**ANNEX 27**

**RESOLUTION MSC.44(65)**
**(adopted on 11 May 1995)**

**STANDARDS FOR FIXED SPRINKLER SYSTEMS FOR HIGH SPEED CRAFT**

THE MARITIME SAFETY COMMITTEE,

RECALLING Article 28(b) of the Convention on the International Maritime Organization concerning the functions of the Committee,

NOTING that it adopted the International Code of Safety for High Speed Craft (HSC Code) on 20 May 1994 by resolution MSC.36(63),

NOTING FURTHER that the Conference of Contracting Governments to the 1974 SOLAS Convention adopted on 24 May 1994 amendments to the Convention which, *inter alia*, include chapter X on Safety measures for high speed craft, to make the provisions of the HSC Code mandatory under that Convention for such craft constructed on or after 1 January 1996,

RECOGNIZING that a high speed craft is designed for light displacement using lighter weight non-conventional shipbuilding materials to provide faster sea transportation and also incorporates fire safety design philosophies that differ from those for conventional ships,

RECOGNIZING FURTHER that the HSC Code requires the public spaces and service spaces, storage rooms other than those containing flammable liquids, and similar spaces on a passenger craft to be protected by a fixed sprinkler system meeting a standard developed by the Organization,

DESIROUS of keeping abreast of the advancement of sprinkler technology and further improving fire protection on board high speed craft,

HAVING CONSIDERED the recommendations made by the Sub-Committee on Fire Protection at its thirty-ninth session and the Sub-Committee on Ship Design and Equipment at its thirty-eighth session,

1. ADOPTS the Standards for Fixed Sprinkler Systems for High Speed Craft set out in the Annex to the present resolution;

2. INVITES Governments to apply the Standards when approving fixed sprinkler systems for use in accommodation areas of passenger high speed craft;

3. AGREES to keep the Standards under review and to amend them as necessary.

ANNEX

STANDARDS FOR FIXED SPRINKLER SYSTEMS FOR HIGH SPEED CRAFT

## 1 General

1.1 Recognizing that high speed craft may require lighter weight materials of construction than traditional vessels and have fire safety design philosophies that differ from conventional vessels, these standards apply only to accommodation areas of high speed craft. These standards should be applied in conjunction with all the other safety features and limitations inherent in vessels designed and operated in full compliance with the High Speed Craft (HSC) Code.

## 2 Types of systems which should be permitted on high speed craft:

2.1 Manual sprinkler systems

2.1.1 Manual sprinkler system is sprinkler system where the admission of water is controlled by manually actuated switches or break glass stations. Water should fill the system and appropriate valves and pumps should automatically operate upon actuation. These systems may have nozzles with fusible elements.

2.1.2 Each protected zone served by a manual sprinkler system should have two switches or break glass stations widely separated with one switch for each protected zone located in the operating compartment or other continuously manned control station. Switches and break glass stations should be suitably protected from unauthorized use, and activation should be alarmed in the operating compartment or the continuously manned control station.

2.2 Automatic sprinkler systems

2.2.1 Wet pipe systems is sprinkler system employing automatic sprinklers attached to a piping system containing water and connected to a water supply so that water discharges immediately from sprinklers opened by heat from a fire.

2.2.2 Dry pipe systems is sprinkler system employing automatic sprinklers attached to a piping system containing air or nitrogen under pressure, to release of which (as from the opening of a sprinkler) permits the water pressure to open a valve known as a dry pipe valve. The water then flows into the piping system and out of the opened sprinklers.

2.3 Combination systems is a system employing both manual and automatic actuation and having nozzles fitted with fusible elements. System piping may be empty or filled with compressed air. Each protected area is fitted with manually actuated break glass stations. Water should fill the system and appropriate valves and pumps should automatically operate upon actuation of a manual station or supplemental detection system. Additionally, a manually actuated switch should be located in the operating compartment. Water should fill the system, and appropriate valves and pumps should automatically operate upon actuation of the switch.

2.4 Equivalent systems are sprinkler systems complying with the Guidelines for approval of sprinkler systems equivalent to that referred to in SOLAS regulation II-2/12 (resolution A.755(18)). Such equivalent systems may be of the types referred to in 2.1, 2.2 or 2.3. Administrations may modify certain of the following hydraulic and pneumatic requirements for these systems consistent with conditions for approved use.

## 3 Pumps

3.1 A means should be provided for manually starting each pump from the operating compartment. Fault alarms should be provided to indicate in the operating compartment when electric power is not available to the pumps.

3.2 All systems should be provided with a means for manually starting the sprinkler pump at a readily accessible position close to the pump such that access and operating means are located outside the space being protected.

3.3 Means should be provided to either automatically exhaust trapped air from the sprinkler pump casing or prime the sprinkler pump from the operating compartment under all operating conditions.

3.4 Means should be provided to indicate the following in the operating compartment:

.1 sprinkler system pressure normal (for constantly pressurized system only);

.2 sprinkler system operating (pump running); and

.3 sprinkler system failure (loss of pressure).

3.5 A gauge should be provided in the operating compartment to indicate sprinkler main pressure.

3.6 Pump, pipe and system sizing

3.6.1 Except as specified in 3.6.2, pumps, piping and other system supply components should be sized and arranged so as to be capable of maintaining within one minute of system activation a minimum flow corresponding to the simultaneous operation of sprinklers in the following hydraulically most demanding design areas:

.1 for manual systems with open nozzles - two horizontally adjacent sprinkler sections but not less than 280 $m^2$;

.2 for manual system with fusible element nozzles - 280 $m^2$;

.3 for wet pipe systems - 150 $m^2$; and

.4 for dry pipe and combination systems - 200 $m^2$.

3.6.2 For all types of systems, the design area can be reduced to the maximum size of the largest space within fire resisting divisions (30 min or greater) on a single deck area.

3.7 For systems other than those permitted under 2.4, the water discharge rate should not be less than 5 $l/m^2/min$.

3.8 In automatic systems, sprinkler pumps should start upon loss of system pressure.

3.9 A sprinkler pump should not be located in any space protected by the sprinkler system it serves.

3.10 There should be not less than two sources of power supply for the seawater pump and automatic alarm and detection system. Where the sources of power for the pump are electrical, these should be a main generator and an emergency source of power. One supply for the pump should be taken from the main switchboard, and one from the emergency switchboard by separate feeders reserved solely for that purpose. The feeders should be so arranged as to avoid galleys, machinery spaces and other enclosed spaces of high fire risk except in so far as it is necessary to reach the appropriate switchboards, and should be run to an automatic changeover switch situated near the sprinkler pump. This switch should permit the supply of power from the main switchboard so long as a supply is available therefrom, and be so designed that upon failure of that supply it would automatically change over to the supply from the emergency switchboard. The switches on the main switchboard and the emergency switchboard should be clearly labelled and normally kept closed. No other switch should be permitted in the feeders concerned. One of the sources of power supply for the alarm and detection system should be an emergency source. Where one of the sources of power for the pump is an internal combustion engine, it should, in addition to complying with the provisions of 3.9, be so situated that a fire in any protected space would not affect the air supply to the machinery.

3.11 The sprinkler system should have a connection from the ship's fire main by way of a lockable screw-down non-return valve at the connection which would prevent a backflow from the sprinkler system to the fire main.

3.12 Primary power for sprinkler pumps should be electrical motors. Emergency sources of power for sprinkler pumps should consist of power from an emergency generator. Alternatively, a dedicated diesel-driven pump may be provided as an emergency source of power.

3.13 Category A craft having a wet pipe sprinkler system may have a hydropneumatic tank in lieu of an emergency source of power for the sprinkler pump. The tank should be sized for 1-minute flow at the required discharge rate over the design area.

## 4 Sprinklers

4.1 For systems other than those of 2.4, sprinklers should be fast response types meeting the requirements of ISO 6182/1.

4.2 For constantly pressurized system, six spare sprinklers of each type should be stored in a readily accessible location on board.

## 5 Valves

5.1 Manual systems

5.1.1 A manual system should become operational through the opening of not more than one shutoff valve on the discharge side of the pump. This valve should be referred to as the control valve and should be located outside the space being protected.

5.1.2 Control valves should be readily accessible by crew members and operable without special tools or keys.

5.1.3 Control valves should be fitted with remote actuators that are controlled from the operating compartment or manual break glass stations, if fitted. Control valves should have local manual overrides.

5.1.4 Control valves should be capable of being manually opened within 45 s with a torque not exceeding 45 Nm under full pump flow conditions. This should be tested at 6 month intervals.

5.1.5 Means should be provided to secure all other valves capable of impairing system operation in the open or "ready" position.

5.2 Automatic and other systems

Means should be provided in automatic and other systems to secure control valves and other valves capable of impairing system operation in the open position.

5.3 All valves

5.3.1 All valves should be labelled indicating their function and normal position. Control valves should also indicate the areas served.

5.3.2 All valves should be provided with means to indicate whether they are open or closed.

## 6 Piping

6.1 Materials used for piping should be steel or as follows:

.1 where located above a 15 minute-rated fire resisting ceiling and comprising either a dry or combination pipe system associated with a fire detection system, or a wet pipe system:

.1.1 materials complying with requirements of Level 3 under resolution A.753(18) on Guidelines for the Application of Plastic Pipes on Ships; or

.1.2 metals other than steel, having properties of good conduction of heat, such as aluminium or copper;

.2 other dry pipe systems and systems not continuously filled with water; materials complying with the requirements of Level 2 of A.753(18).

6.2 Piping should be secured to the craft's structure using engineering practices that account for both static and dynamic loads imposed by swaying pipe, the moving craft and moving fluid inside the pipe.

6.3 The means for fastening the sprinkler piping to the structure of the craft should be suitable for use in the marine environment. Pipe hangers incorporating threaded fasteners should provide a means for the fasteners to remain secure while subjected to vibration from the craft.

6.4 The means of connecting the pipe system to the structure of the craft and piping connections should take into account the long-term properties of the material and the interactions of all the materials used in the means of connection with due regard to preventing corrosion by contact between dissimilar metals.

6.5 Friction loss calculations should utilize the Hazen-Williams formula. Calculation of flows in carbon steel piping, including galvanized piping, should be based on C = 100. Calculations for flows in wet pipe sprinkler systems employing carbon steel piping should be based on C = 120. For all systems, flow calculations for corrosion resistant piping such as copper, copper alloys, stainless steel and plastic piping should be based on C = 150.

## 7 Test arrangements

Test piping should be provided in each zone to periodically allow a full flow test. The piping should discharge the zone's design flow overboard. Test piping may also serve as system drain piping. For wet pipe systems, the discharge piping need not exceed 50 mm in diameter. All systems should also have a test arrangement at the farthest point in each zone to allow a test flow equal to that from a single sprinkler.

## 8 Hydropneumatic tanks

8.1 Systems should have a hydropneumatic pressure tank with a minimum capacity of 200 l and should be fitted with a supplementary supply from a reliable potable or fresh water source that will act in the manner of a hydropneumatic tank.

8.1.1 The tank may be omitted where the system is kept charged with fresh water by a small topping pump taking suction from the potable or fresh water supply. Topping pump operation should be automatic. The pump should be fitted with a sensor to actuate a fault alarm in the operating compartment in the event of loss of pressure to the topping pump suction. The connection of the topping pump to the potable water should be equipped with a reduced pressure back flow preventer.

8.2 Hydropneumatic tanks should be fitted with means for audio and visual indicating in the operating compartment low water level and low air pressure conditions. When the hydropneumatic tank level drops to a predetermined level, the sprinkler pump should automatically start.

8.3 A means should be provided to automatically prevent salt water from entering the hydropneumatic tank.

8.4 A hydropneumatic tank in the potable water system may serve as the hydropneumatic tank for the sprinkler system provided that the potable water demand cannot deplete the water level or air pressure below the minimum levels required for fire protection.

## 9 Compressed air in dry pipe and combination systems and hydropneumatic tanks

9.1 Dry pipe systems should be arranged such that water will discharge from the farthest sprinkler within 60 s of actuation of the sprinkler.

9.2 Compressed air may be taken from a dedicated compressor or other reliable source.

9.2.1 A means should be provided to prevent water from entering the air supply system.

9.3 Air pressure should be automatically maintained to account for normal pressure fluctuations and air supply should be arranged to prevent significant qualities entering the system when the sprinklers activate.

9.4 An alarm should be provided on the bridge to indicate low air pressure in a dry pipe system.

## 10 Trapped water

10.1 All systems should be arranged to be capable of being drained.

10.2 All pendent sprinklers except those in wet pipe systems should be of the dry pendent type to prevent the admission of debris, corrosion and seawater into the pendent drop.

10.3 Those lengths of pipe that cannot be made self draining should be constructed of materials that do not exhibit corrosion during long-term exposure to seawater. Sprinklers in these areas should not be made of brass or other materials subject to corrosion or dezincification.

10.4 All portions of systems subject to freezing should be self draining or filled with an antifreeze solution.

## 11 Electric control systems

11.1 Sprinkler system control, detection, and alarm/indication systems should be electrically separate from all non-fire protection systems.

11.2 A ground fault or open circuit on any one conductor of the sprinkler detection and control system should cause a fault indication at the operating compartment without impairing the operation of the system. This requirement does not apply to conductors delivering power to sprinkler pump motor(s).

11.3 The control system should be provided with emergency power as required by the HSC Code.

## 12 Documentation

Sprinkler system calculations should be retained with the craft's design calculations.

## 13 Human element

13.1 Indicators and controls should be located in the operating compartment in a dedicated display area.

13.2 Controls should not require special keys, codes, or tools to operate.

13.3 Indicators should be in accordance with the Code on Alarms and Indicators.

## 14 Inspection and testing

14.1 A customized testing and inspection procedures manual should be kept with the system records in the operating compartment.

14.2 Customized inspection and testing check list sheets and a log of all inspection and tests should be kept on board.

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