4.2.2 The means of control of any such systems shall be readily accessible and simple to operate and shall be grouped together in as few locations as possible at positions not likely to be cut off by a fire in the protected space.

Chapter 7
Fixed pressure water-spraying and water mist fire-extinguishing systems

1 Application

This chapter details the specifications for fixed pressure water-spraying and water mist fire-extinguishing systems as required by chapter II-2 of the Convention.

2 Engineering specifications

2.1 Fixed pressure water-spraying fire-extinguishing systems

Fixed pressure water-spraying fire-extinguishing systems for machinery spaces and cargo pump-rooms shall be approved by the Administration based on the guidelines developed by the Organization.*

2.2 Equivalent water mist fire-extinguishing systems

Water mist fire-extinguishing systems for machinery spaces and cargo pump-rooms shall be approved by the Administration based on the guidelines developed by the Organization.*

2.3 Fixed pressure water-spraying fire-extinguishing systems for cabin balconies

Fixed pressure water-spraying fire-extinguishing systems for cabin balconies shall be approved by the Administration based on the guidelines developed by the Organization.†

2.4 Fixed water-based fire-fighting systems for ro-ro spaces, vehicle spaces and special category spaces

Fixed water-based fire-fighting systems for ro-ro spaces, vehicle spaces and special category spaces shall be approved by the Administration based on guidelines developed by the Organization.‡

Chapter 8
Automatic sprinkler, fire detection and fire alarm systems

Please see the December 2019 Supplement for changes to this Chapter.

1 Application

This chapter details the specifications for automatic sprinkler, fire detection and fire alarm systems as required by chapter II-2 of the Convention.

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* Refer to Revised guidelines for the approval of equivalent water-based fire-extinguishing systems for machinery spaces and cargo pump-rooms (MSC/Circ.1165), as amended.

† Refer to Guidelines for the approval of fixed pressure water-spraying and water-based fire-extinguishing systems for cabin balconies (MSC/Circ.1268).

‡ Refer to Revised guidelines for approval of fixed water-based fire-fighting systems for ro-ro spaces and special category spaces (MSC.1/Circ.1430).

2 Engineering specifications

2.1 General

2.1.1 *Type of sprinkler systems*

The automatic sprinkler systems shall be of the wet pipe type, but small exposed sections may be of the dry pipe type where, in the opinion of the Administration, this is a necessary precaution. Control stations, where water may cause damage to essential equipment, may be fitted with a dry pipe system or a pre-action system as permitted by regulation II-2/10.6.1.1 of the Convention. Saunas shall be fitted with a dry pipe system, with sprinkler heads having an operating temperature up to 140°C.

2.1.2 *Sprinkler systems equivalent to those specified in paragraphs 2.2 to 2.4*

Automatic sprinkler systems equivalent to those specified in paragraphs 2.2 to 2.4 shall be approved by the Administration based on the guidelines developed by the Organization.*

2.2 Sources of power supply

2.2.1 *Passenger ships*

There shall 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 shall be a main generator and an emergency source of power. One supply for the pump shall be taken from the main switchboard, and one from the emergency switchboard by separate feeders reserved solely for that purpose. The feeders shall 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 shall be run to an automatic changeover switch situated near the sprinkler pump. This switch shall 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 will automatically change over to the supply from the emergency switchboard. The switches on the main switchboard and the emergency switchboard shall be clearly labelled and normally kept closed. No other switch shall be permitted in the feeders concerned. One of the sources of power supply for the alarm and detection system shall be an emergency source. Where one of the sources of power for the pump is an internal combustion engine it shall, in addition to complying with the provisions of paragraph 2.4.3, be so situated that a fire in any protected space will not affect the air supply to the machinery.

2.2.2 *Cargo ships*

There shall not be less than two sources of power supply for the seawater pump and automatic alarm and detection system. If the pump is electrically driven, it shall be connected to the main source of electrical power, which shall be capable of being supplied by at least two generators. The feeders shall 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. One of the sources of power supply for the alarm and detection system shall be an emergency source. Where one of the sources of power for the pump is an internal combustion engine, it shall, in addition to complying with the provisions of paragraph 2.4.3, be so situated that a fire in any protected space will not affect the air supply to the machinery.

2.3 Component requirements

2.3.1 *Sprinklers*

2.3.1.1 The sprinklers shall be resistant to corrosion by the marine atmosphere. In accommodation and service spaces the sprinklers shall come into operation within the temperature range from 68°C to 79°C, except that in locations such as drying rooms, where high ambient temperatures might be expected, the operating temperature may be increased by not more than 30°C above the maximum deckhead temperature.

* Refer to Revised guidelines for approval of sprinkler systems equivalent to that referred to in SOLAS regulation II-2/12 (resolution A.800(19)).

2.3.1.2 A quantity of spare sprinkler heads shall be provided for all types and ratings installed on the ship as follows:

Total number of heads	Required number of spares
< 300	6
300 to 1000	12
> 1000	24

The number of spare sprinkler heads of any type need not exceed the total number of heads installed of that type.

2.3.2 *Pressure tanks*

2.3.2.1 A pressure tank having a volume equal to at least twice that of the charge of water specified in this paragraph shall be provided. The tank shall contain a standing charge of fresh water, equivalent to the amount of water which would be discharged in 1 min by the pump referred to in paragraph 2.3.3.2, and the arrangements shall provide for maintaining an air pressure in the tank such as to ensure that where the standing charge of fresh water in the tank has been used the pressure will be not less than the working pressure of the sprinkler, plus the pressure exerted by a head of water measured from the bottom of the tank to the highest sprinkler in the system.

Suitable means of replenishing the air under pressure and of replenishing the fresh water charge in the tank shall be provided. A glass gauge shall be provided to indicate the correct level of the water in the tank.

2.3.2.2 Means shall be provided to prevent the passage of seawater into the tank.

2.3.3 *Sprinkler pumps*

2.3.3.1 An independent power pump shall be provided solely for the purpose of continuing automatically the discharge of water from the sprinklers. The pump shall be brought into action automatically by the pressure drop in the system before the standing fresh water charge in the pressure tank is completely exhausted.

2.3.3.2 The pump and the piping system shall be capable of maintaining the necessary pressure at the level of the highest sprinkler to ensure a continuous output of water sufficient for the simultaneous coverage of a minimum area of 280 m^2 at the application rate specified in paragraph 2.5.2.3. The hydraulic capability of the system shall be confirmed by the review of hydraulic calculations, followed by a test of the system, if deemed necessary by the Administration.

2.3.3.3 The pump shall have fitted on the delivery side a test valve with a short open-ended discharge pipe. The effective area through the valve and pipe shall be adequate to permit the release of the required pump output while maintaining the pressure in the system specified in paragraph 2.3.2.1.

2.4 Installation requirements

2.4.1 *General*

Any parts of the system which may be subjected to freezing temperatures in service shall be suitably protected against freezing.

2.4.2 *Piping arrangements*

2.4.2.1 Sprinklers shall be grouped into separate sections, each of which shall contain not more than 200 sprinklers. In passenger ships, any section of sprinklers shall not serve more than two decks and shall not be situated in more than one main vertical zone. However, the Administration may permit such a section of sprinklers to serve more than two decks or be situated in more than one main vertical zone, if it is satisfied that the protection of the ship against fire will not thereby be reduced.

2.4.2.2 Each section of sprinklers shall be capable of being isolated by one stop valve only. The stop valve in each section shall be readily accessible in a location outside of the associated section or in cabinets within stairway enclosures. The valve's location shall be clearly and permanently indicated. Means shall be provided to prevent the operation of the stop valves by any unauthorized person.

2.4.2.3 A test valve shall be provided for testing the automatic alarm for each section of sprinklers by a discharge of water equivalent to the operation of one sprinkler. The test valve for each section shall be situated near the stop valve for that section.

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

2.4.2.5 A gauge indicating the pressure in the system shall be provided at each section stop valve and at a central station.

2.4.2.6 The sea inlet to the pump shall wherever possible be in the space containing the pump and shall be so arranged that when the ship is afloat it will not be necessary to shut off the supply of seawater to the pump for any purpose other than the inspection or repair of the pump.

2.4.3 *Location of systems*

The sprinkler pump and tank shall be situated in a position reasonably remote from any machinery space of category A and shall not be situated in any space required to be protected by the sprinkler system.

2.5 System control requirements

2.5.1 *Ready availability*

2.5.1.1 Any required automatic sprinkler, fire detection and fire alarm system shall be capable of immediate operation at all times and no action by the crew shall be necessary to set it in operation.

2.5.1.2 The automatic sprinkler system shall be kept charged at the necessary pressure and shall have provision for a continuous supply of water as required in this chapter.

2.5.2 *Alarm and indication*

2.5.2.1 Each section of sprinklers shall include means for giving a visual and audible alarm signal automatically at one or more indicating units whenever any sprinkler comes into operation. Such alarm systems shall be such as to indicate if any fault occurs in the system. Such units shall indicate in which section served by the system a fire has occurred and shall be centralized on the navigation bridge or in the continuously-manned central control station and, in addition, visible and audible alarms from the unit shall also be placed in a position other than on the aforementioned spaces to ensure that the indication of fire is immediately received by the crew.

2.5.2.2 Switches shall be provided at one of the indicating positions referred to in paragraph 2.5.2.1 which will enable the alarm and the indicators for each section of sprinklers to be tested.

2.5.2.3 Sprinklers shall be placed in an overhead position and spaced in a suitable pattern to maintain an average application rate of not less than 5 L/m^2/min over the nominal area covered by the sprinklers. For this purpose, nominal area shall be taken as the gross horizontal projection of the area to be covered. However, the Administration may permit the use of sprinklers providing such an alternative amount of water suitably distributed as has been shown to the satisfaction of the Administration to be not less effective.

2.5.2.4 A list or plan shall be displayed at each indicating unit showing the spaces covered and the location of the zone in respect of each section. Suitable instructions for testing and maintenance shall be available.

2.5.3 *Testing*

Means shall be provided for testing the automatic operation of the pump on reduction of pressure in the system.

Chapter 9
Fixed fire detection and fire alarm systems

1 Application

1.1 This chapter details the specification of fixed fire detection and fire alarm systems as required by chapter II-2 of the Convention. Unless expressly provided otherwise, the requirements of this chapter shall apply to ships constructed on or after 1 July 2012.

1.2 Definitions

1.2.1 *Section* means a group of fire detectors and manually operated call points as reported in the indicating unit(s).

1.2.2 *Section identification capability* means a system with the capability of identifying the section in which a detector or manually operated call point has activated.

1.2.3 *Individually identifiable* means a system with the capability to identify the exact location and type of detector or manually activated call point which has activated, and which can differentiate the signal of that device from all others.

2 Engineering specifications

2.1 General requirements

2.1.1 Any required fixed fire detection and fire alarm system with manually operated call points shall be capable of immediate operation at all times (this does not require a backup control panel). Notwithstanding this, particular spaces may be disconnected, for example, workshops during hot work and ro-ro spaces during on and off-loading. The means for disconnecting the detectors shall be designed to automatically restore the system to normal surveillance after a predetermined time that is appropriate for the operation in question. The space shall be manned or provided with a fire patrol when detectors required by regulation are disconnected. Detectors in all other spaces shall remain operational.

2.1.2 The fire detection system shall be designed to:

.1 control and monitor input signals from all connected fire and smoke detectors and manual call points;

.2 provide output signals to the navigation bridge, continuously manned central control station or onboard safety centre to notify the crew of fire and fault conditions;

.3 monitor power supplies and circuits necessary for the operation of the system for loss of power and fault conditions; and

.4 the system may be arranged with output signals to other fire safety systems including:

.4.1 paging systems, fire alarm or public address systems;

.4.2 fan stops;

.4.3 fire doors;

.4.4 fire dampers;

.4.5 sprinkler systems;

.4.6 smoke extraction systems;

.4.7 low-location lighting systems;

.4.8 fixed local application fire-extinguishing systems;

.4.9 closed circuit television (CCTV) systems; and

.4.10 other fire safety systems.

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2.1.3 The fire detection system may be connected to a decision management system provided that:

.1 the decision management system is proven to be compatible with the fire detection system;

.2 the decision management system can be disconnected without losing any of the functions required by this chapter for the fire detection system; and

.3 any malfunction of the interfaced and connected equipment should not propagate under any circumstance to the fire detection system.

2.1.4 Detectors and manual call points shall be connected to dedicated sections of the fire detection system. Other fire safety functions, such as alarm signals from the sprinkler valves, may be permitted if in separate sections.

2.1.5 The system and equipment shall be suitably designed to withstand supply voltage variation and transients, ambient temperature changes, vibration, humidity, shock, impact and corrosion normally encountered in ships. All electrical and electronic equipment on the bridge or in the vicinity of the bridge shall be tested for electromagnetic compatibility, taking into account the recommendations developed by the Organization.*

2.1.6 Fixed fire detection and fire alarm systems with individually identifiable fire detectors shall be so arranged that:

.1 means are provided to ensure that any fault (e.g. power break, short circuit, earth, etc.) occurring in the section will not prevent the continued individual identification of the remainder of the connected detectors in the section;

.2 all arrangements are made to enable the initial configuration of the system to be restored in the event of failure (e.g. electrical, electronic, informatics, etc.);

.3 the first initiated fire alarm will not prevent any other detector from initiating further fire alarms; and

.4 no section will pass through a space twice. When this is not practical (e.g. for large public spaces), the part of the section which by necessity passes through the space for a second time shall be installed at the maximum possible distance from the other parts of the section.

2.1.7 In passenger ships, the fixed fire detection and fire alarm system shall be capable of remotely and individually identifying each detector and manually operated call point. Fire detectors fitted in passenger ship cabins, when activated, shall also be capable of emitting, or cause to be emitted, an audible alarm within the space where they are located. In cargo ships and on passenger ship cabin balconies the fixed fire detection and fire alarm system shall, as a minimum, have section identification capability.

2.2 Sources of power supply

2.2.1 There shall be not less than two sources of power supply for the electrical equipment used in the operation of the fixed fire detection and fire alarm system, one of which shall be an emergency source of power. The supply shall be provided by separate feeders reserved solely for that purpose. Such feeders shall run to an automatic changeover switch situated in or adjacent to the control panel for the fire detection system. The main (respective emergency) feeder shall run from the main (respective emergency) switchboard to the changeover switch without passing through any other distributing switchboard. On ships constructed on or after 1 July 2014, the changeover switch shall be arranged such that a fault will not result in the loss of both power supplies.

2.2.2 On ships constructed on or after 1 July 2014, the operation of the automatic changeover switch or a failure of one of the power supplies shall not result in loss of fire detection capability. Where a momentary loss of power would cause degradation of the system, a battery of adequate capacity shall be provided to ensure continuous operation during changeover.

* Refer to General requirements for electromagnetic compatibility for all electrical and electronic equipment (resolution A.813(19)).