Watermist – Applications and Approvals

IWMA Seminar

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Dubai, UAE

By Alex Palle, VID Fire-Kill, Denmark

For a technology to commercialize STANDARDS are needed.

STANDARDS can be divided into three groups:

Fire test standards:

- Being used to find limitations for installation (e.g. installation height, vent., obstructions)
- Being used to find system specifics (e.g. K-factor, pressure, spacing)

Component test standards:

- Being used to determine if design and construction will be able to withstand 30years lifetime.
- Being used to verify production quality and uniformity.

Overall Design, Installation and Service standards

- Being used to specify common and overall requirements for all type watermist systems.
- Being used to describe risk classification, system operation area*, system duration time* (often same or more demanding requirements than for sprinklers and gas systems).

** Sometimes these parameters are found from the testing standards.*

Understanding the need of standards.

As most sprinklers are approved to specific risk classes and to the same k-factors, pressures, spacing and other design specifications, all sprinklers can be used more or less the same way.
Therefor sprinkler design standards can describe almost everything which is needed to design, install, operate and maintain any type and brand sprinkler. You find this knowledge in standards such as NFPA13, EN12845 , CEA4001 etc.
The users mindset with waterbased fixed firefighting systems are therefor that understanding one design standard is enough to work with all systems.

Further, as sprinklers has been existing, used for a long time and proven successful, most applications found on land can be covered by sprinklers.
The users mindset with waterbased fixed firefighting systems are therefor that everything can be protected with a such system.

For watermist this is not the case:

1) Each system has its own design parametres which has to be understood and followed in order to work with the system. These are found in DIOM and datasheets.
2) Fire testing to applications are needed in order to verify the system capability. These has to be done in a valid and representative way.

I want to use this presentation to describe the watermist industry situation today regarding standards, and like to describe what this gives us of possibilities in regards to watermist system use.

Agenda:

1) Watermist Standards – How did it start
2) Today – An overview of standards
3) Examples of WM system applications

1. WM Standards – how did it start.

Watermist exists because of innovative thinking in the early 80’ in Scandinavia.
- High pressure technology was the first to arrive.

Watermist standards exist because:

Montreal Protocol on Substances that Deplete the Ozone Layer: entered into force on January 1, 1989. Halon was one of the Substances.

- IMO needed to find alternatives to Halon. Choices where:
    - CO2 (Kills people)
    - Clean agents, N (Takes amount of space)
    - FM200 (Contains Flour etc.) (Not “clean”, some countries does not accept)
    - Watermist (Not specified in SOLAS, no test protocols)

IMO Decision:
- Implement amendments regarding accepting use of watermist on ships.
- Use innovative “demonstration” tests (tested at SP, Sweden) as starting point to create test protocols and design standard.

1. WM Standards – how did it start.

First protocols came from IMO:

- IMO1165 (Has replaced IMO668/728) (Total flooding for Machinery)
- IMO 1387 (has replaced IMO 913) (Local Protection for Machinery)
- IMO 1272 (has replaced IMO 914) (Protection of car and truck decks)
- IMO MSC 265 (Replaced IMO A800) (Public Spaces and Accommodation)
- SOLAS amendment (implemented design rules for sprinkler equivalent systems)

Development of watermist industry due to the standards:

- More players arrive on marine marked as this became growing fast.
-From 90’ to 03’ more and more high pressure manufacturers develop watermist systems and test to available standards - IMO standards.
-From 02’ low pressure technology is presented on the marketplace.
-Main market for all watermist systems are the maritime as everything is standardized – no problem with acceptance, and market is growing even though more players have arrived – watermist has become a market standard in the maritime sector.

1. WM Standards – how did it start.

However:

-The maritime market became full of players, so some manufacturers had to find new marketplaces – the answer is land.
-Some players became very large and needed to show growing sales => They push watermist in many areas on land to create growth => Eased the path for other players who followed.
-Financial crisis in 2008 reduces the overall maritime market => manufacturers have to find new places to sell => watermist is pushed on land.

Watermist being a technology on land, creates the need of standards for land market so FM, VDS, LPCB, UL, NFPA, CEN and others began to create such or/and to develop their existing standards further to cover WM used in land applications.

2. Today - An overview of standards

Test standards examples:

-FM5560: US light Hazard (EU OH1), machinery, turbines, special hazards, more
-UL2167: Residential areas, LH, OH1 more
-VDS : Car parks, cable tunnels, OH3, Offices, more
-UK/BRE/LPCB: LPS1283 +DD's - Domestic & residential areas, LH & OH1
-Scandinavia: INSTA 900: Domestic & residential areas
-Europe: CEN/TS14972: Offices, Fat fryers, special hazards
-CNPP: Turbine tests
-Marine: IMO standards.

Design standards Examples:

-USA, Middle East, Far East: NFPA 750
-Europe: CEN/TS14972
-Denmark: RETN. 254-1/2
-Scandinavia: INSTA 900: Domestic & residential areas
-Marine: SOLAS

Component standards Examples:

-USA, Middle East, Far East: FM5560
-Europe: CEN/TS14972
-Marine: IMO1165 & IMO A800

2. Today - An overview of standards

	CEN/TS14972	VDS	FM5560	LPS1283	UL 2167
Since	Since year 2008. Work started year 1998	First since year 2000	Since year 1995	Since year 2012/13	Since 2002
Type	Design, fire test, component test standard	Design, fire test, component, production, installation verification test standard	Design, fire test, component, production, installation verification test standard	Design, fire test standard	Simple design, fire tests, component tests,
Scope (simple)	Commercial and industrial app. In Europe	Commercial and industrial app. in Germany+Polen (+Europe)	Commercial and industrial app. in The States (+World)	Commercial app. in The UK (+Europe)	Maritime applications, and land LH, OH1, OH2 (NFPA13) in The States (+World)
Strenght Weaknesses Opportunities Threats	S: Covers hole Europe. Can be used for all applications. W: Only a technical Specification. No listing can be issued. O: Becoming an EN + harmonized T: Woted out.	S: Listing and brand, covers all aspects. W: Comparison to sprinklers. O: accepted in EU (CEN) T: Not accepted in EU (CEN)	S: Listing and brand, covers all aspects. W: Higher safety factors than others. O: accepted in EU (CEN) T: Not accepted in EU (CEN)	S: Listing and brand. W: New standard, only limited scope. O: accepted in EU (CEN), and required in UK. T: Not accepted in EU (CEN), and not accepted/used in UK.	S: Listing and brand, covers all aspects. W: Only 4 approvals totally given, 1 land and 3 maritime. O: Accepted in EU (CEN) and adoption of more applications. T: Not followed by more manufactorers. Not accepted in EU (CEN),

2. Today - An overview of standards

	CEN/TS14972	NFPA 750	Local standards
Type	Design, installation, maintenance	Design, installation, maintenance	Often: Design, installation, maintenance
Scope	Europe	The States	Local country specific.
Strenght Weaknesses Opportunities Threats	S: Covers hole Europe. Can be used for all applications. Worked on for many years. Lot of expirience in the working group. W: Only a technical Specification. Not knowing when/if it becomes EN. To many interests in group: commercial vs technical. O: Becoming an EN + harmonized. If so, it will help the watermist industry grow. T: Woted out.	S: Existing for many years. Revisions comming every 2 years. Known ”brand”. W: Not designed for other parts of the world. Today no link between applications and tests. O: NA. T: NA.	S: Giving minimum requirements. Promoting WM. W: Often copies of old more known standards. Not well described. Lack of description on link between tests and appliction. Creates confusions on market with local standards. O: If CEN/TS does not become EN, it will continue to be followed. T: Superseeded if CEN/TS becomes EN.

2. Today - An overview of standards

And there are even methods to test to applications not covered by standards.
Example described in CEN/TS 14972 annex B

Verification process:

- Fire tests conducted in ISO17025 acc. test lab
- Production facility shall be ISO9001.
- AHJ often involved from beginning.

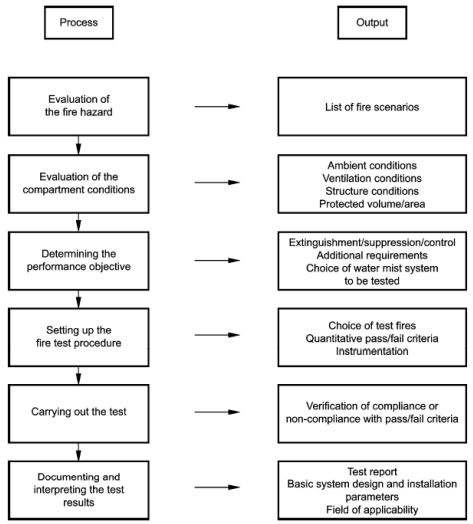


Figure B.1 — Process of developing a fire test procedure

Important paramtres to take into account:

- Fuel load.
- Spread of fire risks.
- Fuel concentration and stacking heights.
- Obstructions.
- Distances between fuels (possibility of fire spreading) .
- Test room geometrics , ceiling heights and volumes .
- Drag and ventilation (Implications for oxygen supply and smothering the fire , activation of the "wrong" nozzles) .
- Distances from nozzles for fuel and floor for horizontal jets (implications for water distribution, local water densities and reaction times) .
- Installation heights and nozzle locations and distances to ceiling (delay times and water sprays) .
- Water pressure and nozzle spacing (Meaning of droplet sizes and local water densities) .
- Classification of the test burning time before manual shutdown
- Nominal release temperatures .
- Acceptance criteria of classification test, with reference to the classification test procedure.
- Etc.

2. Today - An overview of standards

So today there is a good baseline to use watermist in many applications around the world because:

Overall design standards existing such as NFPA750, CEN/TS14972, etc
+
System specific design knowledge found in full scale testing to an official test standard such as VDS, FM5560, UL2167, CEN/TS 14972, IMO, etc) and described in each manufacturers DIOM
=
The same knowledge and trust to use watermist in a given application as it would be with more known and used systems such as sprinkler systems.
The trust come from realistic and succesful fire testing, succesful component testing and a DIOm describing use and limitations of the system.

3. Examples of WM system applications

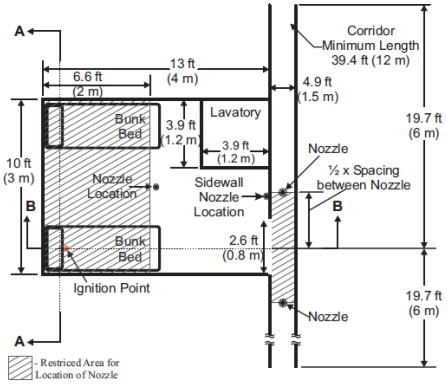
In part 3 I will give some examples on application scope when having tested to the following standards:

- FM5560
- CEN 14972
- VDS protocols

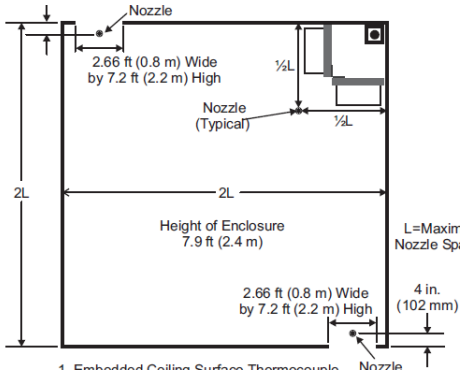
3. Examples of WM system applications

FM5560 Light Hazard:

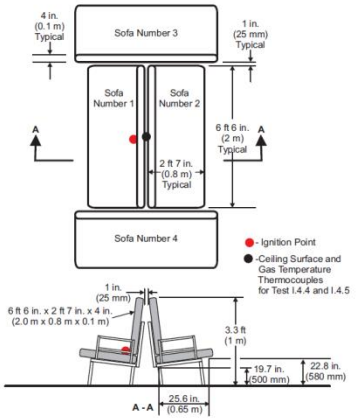
Small Compartment



Large Compartment



Open public space



Limitations:

Pendent nozzles: -H < 5m

Sidewall nozzles: -H < 2,5m, Area < tested.

!! All tests are conducted with the same nozzle and with FM witness.

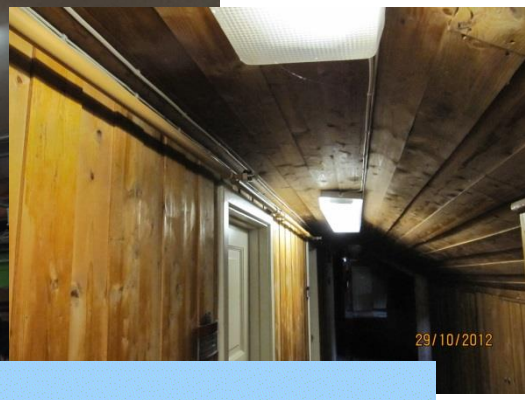
3. Examples of WM system applications

FM5560 Light Hazard:

Nozzle type	Sidewall dyser	Pendent dyser
Applications	Apartments, Atriums, Churches, Concealed spaces, Gymnasiums, Hospitals, Hotel rooms, Institutions, Kitchens, Libraries, Meeting rooms in convention, centers and hotels, Metalworking shops with non-hydraulic cutting operations, Mineral processing such as: glass, cement, ore treating, gypsum processing, etc., Museums, Nursing or convalescent homes, Offices, Residential areas, Restaurant seating areas, Schools and universities classrooms, Unused attics.*	
Risk class	EN 12845 / CEA 4001 / TS 14972: Light Hazard (LH) & Ordinary Hazard, group 1 (OH1)*, FM HC1, NFPA 750 / NFPA 13 LH*	
Dimension limitations	Max ceiling H: 2,5m Max protection are: the tested area.	Max ceiling H: 5m
Application limitations	*exclusive high rack libraries, facilities with storage of electronics and plastic media, Hospital laboratories, Facilities with operation of flammable and hydraulic liquids.	

3. Examples of WM system applications

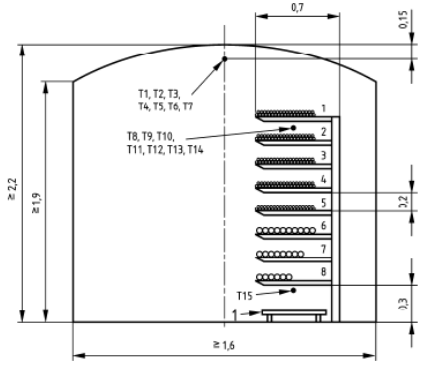
FM5560 Light Hazard:

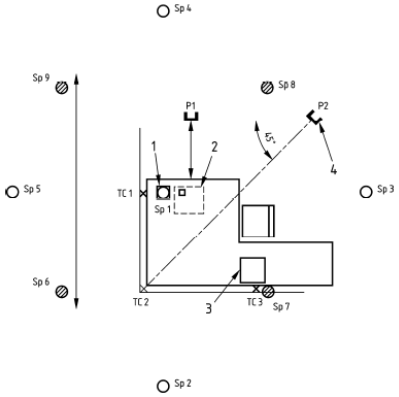


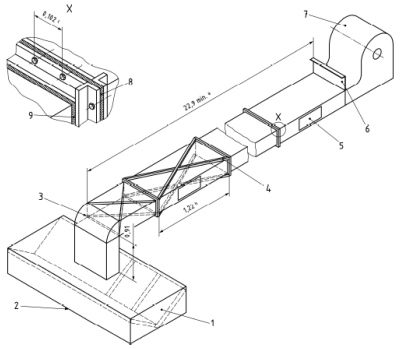
3. Examples of WM system applications

CEN TS 14972:2010 - Annex A:

Flammable liquids | cable tunnels | office occupancies | commercial fat fryers







Limitations:

-Volume< 100m3
-Area < as tested
-Height < as tested.
-Vent. opening < as tested.

-lenght < as tested
-Height < as tested
-width < as tested.

- Height < as tested

-Oil amount (l)
-Installation h. min-max
-fryer surface area
- oil depth,
ALL as tested.

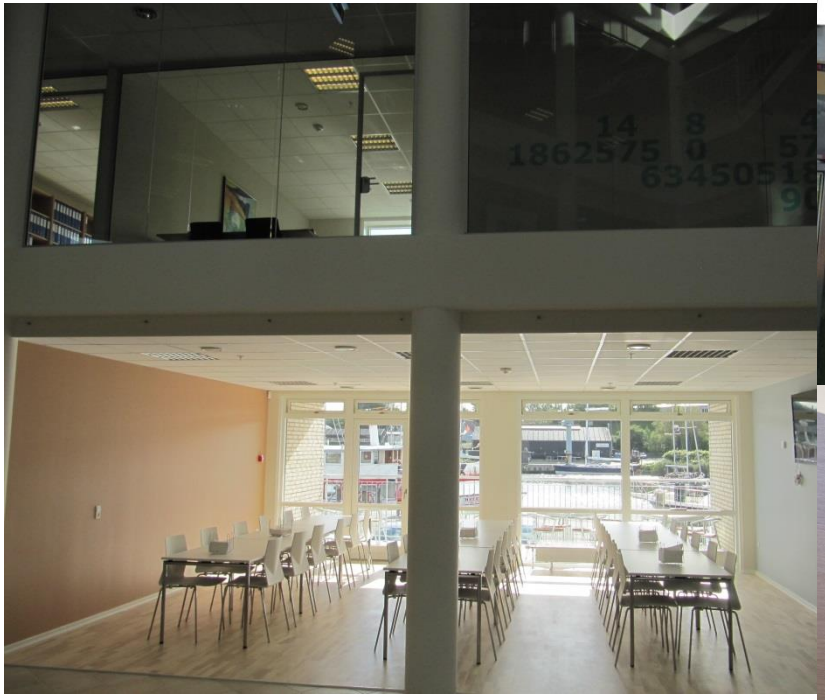
3. Examples of WM system applications

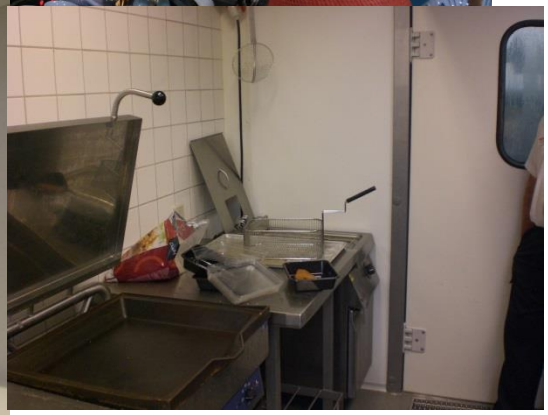
CEN TS 14972:2010 :

Nozzle type	Appendiks A	Appendiks B
Applications	A1: Combustion Engines, processes involving flammable A2: horizontal (max. 10°) cable tunnels. A3: office and school. A4: Commercial fat fryers	Application as tested to.
Risk class	NA.	
Dimension limitations	The tested parametres except A1 where there is a limit volume size of 100m3	The tested parametres
Application limitations	All what found in the full scale fire tests	

3. Examples of WM system applications

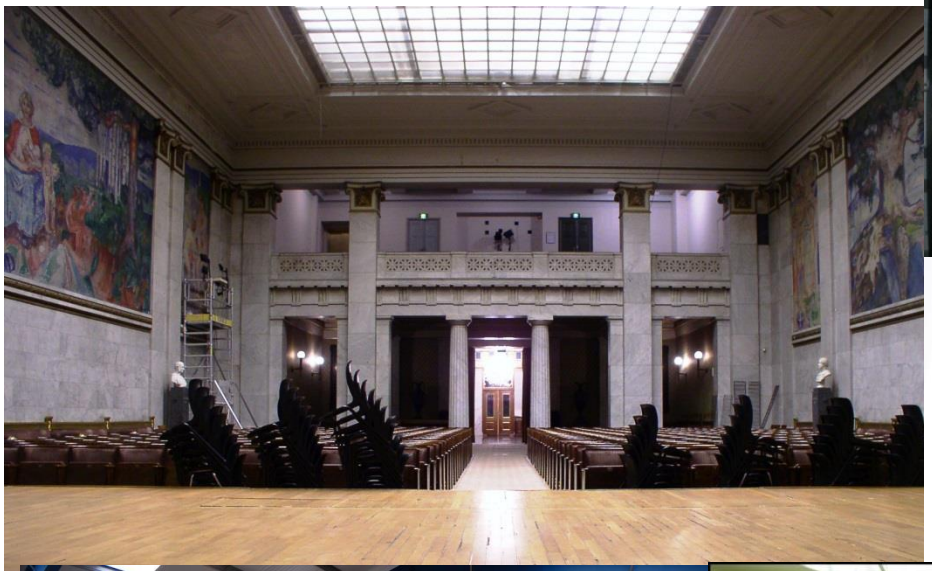
CEN TS 14972:2010 - annex A:

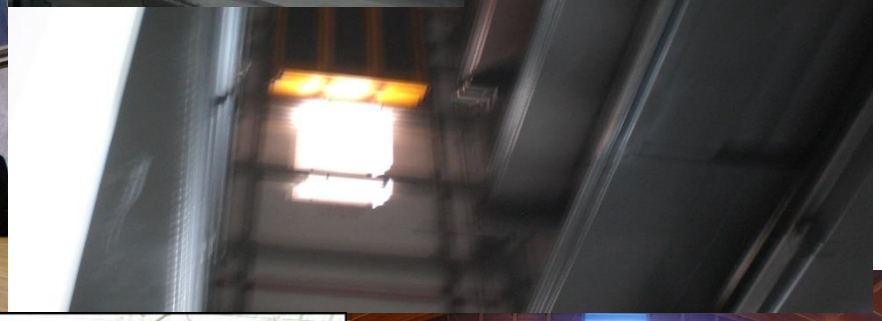




3. Examples of WM system applications

CEN TS 14972:2010 – annex B:

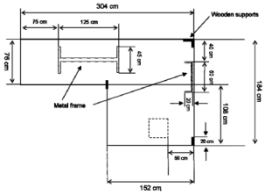




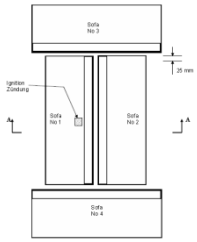
3. Examples of WM system applications

VDS:

OH1 Office



OH1 Hotels



OH1 False ceilings

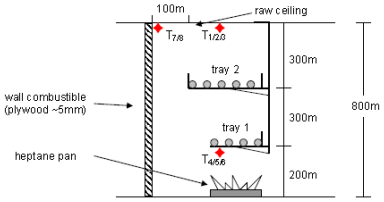
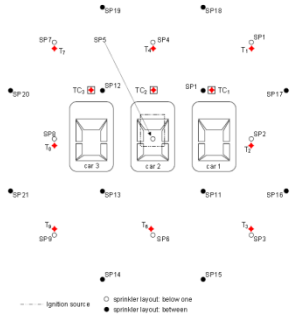


Figure 5.1 – Assembly of fire loads and position of ignition source

OH2 Car garages



OH3Inventories

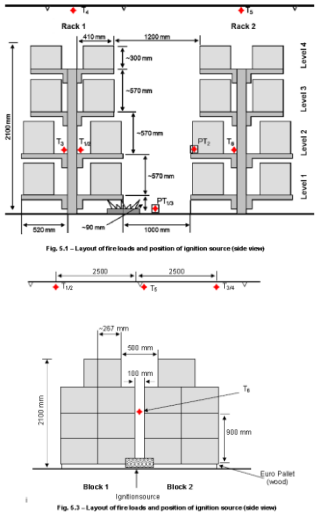


Fig. 5.1 – Layout of fire loads and position of ignition source (side view)

Fig. 5.3 – Layout of fire loads and position of ignition source (side view)

Specific limitations:

- Height: 0,3-0,8m
- Cable area size < 40% of false ceiling area
- Fireload < 12,6MJ/m2

General limitations:

-Height < As tested

-Area < As tested

-

Because of comparison with sprinklers.

5mm/min, 8mm/min, 5mm/min, 6,5mm/min, 8mm/min

VdS have also made test standards for

- *Paint booths*
- *Escalators*
- *Press boards*
- *Machine rooms*

3. Examples of WM system applications

VDS del 1:

Nozzle tested to:	VDS Office	VDS Hotel	VDS false ceiling
Applications without limitations	Offices, banks, meeting rooms, schools, universities, churches, prisons and reformatories, restaurants as well as similar OH1-risks. stations and counter areas (sales areas, shop sections, storages etc. are not included)	Hotels, hospitals, special care homes, nursing homes and -apartments for the elderly	Same as for VDS Office og VDS Hotel, but also for: Train stations and service halls (without sales areas, shop passages, warehouses etc.)
Applications with limitations **Area >51m2** **Fire resistance=F30 ,T30** **Other: no local protection design.**	Store rooms (no storage of flammable liquids, gases etc., synthetics to a limited extent) computer rooms, technics rooms, libraries, file rooms, archives and similar		The following limitations apply to the protection of false floors and ceilings: - ceiling non-combustible (raw ceiling) - no fire load above nozzles, distance in accordance with test - false ceiling incl. support non-combustible - no obstruction to spray (cold test possible) - no ventilation or air movement in false ceiling area - applies to false floors and ceilings of 300 mm – 800 mm height with cable trays (in case of other fire loads to be agreed with VdS) - does not apply to EDP false floors with density >40% of footprint
Dimension limitations	Found in full scale tests	Found in full scale tests	Installations height : 0,3-0,8m
Other limitations	(kitchen areas only if it is verified by additional spray tests that the water cannot hit the oil and sufficient protection is granted),		cables with a layout density < 40% of the base area and a fire load > 12,6 MJ/m².

3. Examples of WM system applications

VDS del 2:

Dyser testet til:	VDS Garage	VDS shopping & inventory
Applikationer Uden begrænsning	OH2 non-automatic, fully enclosed garages and underground garages.	Protection of OH-3 sales, storage and technology areas
Dimensions/installations begrænsninger	Findes ved tests.	Findes ved tests.
Andre begrænsninger	May not be used in other OH2 risks or higher room heights than tested.	Shall be enclosed by OH-1 areas. The area in question shall be enclosed by enclosure surfaces made of non-combustible materials (no fire protection classification). Outside of the solid walls a row of sprinklers shall be installed which have the same parameterisation / design as those inside the area. The additional sprinkler row outside the area will not be required, if the walls are fire-resistant (F 90), exterior walls of the building, or contain other protected areas than those specified above.

Desuden

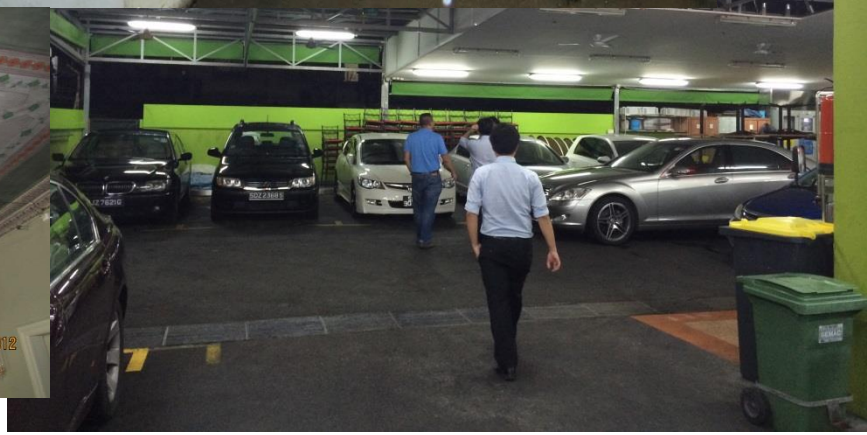
Restrictions and limitations:

- Sale of furniture with foamed plastics alone is not allowed
- A special proof is necessary for extensive open areas (e.g. malls)
- No computer rooms / IT rooms
- No storage of flammable liquids, gases etc.
- Room protection only (no content or local application protection)
- Permitted storage height depends on type of storage: Cat. I = 3,00 m, Cat. II = 2,60 m, Cat. III = 1,70 m and Cat. IV = 1,20 m
- Chaotic storage of materials with exposed plastic surfaces amounting to > 25% without cardboard is permitted up to 5% of the total storage or capacity

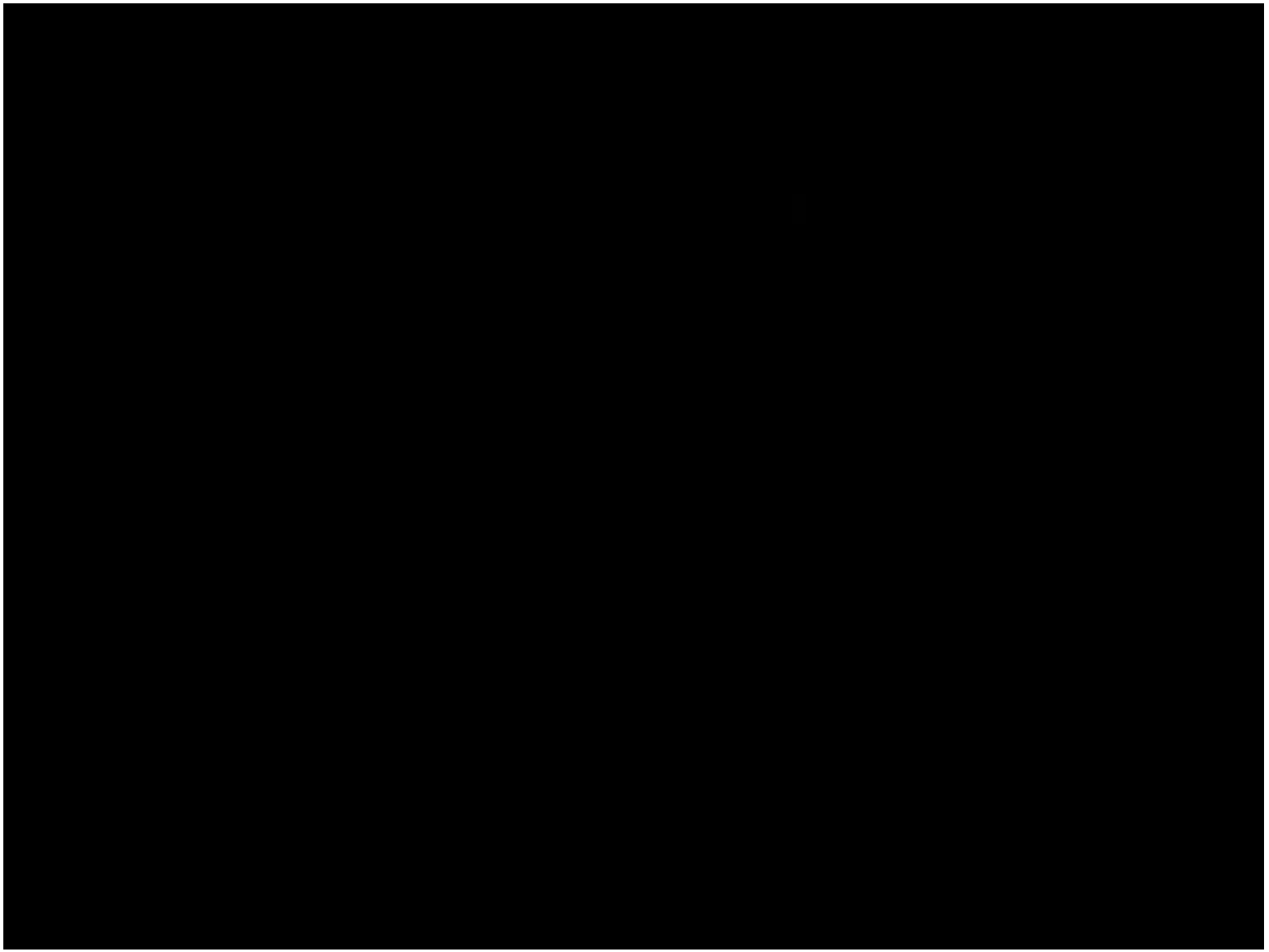
Storage types ST1 - ST4:
Maximum dimensions of areas: 120 m² (design of area of operation for these areas: area size plus 50%, however 180 m² max.)

3. Examples of WM system applications

VDS:



3. Examples of WM system applications



Thank you for your attention.

For more information about VID Fire-Kill solutions please contact our Middle East Official Distributor

WARNER SAFETY

AL Qusais Ind Area 2 , Near AIT ,
Dubai # GF N 25* 16.588 E055* 23.390 ,
1 street 21 junction
11 street & D64 (NE) 32804
United Arab Emirates
Tel : + 971 4 2584443
Fax : +971 4 2677817