

Deluge systems for open spaces

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Content:

- Existing tests for deluge systems in open spaces
- Characteristics of the tests
- Suggestion for test modifications

Existing test protocols for deluge systems for open spaces:

- IMO 913 , MSC.1/Circ.1276 Revised Guidelines for the approval of fixed water-based local application fire-fighting systems for use in category A machinery spaces
- FM 5560 Approval Standard for Water Mist Systems
 - APPENDIX K: Fire Tests for Water Mist Systems for the Protection of Local Applications

IMO 913

Fixed water-based local application fire-fighting systems should provide localized fire suppression in areas, as specified in SOLAS regulation II-2/10.5, for category A machinery spaces, without the necessity of engine shut-down, personnel evacuation, shutting down of forced ventilation fans, or sealing of the space.

2.1 *Fire suppression* is a reduction in heat output from the fire and control of the fire to restrict its spread from its seat and reduce the flame area.

IMO 913

3.4 Test results and interpretation

3.4.1 The local application fire-fighting system is required to extinguish the test fires within 5 min of the start of water discharge. The fuel oil spray and water spray are required to continue in operation after this, as specified in paragraph 4.3. If the fire re-ignites after this five-minute water discharge period the test is considered to be a failure.

- There is an inconsistency between the requirements for an installed system and the tests: The SOLAS requires fire suppression, whilst the test protocol requires extinguishing of the spray fires.

IMO 913

TEST METHOD FOR FIXED WATER-BASED LOCAL APPLICATION FIRE-FIGHTING SYSTEMS

1 SCOPE

This test method is for evaluating the effectiveness of fixed water-based local application fire-fighting systems. The test method verifies the design criteria for vertical and horizontal grids of nozzles. The test method is intended to evaluate maximum nozzle spacing, minimum and maximum distance from the nozzle to the hazard, minimum nozzle flow rate and nozzle angle, if any, in addition to minimum operating pressure.



IMO 913

3.2.3 *Installation requirements for tests*

3.2.3.1 The local application system should consist of uniformly spaced nozzles directed vertically downward or to the side, or installed at an inclined angle, if any, and tested in accordance with paragraphs 3.3 and 3.4.

3.2.3.2 The system should consist of either a 2 x 2 or 3 x 3-nozzle grid in general.

3.2.3.3 The nozzles should be installed at least 1 m below the ceiling of the enclosure.

3.2.3.4 The maximum spacing of the nozzles should be in accordance with the manufacturer's system design and installation manual.

3.2.3.5 Additional nozzles may be installed at the test in accordance with manufacturer's instruction. In this case, details for additional nozzles should be included in the test report and reflected in the individual ship's design.

- IMO 913 allows in principle all positions and orientation of nozzles. The grid of nozzles should be specified by the manufacturer

FM 5560, Appendix K: Fire tests for water mist systems for the protection of Local Applications

- Diesel or Heptane:
 - 1m x 1m, 2m x 2m, 3m x 3m Square Pool Fires
 - Y x Y, Y x 2Y and Y x 3Y Channel Pool Fires
 - Horizontal Spray and Vertical Spray, 6 MW Spray Fires
 - 2m x 2m Square Pool Fire Combined with a 6 MW spray fire
 - 3m x 3m Obstructed Square Pool Fire
 - 1m x 1m Offset Square Pool Fire
 - 6 MW Spray Fire With an External Ignition Source

FM 5560 APPENDIX K

- APPENDIX K: Fire Tests for Water Mist Systems for the Protection of Local Applications.....
- K.1 General Testing Requirements.....
- K.2 Instrumentation and Test Equipment Requirements.....
- K.3 Fire Scenarios and Test Configurations.....
 - K.3.1 Square Pool Fires.....
 - K.3.2 Channel Pool Fires.....
 - K.3.3 Spray Fires.....
 - K.3.4 6.6 ft by 6.6 ft (2 m by 2 m) Square Pool Fire Combined with a 6 MW Spray Fire.....
 - K.3.5 Obstructed 9.8 by 9.8 ft (3 by 3 m) Square Pool Fire.....
 - K.3.6 Offset 3.3 by 3.3 ft (1 by 1 m) Square Pool Fire.....
 - K.3.7 6 MW Spray Fire with an External Ignition Source.....
 - K.3.8 Other.....

FM 5560 APPENDIX K

The Approval criteria for the fire tests are as follows:

- A. The water mist system shall be capable of extinguishing all seven of the fire scenarios in this Appendix. The system components, component locations, and operating conditions shall remain unaltered throughout the fire tests. All fire tests shall be conducted using the spray specifications from the manufacturer's design manual in regard to nozzle placement, spray flux and spray duration.



FM 5560 APPENDIX K

K.3.1 Square Pool Fires

Criteria: The fires are to be extinguished and the extinguishment time shall not be affected by pool size to within 30 percent for each of the fire tests.

Fuel: Diesel or heptane

Type: 3.3 ft by 3.3 ft (1 m by 1 m), 6.6 ft by 6.6 ft (2 m by 2 m), and 9.8 ft by 9.8 ft (3 m by 3m) pool fires.

General system specifications (see Figure K-1):

- A. The nozzles shall be in a uniform grid pattern above the pool.
- B. Nozzles shall be oriented vertically downward. Nozzles along the perimeter of the grid may be angled towards the hazard, but should remain constant regardless of pool size.

- There is an inconsistency between the requirements for an installed system and the tests:
- The approval criteria says that the manufacturer's design manual shall be used for nozzle location, but the test specifies only vertically downward nozzle orientation and angled nozzles in the perimeter of the grid. Horizontally mounted nozzles seem to be excluded.

Conclusions:

- IMO 913 has an option for nozzle positioning which is good. However, the fire source is limited to liquid spray fires.
- FM 5560 APPENDIX K has a variety of liquid spray and pool fires, but seems to limit nozzle positioning to some extent.
- We need to have a test procedure that reflects the manufacturer's design manual, with both horizontally and vertically oriented or inclined nozzles. Nozzle positions should not be limited to overhead nozzles.

Future test protocols for watermist deluge systems

- IMO 913 and FM 5560 APPENDIX K are both all about liquid fire hazards
- Test protocols for solid fuels should also be considered to be used in a similar setup for protection.
- For instance, the standard plastic commodity could be used (cardboard boxes filled with plastic cups).
- No other fixed firefighting systems for local application (deluge systems) have the requirements that all types of liquid spray or pool fires shall be extinguished.
- Fire suppression could be added as a secondary requirement.