,0	220	0,5	110							

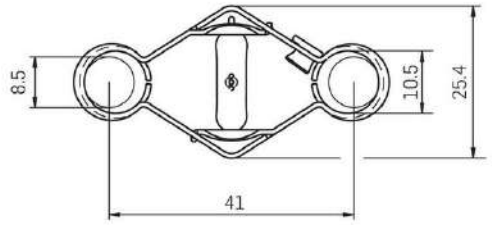
SPRINKLER

LPWM



°F	°C	Color
135	57	orange
155	68	red
165	74	red
175	79	yellow
200	93	green
212	100	green
250	121	blue
286	141	blue
325	232	mauve
360	182	mauve
400	204	black
450	232	black
500	260	black

Marked acc. to UL approval and manufacturing date codes



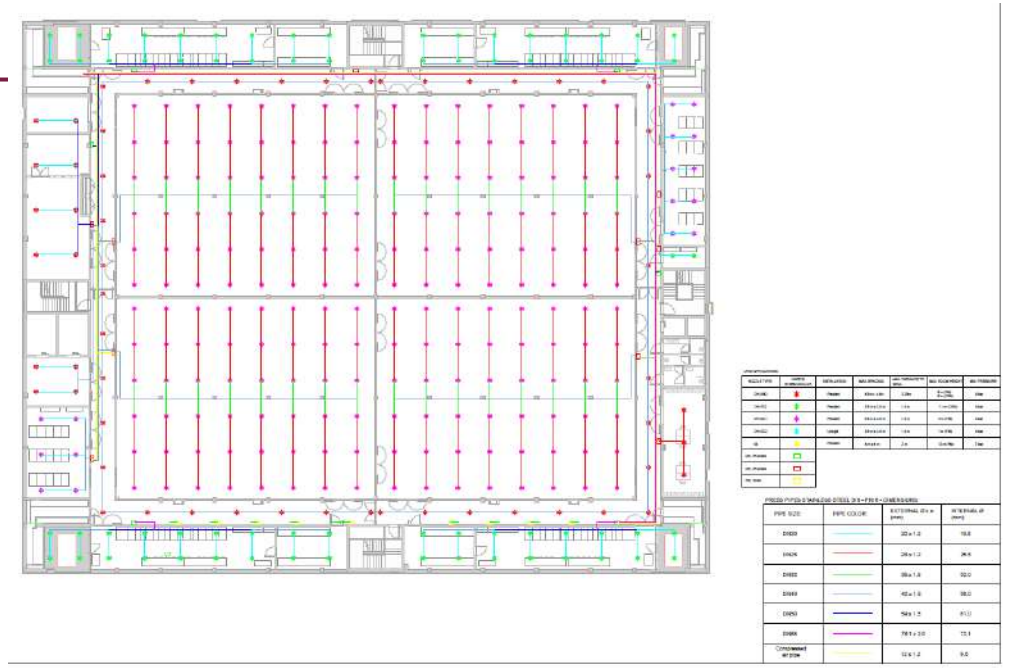
Flexibility & Fluid delivery time

FM DS 5-32

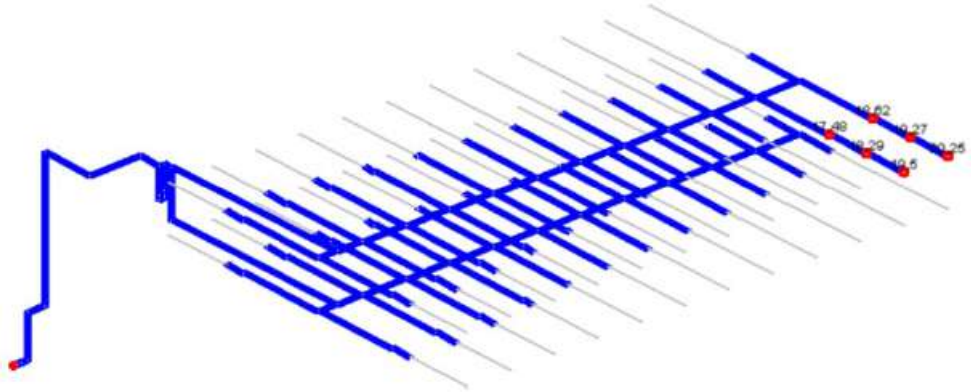
- 2.4.4.2.3 maximum 30s for sprinkler;
- 2.4.4.3.5 maximum 30 for water mist;

LPWM valves can be decentralized for a faster fluid delivery time:

- Faster action against fire;
- Less property loss;
- Easier system scalability;



Filling at 20.4 second after watermist activation

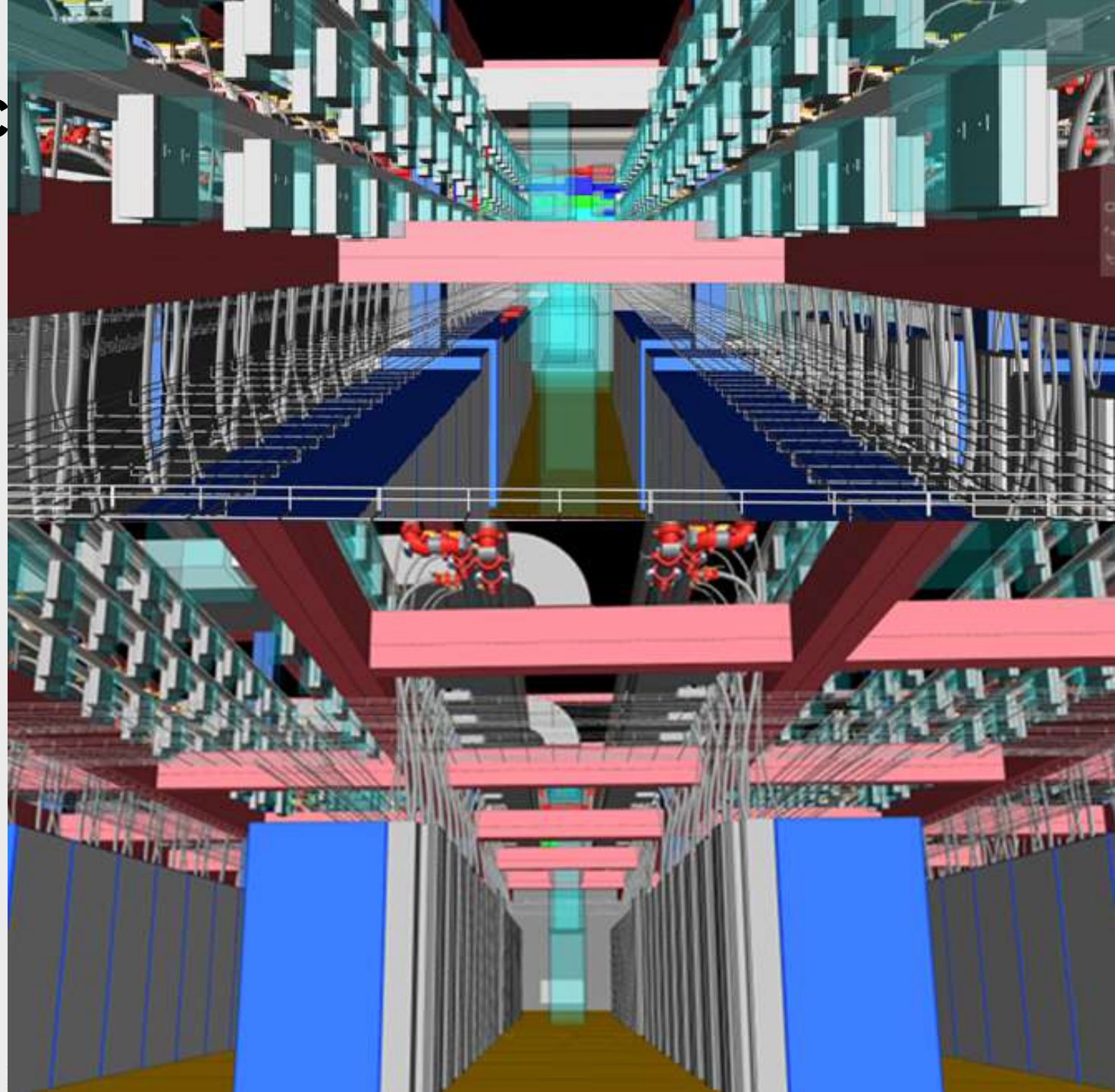


Flexibility & Obstruc

Liquid Cooling is changing the building shape;

The obstructions / fire loads;

The ceiling height;



Flexibility & Obstruction

Water Mist

Sprinkler

*Cable trays distance from ceiling 300mm

Benefits over conventional sprinkler

Water consumption

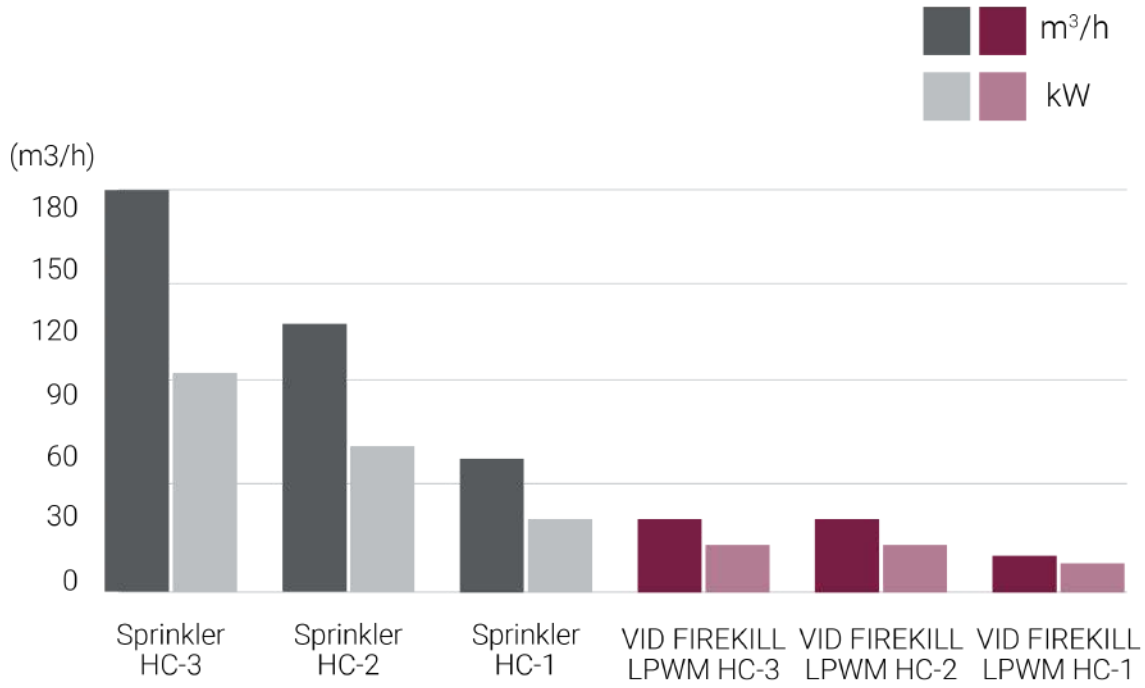
Less space

Less property loss

Less power

Less obstructions

Easier and flexible design



Other benefits

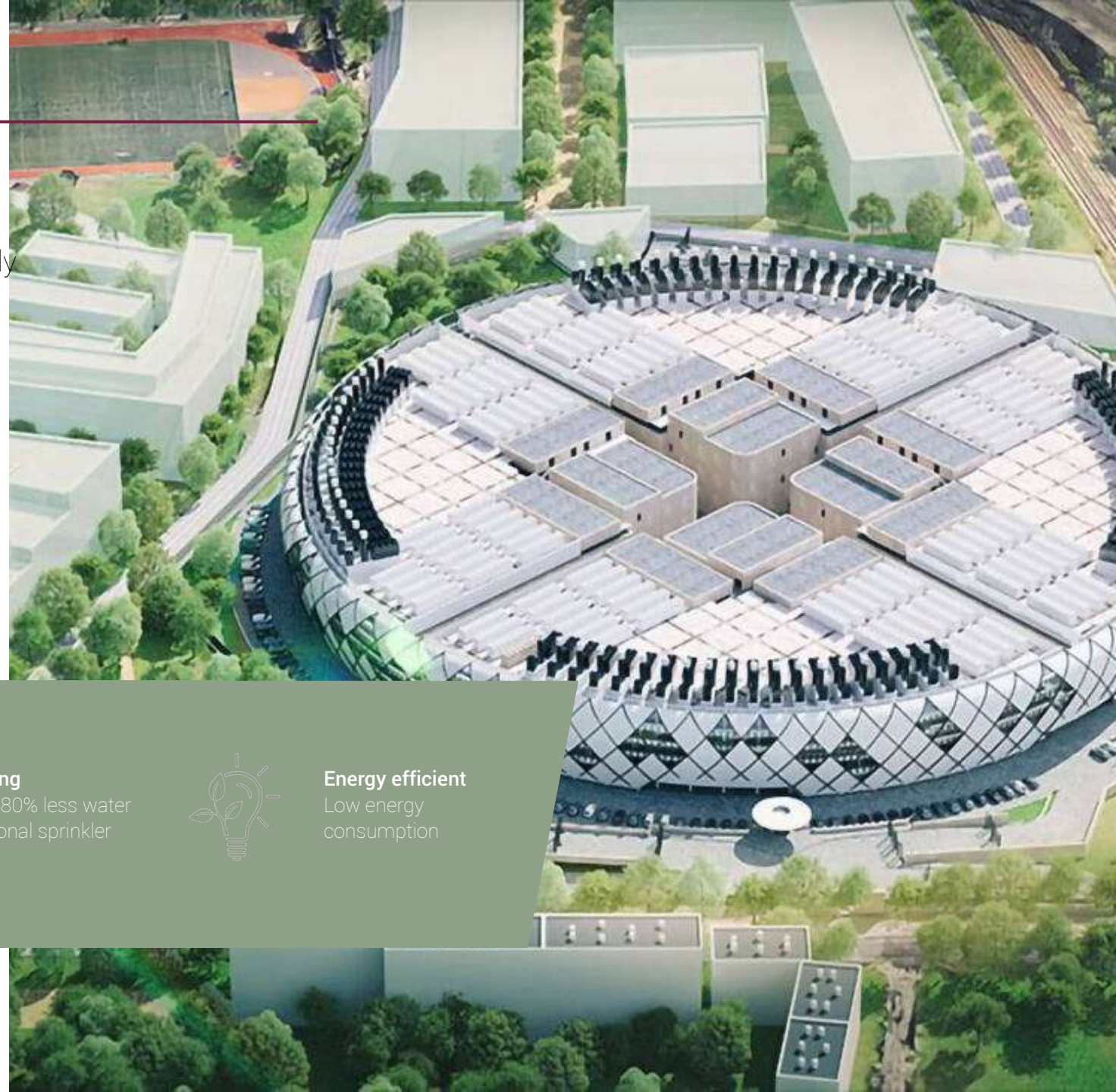
The VID FIREKILL system is the most environmentally friendly solution found on the market.

Sustainability 70% less CO-2e

Faster fluid delivery time thanks to decentralized valves;

Stronger performance against fire;

Performance tested to achieve flexibility



Sustainable solution
Reduced CO2 emissions by up to 70%
Sustainable fire safety design
Reduced production footprint

Water saving
Uses up to 80% less water than traditional sprinkler systems

Energy efficient
Low energy consumption

Thank you

Riccardo Cerati

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