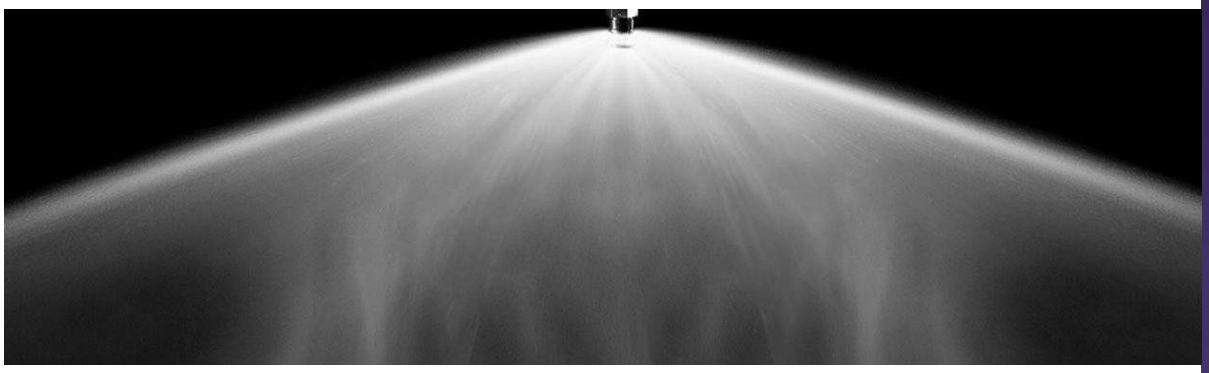
IWMA
International Water Mist Association

WATER MIST GUIDE



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1 Purpose and scope of this document

The purpose of this document is to set out key facts about water mist as a firefighting technology. The document will define water mist and provide a brief history, discuss classifications and how water mist works, and how water mist is used for different types of applications based on large-scale fire testing. It will also cover design, installation, operation and maintenance standards.

The purpose of this document is not to replicate information that exists in standards but to explain the context in which they have been drafted, their objectives and limitations.

It is meant to be a useful document for those who specify and design automatic fire suppression systems, those who have a role in approving these, or who simply want to learn more.

2 Water mist technology

2.1 Introduction

Water mist technology is considered a mature fire suppression technology as it has entered the third decade of installation both in marine and in land-based applications. Initiated more than 30 years ago to support the Halon replacement on board ships, the technology grew very rapidly, achieving almost 100% of the marine fire protection market on board passenger ships, protecting all the hazards from the machinery spaces to the accommodation and public spaces. In the beginning of this millennium, many water mist fire test protocols were published for a range of different land-based applications, published by international organizations including FM (Factory Mutual) Approvals, UL (Underwriters Laboratories), VdS, LPCB (Loss Prevention Certification Board) and others.

In December 2020, the European water mist standard EN 14972-1 Design, Installation, Inspection and Maintenance was published. The standard is applicable for a wide variety of residential-, commercial- and industrial applications.

2.1.1 Key principles and comparison to sprinklers

Water mist systems are very similar to sprinkler systems in that a required amount of clean water is supplied through distribution pipework with a minimum pressure, to the heads/nozzles in a defined area. Required water flows and pressure to the water mist nozzles are based on successful large-scale fire testing results.

Sprinkler standards refer to data sheets from the sprinkler manufacturer, which describe what type of areas the sprinkler heads are tested to – what heights, how much pressure and amount of water is required for different spacing between the heads, to meet the water density requirement stipulated in the standard.

The water mist standard refers to the water mist manufacturer's Design, Installation, Operation and Maintenance (DIOM) manual. It describes which fire test protocol the system has been tested to and passed, with a fire test report from the accredited fire laboratory. The fire test report confirms the nozzle water flows and pressure, spacing between nozzles, areas and ceiling heights the system passed the fire tests with.

As for sprinklers, the water mist standard defines the requirements for the minimum area of operation and duration for the water mist system based on the application it is protecting.

The method is not very different, except that sprinklers define requirements for water density in the standard, while water mist defines requirements for water density based on successful large-scale fire tests.

2.1.2 Optimization and efficiency

A water mist manufacturer can optimize spray-pattern, pressure and water flows for the type of areas and volumes to be protected. The obvious advantage is that required water flows are typically significantly less than for sprinkler systems. Less water means smaller pipe dimensions, faster and more flexible installations, and shorter stoppage time in case of system operation. Also, smaller tanks and pumps, where that is required.

For some applications water mist is an alternative to gas extinguishing systems, especially in conjunction with flammable liquid class B fires in enclosed spaces. The advantage of using clean water applies to these systems as well, with effective cooling, preventing re-ignition and increased safety for life and property. The same requirements apply for these systems.

Complying with the standards requires large-scale fire testing to document efficient fire suppression performance, and the systems are designed and installed based on the fire test results, which will be described in the manufacturers DIOM manual. In addition, the standard requires component testing, to document and ensure reliability of all critical components in the water mist system.

2.2 Definition of water mist

Definitions vary slightly between standards in terms of the method of measurement but essentially: A water spray for which the cumulative volumetric distribution of water droplets is less than 1000 µm (1mm) within the nozzle operating pressure range.

2.3 Definition of a water mist system

An automatic fire suppression distribution system connected to a water supply, that discharges atomised media where required, that is fitted with one or more nozzles capable of delivering water mist intended to control, suppress or extinguish fire.

2.4 Environmental impact of water mist

A 2022 study on the impact of choosing water mist systems for a Norwegian hospital construction, showed a 71% reduction in greenhouse gas emissions from just the materials compared to traditional sprinklers, the reduction largely due to pipe dimensions.

The construction and building sector accounts for approximately 40% of global energy and process-related emissions, and recent reports show that the automatic suppression system accounts for a major portion of a building project's emissions. The choice of fire suppression systems becomes crucial to reach stated emission reduction goals of 50% by 2030.

Availability of sufficient firefighting water, and contaminated water run-off, are increasingly becoming a concern when fighting fires. The advantage of water mist using significantly less water than traditional water-based suppression systems aid in mitigating these issues.

2.5 How water mist works?

For a fire to spread, it relies on the presence of the three elements of the fire triangle, oxygen, heat and combustible material. The removal of any one of these elements can suppress or extinguish a fire.

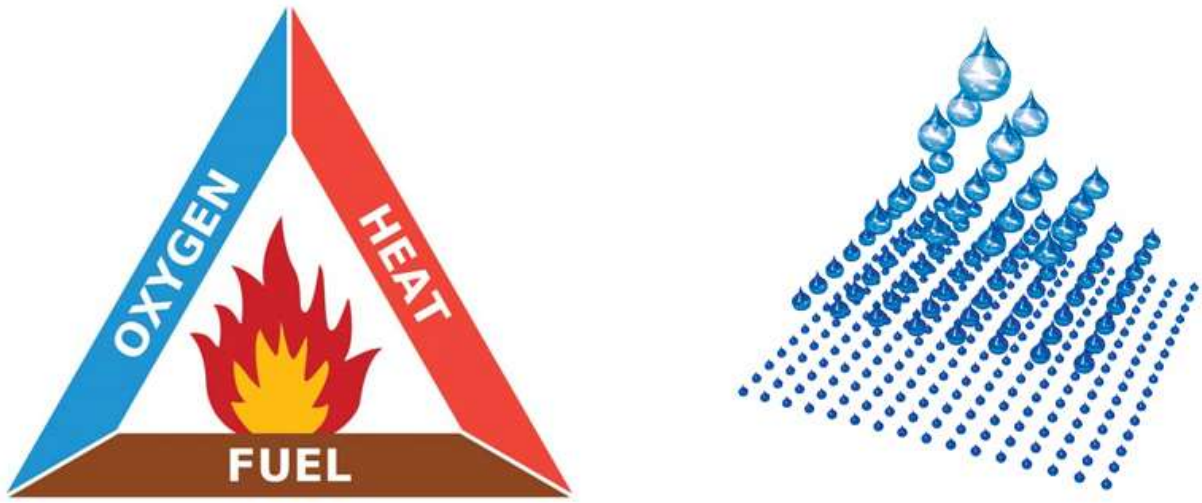


Figure 1. The fire triangle and water droplet size in relation to surface area

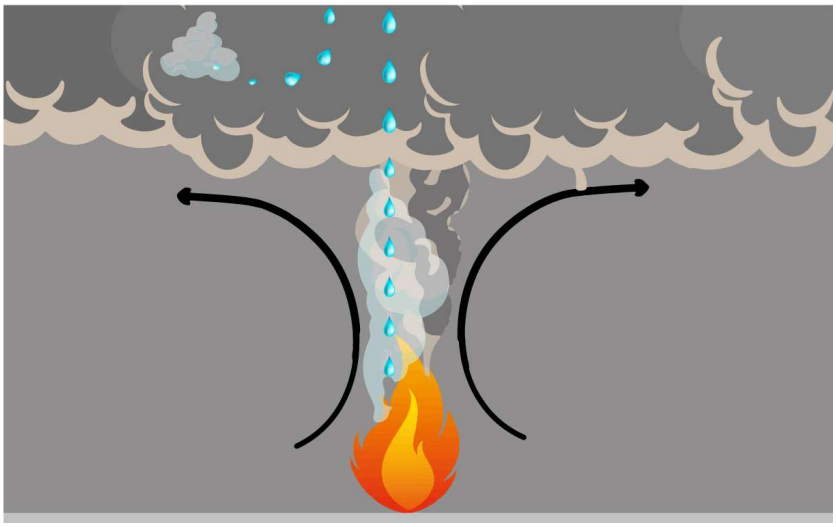
Water mist removes heat and displaces oxygen within the triangle. It achieves this by dispersing water through specially designed nozzles at low, medium or high pressure. Generally, as system pressure increases, the water droplet size decreases.

Note! It takes 335kJ to heat 1 litre of water from 20°C to 100°C and 2257kJ to convert 1 litre of water to steam. Water expands 1700 times upon vaporisation, so the high energy-absorption capability of small water droplets produces the rapid cooling and oxygen dilution characteristics that are unique to water mist.

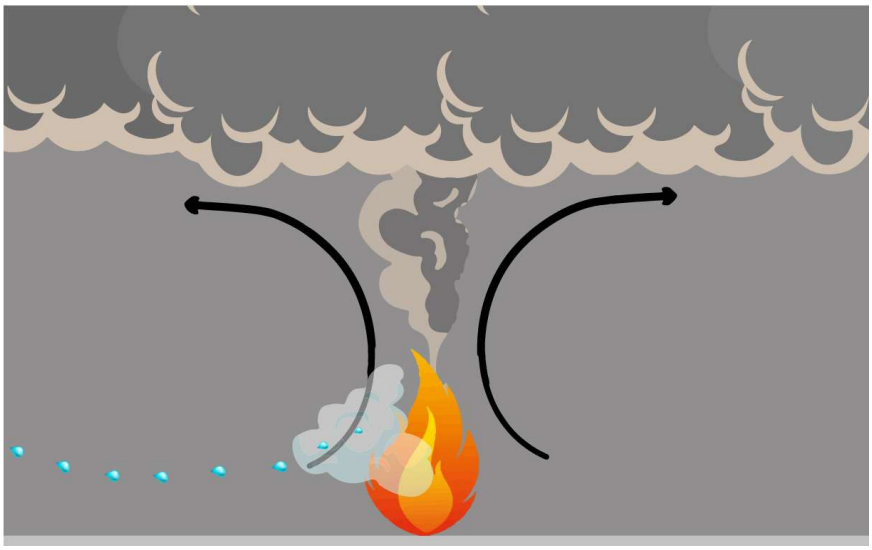
Water mist is effective at suppression by cooling and suffocating and not primarily by wetting (wetting is a secondary mechanism), which is the case with large droplet systems such as sprinklers. Although, the droplets that are not converted to steam will wet down the surrounding area. Water mist also acts as a barrier to the radiant heat from the fire.

Water mist systems are designed so that this can take place in several ways, non-exclusive examples as follows:

a) High speed directional nozzles at the fire load from the top and/or sides to generate enough momentum to overcome the upward draught, to address the risk locally.



b) Nozzles placed closer to the base of the fire so that water mist is dragged to the flame front. Water mist therefore leverages the Archimedes Principle where the hot, less dense air is rising, and the cooler air is being drawn into the fire's base.



c) Deploying the mist in an enclosed compartment so that water mist entrains the fire gases, expands and suffocates the fire

2.6 Fire classifications

Different water mist systems have been developed to suppress, control or extinguish fires involving the most varied types of fuels (excluding fires involving metals). The table below shows the flexibility of water mist fire types when compared to other forms of suppression/extinguishment. The application to electrical fires is typically safe from the hazard of electrocution but caution is required with high voltages where the current leakage increases, and air gap drops with the presence of water droplets and additives in the air gap.

Which extinguisher for which fire?	A	B	C	D		F
	Wood, paper, textiles and other carbonaceous materials.	Flammable Liquids, petrols & spirits	Flammable Gases (Propane, butane)	Fires involving burning metals	Fires caused by an electrical fault where electric current may be present.	Cooking oils and fats. For example oilive oil, or lard
Water Mist	✓	✓	✓	✗	✓	✓

Figure 2. Safe uses of different fire suppression media

2.7 Fire protection objectives

Water mist technology is used to meet different objectives as required by the application. These are the following:

2.7.1 Fire control

Reduction of radiated heat to persons or surfaces which may be impact by proximity to a fire.

2.7.2 Fire suppression

The sharp reduction of the rate of heat release of a fire and the prevention of re-growth.

2.7.3 Fire extinguishment

The complete suppression of a fire until there are no burning combustibles.

2.7.4 Fire containment

Precautions, which contain the fire to the smallest area and control the threat to life safety and the extent of the property damage.

2.7.5 Temperature control

The limitation of peak temperature achieved in an enclosure or structure for integrity purposes.

3 Water mist systems classifications

Water mist systems are proprietary designs customized to the application, resulting in a variety of nozzles, positions and activation methods. The list of classifications below is a non-exclusive list of applications

3.1 Types of application

3.1.1 Area protection

An area protection system is designed to control and suppress fires involving nozzles operating within the area. This may be done with automatic nozzles where the heat of the fire actuates individual nozzles to facilitate water discharge only in the vicinity of the fire. In higher hazard or sensitivity environments, the nozzles may be zoned to allow for the quick or more strictly controlled discharge of one or multiple nozzles at once. Typical applications include commercial and residential protection.

3.1.2 Local application

A local application (or object protection) system is used to protect stand-alone equipment only, such as diesel engine generator sets, transformers and deep fat fryers, by discharging water mist directly onto the fire risk. Their use is advantageous when a specific risk is higher than the risk in the surrounding space.

Local application solutions typically use open nozzles activated by a separate fire detection system.

3.1.3 Volume protection / total flooding

Volume protection or total flooding systems are used to discharge water mist into a specific volume, compartment or room to protect all hazards in an enclosure. Typical applications are machinery spaces.

3.1.4 Zoned application protection

Zoned application systems are designed to protect multiple hazards in a predetermined portion of an area.

3.2 Operating pressure

Operating pressure vary slightly from region to region.

In Europe, it is commonly referred to as low pressure (up to 16 bar) and high pressure (exceeding 16 bar).

NFPA 750 classifies pressures as follows:

- Low-pressure systems operate up to 12 bar or less.
- Medium-pressure systems operate between 12 and below 35 bar.
- High-pressure systems are those operating at 35 bar and above.

Within this document, we refer to the operating pressures commonly used in Europe.

3.2.1 Low-pressure water mist systems

Low-pressure nozzles resemble sprinklers in that they operate with pressures up to 16 bar but utilise different principles to generate the small droplets of water mist. The primary method of suppression is suffocation and cooling of the fire. The droplets that are not converted to steam will wet the surrounding area and prevent the fire from spreading.

Figure 3. Examples of low-pressure water mist nozzles

A range of open and automatic 'heat sensitive' low-pressure water mist nozzles is illustrated above. These have operating pressures of between 2 and 16 bar.

3.2.2 Medium-pressure water mist systems

Typically, in Europe only low- and high-pressure water mist systems are differentiated.

3.2.3 High-pressure water mist systems

High-pressure nozzles operate with pressures above 16 bar and usually up to 200 bar and generate the smallest droplets of water mist. A range of open and automatic 'heat sensitive' high-pressure water mist nozzles is illustrated below.

Figure 4. High-pressure, open and automatic water mist nozzles

3.2.4 Water mist pipework and fittings as related to operating pressure

The material used for the pipework and fittings of a water mist system should be governed by suitability for the application. This is typically affected by properties such as: resistance to heat, suitability for operating pressure and flow requirements, ease of use, material cost, chemical stability and compatibility, and durability, to name a few. All water mist systems require the use of non-corrosive materials. or Low-pressure system pipes and fittings typically utilize stainless steel or a plastic variety approved for use in automatic fire suppressions systems, such as CPVC, PP or Pex-A. High-pressure systems normally utilise stainless steel pipework, hoses and fittings.

Figure 5. Examples of high-pressure water mist piping and fittings and of low-pressure water mist pipes and fittings.

3.3 Types of nozzles

3.3.1 Automatic nozzles

An automatic nozzle has an integrated heat-sensitive bulb which is designed to break when the surrounding air reaches a pre-determined temperature. As the bulb bursts, it allows a valve to open, and water pressure releases the mist droplets. The bulb's activation temperature should be based on the highest expected ambient temperature in the application, plus safety margin. Automatic nozzles are typically placed near the ceiling, at the highest point in the protected area, as they need to be exposed to the rising hot smoke layer.

Only the nozzles exposed to hot air will activate, meaning not all nozzles in a compartment will necessarily discharge—only those near the fire. However, an assumed number of nozzles must be expected to activate based on the occupancy, risk, and size of the protected area. This is known as the area of nozzle operation, a key performance requirement specified in standards to ensure that the system provides adequate water flow and pressure for the likely number of activated nozzles, including safety margins.

3.3.2 Open nozzles

Open nozzles are those without an integrated heat-sensitive bulb or valve that opens. When water is released into the pipe network, it will discharge from all connected nozzles (unless specific sections are zoned by valves). Since there is no heat-sensitive bulb, the system is activated either by a detection system or manually. Open nozzles are typically used in volume protection and local applications where multiple nozzles are directed at a specific fire risk.

3.3.3 Electronically Operated Automatic Nozzles

An electronic nozzle releases water automatically using electronic controls. This electronic control ensures that a predetermined number of nozzles operate, maintaining consistent activation for the defined area of nozzle operation. Unlike automatic nozzles, which rely on a heat-sensitive bulb, electronically operated automatic nozzles can be triggered by smoke, heat, or flame detectors.

3.4 Water supply methods

Water mist can be delivered either through a pre-pressurised system (stored water and propellant gas in cylinders) or a flow-generating device (a pump) through the system's distribution pipework to the discharge nozzles using either a single or twin fluid delivery system.

3.4.1 Single fluid pumped

A single fluid system generates water mist by delivering water through the nozzle under pressure from either a low- or high-pressure pump system.

3.4.2 Single fluid pressurized

A single fluid system generates water mist by delivering water through the nozzle under pressure from pressurised gas cylinders. The propellant gas does not mix with the water being pressurised; it is only used for flow generating purposes.

3.4.3 Twin fluid

A twin fluid system generates water mist by mixing an inert gas or air to the water supply pipework or directly at the nozzle.

3.5 System operation type

3.5.1 Wet pipe systems (Automatic nozzles)

Water mist system using automatic or automatic/pneumatic nozzles attached to a piping system containing water and connected to a water supply so that water discharges immediately from nozzles operated by the heat from a fire.

Wet pipe systems are the most common water-based suppression configuration and are typically used to protect areas where temperatures are above 4oC or are unlikely to fall below freezing point.

3.5.2 Dry pipe systems (Automatic nozzles)

This water mist system uses automatic nozzles fitted into distribution pipework that are permanently pressurised with air, nitrogen or other inert gas. In the event of a fire, when a nozzle operates, the pressure drop within the distribution pipework activates the system's control valve to release water into the pipework where it is discharged through the nozzle.

These systems are typically used in the same applications as wet pipe systems where the key constraint is the need to avoid freezing of water in the pipes. There is naturally a delay in flow of water because of the time it takes to fill the distribution pipework with water, which increases with the size of the area being protected.

3.5.3 Deluge systems (Open nozzles)

A deluge system is designed to supply water to several open nozzles simultaneously in the event of a fire. This is achieved when a separate fire detection system is actuated. This in turn operates the main control unit to release the water through all the open water mist nozzles to effect rapid control and/or extinguishment of the fire. Fire detection systems can be electrical, electronic or pneumatic.

Because the nozzles are open, the water distribution system is kept dry and unpressurised (no leaks, freezing risk) but as a result there is also a delay while the water is being driven through the distribution pipework to the nozzles.

A deluge system can also be designed with zoned sections, where only the nozzles in the affected zone activate upon fire detection. This configuration allows multiple areas to be protected while ensuring that water discharge is limited to the specific zone where the fire is detected.

3.5.4 Pre-action systems (Automatic nozzles)

A pre-action system uses automatic water mist nozzles in conjunction with an independent detection system installed in the same area as the automatic nozzles. On signal from the detection system the control panel automatically opens the control valves, allowing water to flow into the distribution pipework in readiness for the automatic water mist nozzle to operate due to the breakage of the heat-sensitive bulb (single interlock system).

These systems provide prior warning of system discharge and prevent system discharge caused by accidental damage to a water mist nozzle's heat-sensitive bulb or system pipework.

3.5.5 Electronically Operated Automatic System

Electronically operated automatic systems consist of a nozzle which incorporates a valve which is commanded by a controller to discharge the water. This allows for one or more nozzles to operate.

3.6 System design type

3.6.1 Engineered systems

Engineered systems are the most used system design type for water mist systems. These systems are custom designed for each project, requiring precise specifications for nozzle spacing, pipe diameters, and pump capacity. This ensures that the water supply provides sufficient flow and pressure through the pipework to the water mist nozzles installed throughout the application.

Hydraulic calculations are essential to verify that the system will perform as intended. These calculations consider factors such as nozzle types, water flow and pressure, operation areas and objects, and the specific hazards being protected.

3.6.2 Pre-engineered systems

Pre-engineered systems have pre-determined flow rates, nozzle pressures, and water quantities. They are designed to protect a specific piece of equipment, such as a commercial kitchen, turbine or engine, where the area of coverage is consistent.

4 Using water mist system

In many applications, equivalency has been demonstrated with sprinkler systems, deluge systems and gas suppression systems.

In water mist industry the term “equivalency” is usually used in comparing the firefighting performance of a water mist system to that of a sprinkler system as evaluated in full scale fire tests. The acceptance criteria of many of the fire test protocols are directly or indirectly based on reference testing with sprinklers, and the requirement is that the water mist system must be at least equivalent with respect to fire damage and temperature control.

It is not possible nor reasonable to have a dedicated fire test protocol for every possible application or occupancy. The applicability of each fire test protocol could also be extended on a case-by-case evaluation to fire hazards or occupancies that provide an equal challenge from firefighting point of view.

Water mist systems are performance-based systems fire tested at an accredited fire laboratory according to a fire test protocol which defines the area, volume and fire-load the protocol is applicable for, and its limitations.

Considerations and possible limitations, which are addressed within the protocols and standards, could be the following:

- Ventilation conditions
- Obstructions

For land-based applications individual fire test protocols can be found as parts of the EN 14972 series and form the basis for the development of the DIOM manuals.

For marine applications, the International Marine Organization (IMO) standards apply.

In addition to the required performance-based fire tests, all critical components shall be tested to a component test protocol. The EN 17450 series cover the critical water mist components and is based on existing component approval protocols.

The manufacturer is responsible for training the designer and installer of the system using the DIOM manual. The manufacturer authorizes the trained individuals to assure competence for the design and installation of the specific product or system. The manufacturer provides training certificates for the respective roles (i.e. design, installation, inspection, maintenance etc.) in which the individual has completed the training.

The IWMA Matrix lists all relevant land-based and marine fire test protocols.

4.1 Applications

4.1.1 Industrial applications

Water mist technology is widely used for the protection of various industrial applications.

Fire protection of machinery spaces has been a main application for marine water mist systems and was transferred to land-based applications in the 1990’s.

Today, generators, turbines, transformers and other equipment incorporating a flammable liquids (Class B) fire risk are protected by water mist systems based on well-established fire test protocols within the EN 14972 standard series (EN 14972-8, EN 14972-9, EN 14972-14, EN 14972-15). Systems are designed as volume protection systems as well as local protection systems. Systems tested and certified according to the aforementioned fire test protocols are designed as fire extinguishing systems utilizing open nozzles.

Water mist systems are also suitable to protect Class F fires in industrial deep fat fryers where fires are extinguished and re-ignitions are prevented by cooling of the oil and the surrounding metalwork. The fire test protocol EN 14972-16 covers this risk.

Cable tunnels are a vital part of power and communication networks in modern societies. Water mist technology has been identified as an effective fire protection system for this application, thus the fire test protocol EN 14972-11 covers this risk.

4.1.2 Applications in buildings

Whether a building is classified as residential or commercial should be defined in the fire strategy.

The protection goal for the installation for water mist in commercial and residential properties can vary significantly. The intent may be for life safety (allow for safe evacuation from the property on fire) or asset protection, which is the primary driver for commercial or industrial applications. More and more countries require automatic suppression systems for protection of residential occupancies. Effective fire suppression with less water requirements and smaller pipework, makes water mist an attractive solution for these buildings.

4.1.3 Commercial buildings

Water mist systems are capable to protect all areas within commercial buildings. Today for all areas in such buildings, test protocols exist; meaning protection concepts for such buildings can be applied. The protection of an entire commercial building often is a combination of the below mentioned fire test protocols.

Many building types fall under the term of commercial buildings such as high-rise buildings, hospitals, hotels, museums, libraries, archives, education facilities, heritage buildings, office buildings, data centers, retail areas and similar buildings.

All these buildings have different types of fire hazards depending on their use. Several different fire test protocols may need to be applied to prove the compliance of a water mist system for the full building protection coverage. (EN 14972-2, EN 14972-3, EN 14972-4, EN 14972-5, EN 14972-6, EN 14972-7, EN 14972-10). Systems are designed as area protection. Systems that have been tested and have successfully passed the aforementioned fire test protocols are designed as fire control and suppression systems utilizing automatic nozzles.

4.1.4 Residential buildings

Water mist systems have been identified as effective to protect domestic and residential buildings. Domestic buildings are one or two-family dwelling houses, terraced-houses, prefabricated houses, bed and breakfast accommodations and maisonettes.

Residential buildings include apartment buildings (low rise or high rise), care homes, child or adult care centres and student accommodation. Residential areas within commercial properties may be protected with residential fire tests subject to authority having jurisdiction (AHJ) approval.

The fire test protocol EN 14972-17 is specifically developed to protect these occupancies with building heights up to 45m. The test protocol distinguishes between domestic and residential. Systems are designed as fire control and suppression systems utilizing automatic nozzles.

The commercial test protocols EN 14972-3, EN 14972-4 and EN 14972-7 are also applicable test protocols to protect residential occupancies. These protocols have no building height limit and require a larger assumed maximum area of operation for design purposes.

4.1.5 Marine applications

The International Maritime Organization (IMO) is the body responsible for the development of guidelines that contain fire test protocols intended to ensure that water mist systems provide protection equivalent to carbon dioxide systems and conventional sprinkler and water spray systems to protect machinery spaces and accommodation areas on ships.

The IMO A800 as amended in MSC. 265 includes fire test protocols equivalent to sprinkler systems for cabins, corridors, accommodation and public spaces, shopping and storage areas on board of ships. Systems are designed as fire control and suppression systems utilizing automatic nozzles.

The IMO MSC/Circ. 1165 includes fire test protocols for total flooding in machinery spaces and addresses multiple types of liquid fuel fires and Class A fires in machinery compartments.

The IMO MSC/Circ. 1387 includes fire test protocols for local application systems in machinery spaces and is intended to provide additional, localized fire suppression in areas where there is a possibility of flammable or combustible liquids contacting heated surfaces.

Systems tested and approved according to the aforementioned two fire test protocols are designed as fire extinguishing systems utilizing open nozzles.

For Ro-Ro spaces and special category spaces the IMO MSC/Circ. 1430 describes fire test protocols for both prescriptive and performance-based requirements for water mist control and suppression systems used to protect spaces containing motor vehicles, trailers or other similar units.

Systems tested and approved according to the aforementioned fire test protocol are designed utilizing open nozzles.

4.2 Design, installation, operation and maintenance (DIOM) manual

The DIOM manual is a key document provided by the manufacturer of the water mist system, containing essential information about the system. The content of the manual will vary depending on the application and manufacturer. It is used by specifiers, approvers, and other stakeholders to understand how the system works, how it should be designed, installed, and maintained. For this reason, the DIOM manual should be made publicly available or accessible to these stakeholders upon request.

The DIOM manual outlines the applications the system has been tested and validated for, and the system limitations. It typically refers to the respective standard to which the system is applicable for.

EN 14972-1:2020 specifies the critical information that must be included in the DIOM manual, such as:

- General information regarding the type of system
- Fire protection objective
- Limits of application
- Description of components and the standards to which they are designed
- Testing of the specific system(s) and details of the protocols against which they have been tested and the results of such tests
- Approvals and certifications gained in respect of systems and components
- Planning, design and any specific qualifications or approvals needed by the designer
- Nozzle maximum and minimum spacings, height, working and standby pressure
- Minimum design area of nozzle operation, minimum number of nozzles in design area
- Discharge duration per application

- Water supply and quality requirements
- Installation process
- Testing and commissioning
- Inspection and maintenance
- Interaction with other fire systems (detection, alarm, smoke control)

RISE protection process as illustrated can be effectively applied to the selection of water mist systems. This structured approach involves:

1. Defining the protection risks to understand the specific hazards and fire scenarios to be mitigated.
2. Investigating the system suitability to ensure the selected water mist system matches the identified risks and environmental conditions.
3. Providing evidence of capabilities by validating the system's performance through testing, certifications, and real-world references.

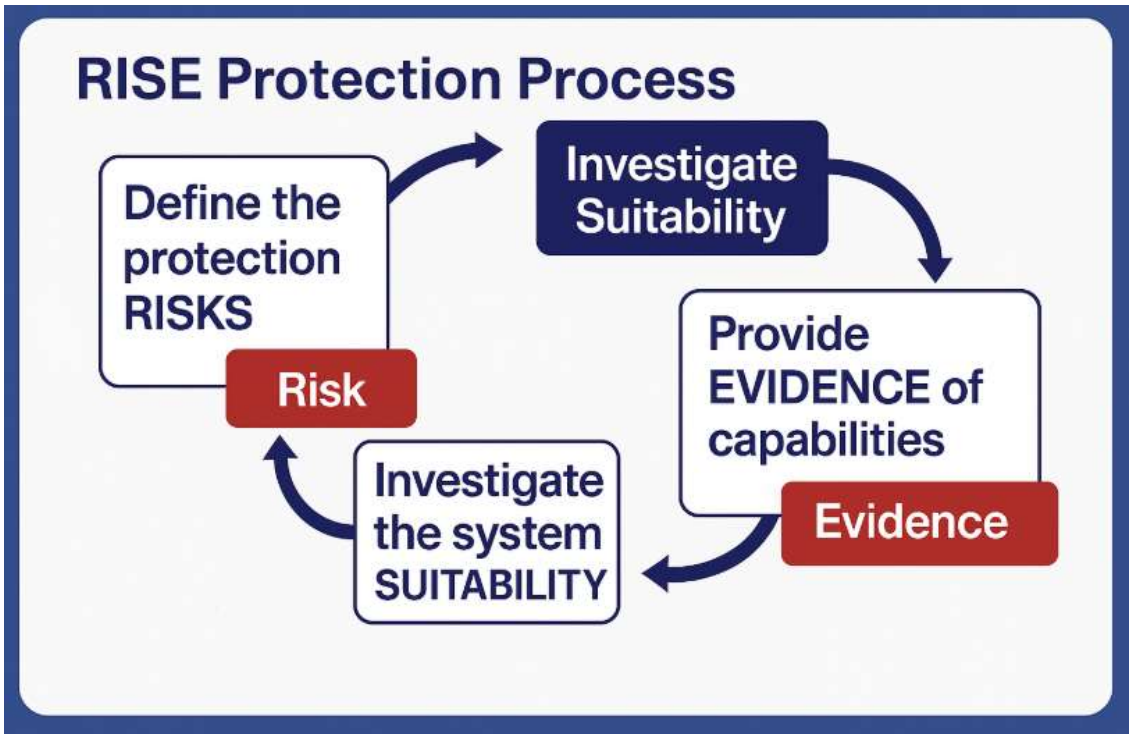


Figure 6. RISE protection process

4.3 Approvals and certification

Water mist system standards require both application related performance based fire testing as well as testing of all critical system components. This is to ensure both effectiveness and reliability and shall be clearly described in the DIOM manual for the system.

Approval is achieved by third-party testing and verification of the performance and construction of the overall system or system components. Although certification is not required by national building codes or standards, it offers many benefits. This is because certification is the assessment by a competent

body that gives a much higher credibility to a product or service compared to one that does not have it. Robust certification also performs important functions such as demonstrating the efficacy of the design, configuration and system components.

4.4 Water mist system selection

Consultation with the relevant stakeholders should take place before any fire protection system is specified. The following should precede its specification.

1. Need has been identified and objective defined including special considerations
2. Identify appropriate design and installation standard and the applicable fire test protocols
3. Selecting the appropriate system for the hazard

Examples of stakeholders could be the following:

- The building control authority or approved inspector
- The fire authority
- The insurer(s) of the premises and premises' contents
- The owners, shipping companies and property managers
- Classification bodies (marine systems)

Once a water mist system has been selected, three conditions need to be satisfied for a water mist system to perform as intended:

a) the system chosen must be suitable for the fire load (the application) it is being proposed

b) the system must be designed, installed and commissioned correctly according to the DIOM manual

c) the system must be maintained so that it is ready to operate

4.5 Design, installation and commissioning

All persons who design, install, commission, inspect, test, maintain and operate water mist systems shall be trained by the system manufacturer and kept adequately trained in the functions they are expected to perform. Personnel working in an enclosure protected by water mist shall receive training in the operation and use of the system and regarding safety issues. The DIOM manual shall be available to all relevant stakeholders.

The design, installation and commissioning procedures are designed to replicate, in the field, the system performance that has been designed by the manufacturer and tested by a third-party approver.

Pressure test certificates shall be provided.

After the system has been commissioned by authorized personnel, the installer shall hand over to the user of the system a final certificate stating that the system meets all requirements of the current standard and indicate any possible deviations from the standard.

4.6 Availability and maintenance

Correct installation of a suppression system is only the start of its life in service. For it to be effective at suppression, it needs to be "available" during its lifetime. This results in the need for maintenance to verify that environmental or occupancy parameters have not changed significantly over time as well as to verify that none of the system's components have been tampered with or damaged.

A user's operating and maintenance manual should include detailed maintenance instructions covering all the individual weekly, monthly, quarterly and annual test procedures for all the mechanical and electrical components that make up the overall water mist system.

Many systems today also use remote monitoring to detect faults early, instead of waiting for the next scheduled inspection. This makes maintenance more efficient and helps reduce the time the system is out of service.

A complete list of components and their maintenance requirements is provided in the manufacturer's Design, Installation, Operation, and Maintenance (DIOM) manual, which accounts for relevant spare components, standards and certifications applicable to the system.