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**GUIDELINES FOR THE APPROVAL OF FIXED WATER-BASED LOCAL APPLICATION
FIRE-FIGHTING SYSTEMS FOR USE IN CATEGORY A MACHINERY SPACES**

1 The Maritime Safety Committee, at its seventy-first session (19 to 28 May 1999), approved Guidelines for the approval of fixed water-based local application fire-fighting systems for use in category A machinery spaces, as set out in the annex.

2 Member Governments are requested to apply the annexed Guidelines when approving fixed water-based local application fire-fighting systems for use in category A machinery spaces.

ANNEX

GUIDELINES FOR THE APPROVAL OF FIXED WATER-BASED LOCAL APPLICATION FIRE-FIGHTING SYSTEMS

1 General

Fixed water-based local application fire-fighting systems should provide localized fire suppression in areas, as specified in SOLAS regulation II-2/7.7 for category A machinery spaces, without the necessity of engine shut-down, personnel evacuation, shutting down of forced ventilation fans or the sealing of the space.

2 Definitions

2.1 **Fire suppression:** 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.

2.2 **Water-based extinguishing medium:** Fresh water or sea water with or without additives mixed to enhance fire-extinguishing capability.

3 Principal requirements for the system

3.1 The system should be capable of manual release.

3.2 The activation of the fire-fighting system should not result in loss of electrical power or reduction of the manoeuvrability of the ship.

3.3 The system should be capable of fire suppression based on testing conducted in accordance with the appendix to these guidelines.

3.4 The system should be capable of fire suppression with forced ventilation fans running and supplying air to the protected area, or a method of automatically shutting air supply fans upon release of the system should be provided to ensure that the fire-fighting medium is not dispersed.

3.5 The system should be available for immediate use and capable of continuously supplying water-based medium for at least 20 minutes in order to suppress or extinguish the fire and to prepare for the discharge of the main fixed fire-extinguishing system within that period of time.

3.6 The system and its components should be suitably designed to withstand ambient temperature changes, vibration, humidity, shock, impact, clogging and corrosion normally encountered in machinery spaces. Components within the protected spaces should be designed to withstand the elevated temperatures which could occur during a fire. Components should be tested in accordance with the relevant sections of appendix A of MSC/Circ.668, as amended by MSC/Circ.728.

3.7 The system and its components should be designed and installed based on international standards acceptable to the Organization*, and manufactured and tested in accordance with the appropriate elements of the Appendix to these guidelines.

3.8 The location, type and characteristics of the nozzles should be within the limits tested, as referred to in paragraph 3.3. Nozzle positioning should take into account obstructions to the spray of the fire-fighting system.

3.9 The electrical components of the pressure source for the system should have a minimum rating of IP 54. Systems requiring an external power source need only be supplied by the main power source.

3.10 The piping system should be sized in accordance with a hydraulic calculation technique** to ensure availability of flows and pressures required for correct performance of the system.

3.11 The water supply for local application systems may be fed from the supply to a water-based main fire-fighting system providing that adequate water quantity and pressure are available to operate both systems for the required period of time. Local application systems may form a section(s) of a water-based main fire-extinguishing system provided that all requirements of SOLAS regulation II-2/10 and these guidelines, and MSC/Circ.668, as amended by MSC/Circ.728, are met, and the systems are capable of being isolated from the main system.

3.12 The capacity and design of the system should be based on the protected area demanding the greatest volume of water.

3.13 The operation controls should be located at easily accessible positions inside and outside the protected space. The controls inside the space should not be liable to be cut off by a fire in the protected areas.

3.14 Pressure source components of the system should be located outside of the protected areas.

3.15 A means for testing the operation of the system for assuring the required pressure and flow should be provided.

3.16 Where automatically operated fire-fighting systems are installed, a warning notice should be displayed outside each entry point stating the type of medium used and the possibility of automatic release.

*Pending the development of international standards acceptable to the Organization national standards as prescribed by the Administration should be applied.

**Where the Hazen-Williams Method is used, the following values of the friction factor "C" for different pipe types which may be considered should apply:

Pipe type	C
Black or galvanised mild steel	100
Copper and copper alloys	150
Stainless steel	150

- 3.17 Operating instructions for the system should be displayed at each operating position.
- 3.18 Spare parts and operating and maintenance instructions for the system should be provided as recommended by the manufacturer.
- 3.19 Nozzles and piping should not prevent access to engine or machinery for routine maintenance. In ships fitted with overhead hoists or other moving equipment, nozzles and piping should not be located to prevent operation of such equipment.

APPENDIX

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 in addition to minimum and maximum operating pressure.

2 SAMPLING

2.1 The nozzles and other system components should be supplied by the manufacturer with design and installation criteria, operating instructions, drawings, and technical data sufficient for the identification of the components.

2.2 The flow rate for each type and size of nozzle should be determined at the minimum and maximum nozzle operating pressure.

3 FIRE TESTS

3.1 Test principles

3.1.1. These tests are intended to evaluate the fire-extinguishing capabilities of individual nozzles and grids of nozzles used as local application fire-fighting systems on light diesel oil fuel spray fires.

3.1.2 The tests also define the following design and installation criteria:

- .1 maximum spacing between nozzles;
- .2 minimum and maximum distance between the nozzles and the protected hazard;
- .3 the need for nozzles to be positioned outside of the protected hazard; and
- .4 minimum and maximum operating pressure.

3.2 Test description

3.2.1 Test enclosure

3.2.1.1 The test enclosure, if any, should be sufficiently large and provided with adequate natural or forced ventilation during the fire test to ensure that the oxygen concentration at the fire location during the fire test remains above 20% (by vol) without activation of the local application fire-fighting system.

3.2.1.2 The test enclosure, if any, should be at least 100 m² in area. The height of the test enclosure should be at least 5 m.

3.2.2 Fire scenarios

3.2.2.1 The fire scenarios should consist of nominal 1 and 6 MW spray fires. These fires should be produced using light diesel oil as the fuel as described in Table 3.2.2.1.

Table 3.2.2.1
Spray fire parameters

Spray nozzle	Wide spray angle (120° to 125°) full cone type	Wide spray angle (80°) full cone type
Nominal oil pressure	8 Bar	8.5 Bar
Oil flow	0.16 ± 0.01 kg/s	0.03 ± 0.005 kg/s
Oil temperature	$20 \pm 5^{\circ}\text{C}$	$20 \pm 5^{\circ}\text{C}$
Nominal heat release rate	6 MW	1 MW

3.2.2.2 The fuel spray nozzles should be installed horizontally and directed toward the centre of the nozzle grid.

3.2.2.3 The fuel spray nozzle should be located 1 m above the floor and at least 4 m away from the walls of the enclosure, if any.

3.2.3 Installation requirements for tests

3.2.3.1 The local application system should consist of uniformly spaced nozzles directed vertically downward.

3.2.3.2 The system should consist of either a 2 x 2 or 3 x 3 nozzle grid, as required.

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

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

3.3 Test programme

3.3.1 The fire-extinguishing capabilities of the system should be evaluated for the minimum and maximum separation distances (the distance between the nozzle grid and the fuel spray nozzle). These distances should be as defined in the manufacturers system design and installation manual.

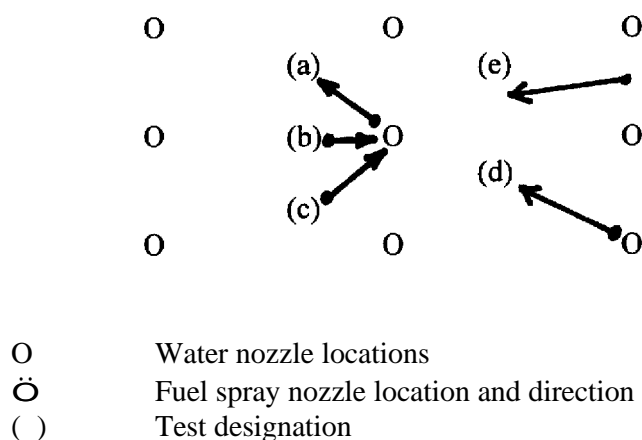
3.3.2 Each separation distance should be evaluated against the two fire scenarios (1 and 6 MW spray fires). Tests should be conducted with the fuel spray nozzles horizontally positioned in the following locations:

- .1 under one nozzle in the centre of the grid;
- .2 between two nozzles in the centre of the grid;

- .3 between four nozzles;
- .4 under one nozzle at the edge of the grid (corner); and
- .5 between two nozzles at the edge of the grid.

These fire locations are shown in figure 3.3.2.

Figure 3.3.2
Fuel spray nozzle locations



3.4 Test results and interpretation

3.4.1 The local application fire-fighting system is required to extinguish the test fires within 5 minutes from the start of water discharge. If the fire re-ignites after this five minute water discharge period the test is considered to be a failure.

3.4.2 The results of the tests should be interpreted as follows:

- .1 Systems (utilizing a 3 x 3 nozzle grid) that extinguish fires referred to in 3.3.2.1 to 3.3.2.3 are considered to have successfully completed the protocol with the condition that the outer nozzles should be installed outside of the protected area a distance of at least 1/4 of the maximum nozzle spacing.
- .2 Systems (utilizing either a 2 x 2 or 3 x 3 nozzle grid) that extinguish fires referred to in 3.3.2.3 to 3.3.2.5 are considered to have successfully completed the protocol and can be designed with the outer nozzles located at the edge of the protected area. This does not prohibit the location of the nozzles outside of the protected area.
- .3 The requirements stated in either 3.4.2.1 or 3.4.2.2 should be met for both the minimum and maximum separation distances as well as the minimum and maximum operating pressures.
- .4 For installations which may be adequately protected using individual nozzles or a single row of nozzles, the effective nozzle coverage (width and length) is defined as 1/2 the maximum nozzle spacing.

4 TEST PROCEDURE

4.1 Pre-burn time

Each fuel oil spray should be ignited and allowed to burn for no more than 15 seconds prior to system operation.

4.2 Measurements

4.2.1 Fuel oil spray system

4.2.1.1 The fuel oil flow rate and pressure in the fuel oil spray system should be verified prior to the test.

4.2.1.2 The fuel oil spray system pressure should be measured during the test.

4.2.2 Oxygen concentration at the fire location

Oxygen concentration should be measured at 100 mm below the fuel oil spray nozzle.

4.2.3 Water spray system pressure and flow rate

The system water pressure and flow rate should be measured using suitable equipment.

4.3 Operation of the fire-fighting system

4.3.1 The water spray system should be activated within the pre-burn time specified in section 4.1.

4.3.2 The water spray system should be operated for a minimum of one minute after fire extinguishment.

4.3.3 The fires should be extinguished within the 5 minutes of water application.

4.3.4 The fuel oil spray should be operated for at least 15 seconds after fire extinguishment.

4.4 Observations during the fire test

During the test, following observations should be recorded:

- .1 start of the ignition procedure;
- .2 start of the test (ignition);
- .3 time when the extinguishing system is activated;
- .4 time when the fire is extinguished;
- .5 time when the extinguishing system is shut off;
- .6 time of re-ignition;
- .7 time when the fuel supply to the nozzle is stopped; and
- .8 time when the test is terminated.

5 TEST REPORT

The test report should, as a minimum, include the following information:

- .1 name and address of the test laboratory;
 - .2 date of issue and identification number of the test report;
 - .3 name and address of applicant;
 - .4 name and address of manufacturer or supplier of the product;
 - .5 test method and purpose;
 - .6 product identification;
 - .7 description of the tested product:
 - .1 assembly drawings;
 - .2 descriptions;
 - .3 assembly of included materials and components;
 - .4 specification of included materials and components;
 - .5 installation specification; and
 - .6 detailed drawings of the test set-up;
 - .8 date of tests;
 - .9 drawing of each fire test configuration;
 - .10 measured water spray nozzle flow characteristics;
 - .11 identification of the test equipment and used instruments;
 - .12 test results including observations and measurements made during and after the test:
 - .1 maximum nozzle spacing;
 - .2 minimum and maximum separation distances; and
 - .3 minimum and maximum operating pressures;
 - .13 deviations from the test method;
 - .14 conclusions; and
 - .15 date of the report and signature.
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