MSC Guidelines for Watermist Fire Suppression Systems

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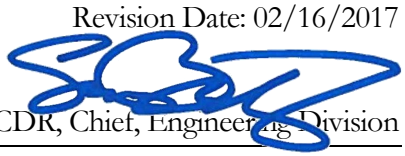

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References:

a. National Fire Protection Association (NFPA) 750, 1996 Edition, "Standard on Water Mist Fire Protection Systems"

b. SOLAS, Consolidated Edition 2004, Chapter II-2, Regulation 10.5.6, "Fixed Local Application Fire Extinguishing Systems"

c. International Code for Fire Safety Systems, Resolution MSC.98(73) Chapter 7, "Fixed Water Spraying and Water Mist Fire Extinguishing Systems"

d. Maritime Safety Committee Circular 913, "Guidelines for the Approval of Fixed Water Based Local Application Fire Fighting Systems for use in Category A Machinery Spaces"

e. IMO Resolution A.800(19) Annex, "Revised Guidelines for the Approval of Sprinkler Systems Equivalent to That Referred to In SOLAS Regulation II-2/12" (Total Flooding for Accommodation and Service Spaces)

f. Maritime Safety Committee Circular 1165, "Guidelines for the Approval of Equivalent Based Fire Extinguishing Systems for Machinery Spaces and Cargo Pump Rooms" (Total Flooding for Machinery Spaces)

g. COMDINST M16714.3, "Equipment List" , Equipment Class 162.135

Contact Information:

If you have any questions or comments concerning this document, please contact the Marine Safety Center by email or phone, referring to the Procedure Number: **E1-03**.

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Responsibilities:

The submitter shall provide sufficient documentation and plans to indicate compliance with the applicable requirements; this includes a complete bill of materials, component technical data sheets, and arrangement plans. The submission shall be made in triplicate.

General Guidance:

Watermist system requirements vary based on the application. Specified applications are as follows: (1) total flooding systems for cargo pump rooms and machinery spaces, (2) total flooding systems for accommodation and service spaces, and (3) local application systems. The following guidance outlines requirements that are applicable to all watermist systems and additional requirements specific to the application.

Applicable to all watermist applications:

- The submission should clearly indicate if the system is:
  - Required for the vessel
  - Equipment installed in excess of what is required
  - Equipment installed to provide an equivalent level of safety to the required fixed fire suppression system.

- The water mist nozzles must be "USCG Type Approved"; as evidenced by listing in reference (g). A system O&M manual is included as part of the approval. Nozzles and necessary components are listed in the manual.

- Tubing and fittings must be constructed of corrosion resistant materials and provide a 4:1 safety factor (Burst press/MAWP). Low pressure systems (pressure <175 psi) may use copper tubing and fittings or galvanized pipe and fittings. Galvanized pipe is not recommended due to possible clogging of the nozzles. Intermediate and high pressure systems (150 >pressure< 1,450 psi) require stainless steel tubing and fittings. (AISI 304 or 316 tubing are most common). Acceptable pipe and fitting specifications are listed in Table 2-3.3.1 and 2-4.2.1 of reference (a). Equivalent materials are acceptable per approved manuals.

- The nozzles shall be used in accordance with their listing. The following specifics shall be included on the plans (Note that bilge nozzles are required for the bilges of machinery spaces and cargo pump rooms. (MSC 1165, 1.3)):

  a) Hazard type and protection objective (e.g. protection of bilge, machinery space, accommodations, local application, total flooding)

  b) Nozzle height above hazard

  c) Spacing between nozzles

Calculations

General Guidance (continued):

- The capacity of the water supply system and piping and nozzle arrangements are subject to the following requirements based on the type of system and hazard protected. Design areas are as follows:

  a) Local Application System: Based on protection of the *largest hazard area* (main engine, generator, boiler front, etc). Sprinkler dimensioning and minimum nozzle pressure shall be in accordance with the manufacturer's manual. (MSC 913, 3.12)

  b) Total flooding system for machinery spaces or cargo pump rooms: Based on complete protection of the space with the greatest water demand (usually the largest space). Sprinkler dimensioning and minimum nozzle pressure shall be in accordance with the manufacturer's manual. (MSC 1165, 20)

  c) Total flooding for accommodation and service spaces:

     i. Domestic voyage only: For a light hazard area, the *minimum design area* is 1,507 ft^2 (140 m^2). For ordinary hazard spaces, the *minimum design area* is 3,014 ft^2 (280 m^2). The design area(s) should be clearly identified on the plans. Sprinkler dimensioning and minimum nozzle pressure shall be in accordance with the manufacturer's manual. (NFPA 750, 14.2.11)

     ii. International voyage: Regardless of the hazard group, the *minimum design area* is 3,014 ft^2 (280 m^2). Small vessels having spaces with individual areas less than 280 m^2 may use a smaller design area as outlined in reference (b). The design area(s) should be clearly identified on the plans. Sprinkler dimensioning and minimum nozzle pressure shall be in accordance with the manufacturer's manual (MSC A800(19), 3.22)

- System flow calculations must be provided. Calculations must include a pipe isometric diagram with nodal points identified on the plans, nozzle K-factor and nozzle pressures.

  a) There are two acceptable calculation methods. The Hazen Williams method is referenced in IMO documents and NFPA 750 requires use of the Darcy Weisbeck method for intermediate and high pressure systems.

General Guidance (continued):

Water supply arrangement

- For total flooding systems, the pump(s) shall be located outside of category A machinery spaces and/or protected spaces. For local application systems, the pump(s) shall be located outside of the protected areas (not necessarily outside the space). (NFPA 750, 14.2.13; MSC A800(19), 3.15; MSC 1165, 21)

- A single pump unit may be used for a system servicing multiple spaces (accommodation, service spaces, machinery spaces and local application systems) provided the pump has sufficient capacity for the system or area with the largest flow and pressure demands. (NFPA 750, 14.3.5, MSC A800(19), 3.22 MSC 1165, 19)

- The pump(s) shall be sized to meet the required flow and pressure in accordance with the hydraulic calculations.

- The water supply tank have sufficient volume to provide water for the specified times, without intervention. The potable water tanks are acceptable as a water source provided steps are taken to ensure an adequate supply of water is maintained for the watermist system. High & low tank suctions or low water alarms and pump shutdowns are acceptable for this purpose.

- The water supply tank must have sufficient volume to provide water for the specified times, without operator intervention, as follows:

    a) Local application systems: 20 minutes (MSC 913, 3.5)

    b) Machinery spaces and cargo pump rooms: 30 minutes (MSC 1165, 19)

    c) Accommodation and service spaces: 30 minutes (MSC A800(19), 3.3)

- For total flooding systems, a redundant means of pumping shall b e provided. Generally, this will be in the form of an additional pump assembly. The additional pump shall be sufficient to compensate for the loss of a single pump unit. Switching over to a redundant means of pumping may be automatic or manual. Local application systems are exempt from this requirement. (MSC A800(19), 3.9; MSC 1165, 17)(amended by MSC.1/ Circ 1386)

- A filter or strainer shall be provided in the pump suction piping. Generally, low pressure systems use a 10 micron filter, minimum; high pressure systems use a 75 or 100 micron filter. Installation must be per the manufacturer's manual. (NFPA 750, 14.1.13)

- The pump(s) shall start automatically upon system actuation. (NFPA 750, 14.2.1; MSC A800(19) 3.1)

- The system shall be fitted with a permanent seawater inlet connection. (NFPA 750, 14.2.5; MSC A800(19), 3.10; MSC 1165, 17)

Controls

- Total flooding systems for machinery spaces and cargo pump rooms may be manual in operation. Local application systems are required to have manual activation; automatic activation is optional. (NFPA 750, 14.3.3; MSC 1165, 10)

General Guidance (continued):

- For total flooding systems, controls must be readily accessible outside of the protected space and in a space that is accessible in the event of a fire in the protected space. For local application systems, controls shall be provided in easily accessible locations inside and outside the protected space. Controls for the individual valves will usually be provided adjacent to the individual hazards. (NFPA 750, 14.3.7; MSC 1165, 21; MSC 913, 3.13)

- For total flooding systems, power must be provided by both the main and emergency sources; an automatic change-over switch is required. The emergency power supply should be provided from outside the protected space. Local application systems need only be provided with a main power source. (NFPA 750, 14.3.6; MSC A800(19), 3.8; MSC 1165, 16; MSC 913, 3.9)

- Systems shall be provided with the following controls, indicators and alarms: (NFPA 750, 14.1.7; MSC A800(19), 3.17; MSC 1165, 24)

    a) Local and remote pump controls

    b) Power available and failure indicators;

    c) Water flow and flow locations;

d) Pump run indicators

e) Pressure monitoring devices in control rooms

- A means for testing the operation of the water supply arrangement and/or zones shall be provided. (NFPA 750, 14.3.8; MSC A800(19) 3.16; MSC 1165, 23; MSC 913, 3.15)
- The electrical components shall have a minimum enclosure rating of IEC IP54 (dust and splash protected) (MSC 913, 3.9; MSC 1165, 16))
- A warning notice must be displayed outside each entrance to the protected space noting the extinguishing medium and the possibility of automatic release. (MSC 913, 3.16)
- Operating instructions must be provided at each operating station. (MSC A800(19), 3.18; MSC 1165, 25; MSC 913, 3.17)

General Guidance (continued):

Additional Requirements for Total Flooding Systems Protecting Accommodation & Service Spaces

- The system must be operated automatically, with no operator intervention. The system must detect the fire and control or suppress the fire with a water based extinguishing medium. Detection should be by a USCG Type Approved Fire Detection System. (MSC A800(19), 3.1)
- The system shall be of the wet type with closed nozzles. Exposed sections subject to freezing may be dry pipe, preaction, deluge or antifreeze type. (NFPA 750, 14.2.7; MSC A800(19), 3.20)
- A pressure tank or water cylinders sized to meet the pressure and flow demands of the most hydraulically demanding area for one minute is/are required. Compressed air, nitrogen or other arrangements shall be provided to charge the pressure tank or cylinders in order to meet the flow and pressure requirements. For a hydro-pneumatic tank, means of replenishing the air and fresh water shall be provided and a gauge glass shall be provided on the tank. (NFPA 750, 14.2.2, MSC A800(19) 3.2)
- Each sprinkler section shall be provided with a check valve, pressure gauge and test connection. (NFPA 750, 14.3.8; MSC A800(19), 3.17)

- Sprinklers must be grouped into separate sections. A section must not serve more than two decks and/or one main vertical zone. (NFPA 750, 14.2.11; MSC A800(19), 3.12)

- Sprinklers must be of the fast response type. In accommodation and service spaces, the sprinkler temperature rating must be between 135° F and 175° F (57° C and 79° C). Where high ambient temperatures are expected, the rating may be increased to 85° F (30° C) above the maximum expected temperature. (MSC A800(19) 3.20)

- Each section of sprinklers shall be capable of being isolated by one valve only. The isolation valve must be readily accessible. The section valve shall be provided with a means to prevent unauthorized operation. Locking valves in the open position are not acceptable. (MSC A800(19), 3.13

Disclaimer

This guidance is not a substitute for applicable legal requirements, nor is it itself a rule. It is not intended to nor does it impose legally-binding requirements on any party. It represents the Coast Guard's current thinking on this topic and may assist industry, mariners, the general public, and the Coast Guard, as well as other federal and state regulators, in applying statutory and regulatory requirements. You can use an alternative approach for complying with these requirements if the approach satisfies the requirements of the applicable statutes and regulations. If you want to discuss an alternative, you may contact the Marine Safety Center (MSC), the unit responsible for implementing this guidance.