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Circular letter No.3190
15 June 2011

To: All IMO Members
Contracting Governments to the International Convention for the Safety of Life at Sea, 1974

Subject: **Amendments to the International Convention for the Safety of Life at Sea, SOLAS 1974, as amended**

Amendments to the International Code of Safety for High-Speed Craft, 2000 (2000 HSC Code), as amended

Amendments to the International Code for Fire Safety Systems (FSS Code), as amended

1 The Maritime Safety Committee, at its eighty-seventh (12 to 21 May 2010), eighty-eighth (24 November to 3 December 2010) and eighty-ninth (11 to 20 May 2011) sessions approved draft amendments to:

- .1 chapters II-1, II-2, III, V, VI, VII and XI of the International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended, set out in annex 1;
- .2 the International Code of Safety for High-Speed Craft, 2000 (2000 HSC Code), as amended, set out in annex 2; and
- .3 the International Code for Fire Safety Systems (FSS Code), as amended, set out in annex 3,

for circulation with a view to adoption at its ninetieth session (16 to 25 May 2012).

2 The Secretary-General has the honour to transmit herewith, in accordance with article VIII(b)(i) of the International Convention for the Safety of Life at Sea, 1974, the text of the aforementioned proposed amendments to the Convention and the 2000 HSC and FSS Codes, given in the annexes 1 to 3, respectively, for consideration with the view to adoption by the Committee at its ninetieth session, in accordance with article VIII(b)(iv) of the Convention.

ANNEX 1

DRAFT AMENDMENTS TO THE INTERNATIONAL CONVENTION FOR THE SAFETY OF LIFE AT SEA, 1974, AS AMENDED

CHAPTER II-1 CONSTRUCTION – STRUCTURE, SUBDIVISION AND STABILITY, MACHINERY AND ELECTRICAL INSTALLATIONS

Part B-1 Stability

Regulation 8-1 – System capabilities after a flooding casualty on passenger ships

1 The existing regulation II-1/8-1 is replaced by the following:

"Regulation 8-1 – System capabilities and operational information after a flooding casualty on passenger ships

1 Application

Passenger ships having a length, as defined in regulation II-1/2.5, of 120 m or more or having three or more main vertical zones shall comply with the provisions of this regulation.

2 Availability of essential systems in case of flooding damage^{*}

A passenger ship constructed on or after 1 July 2010 shall be designed so that the systems specified in regulation II-2/21.4 remain operational when the ship is subject to flooding of any single watertight compartment.

3 Operational information after a flooding casualty

For the purpose of providing operational information to the Master for safe return to port after a flooding casualty, passenger ships constructed on or after [1 January 2014] shall have:

- .1 onboard stability computer; or
- .2 shore-based support,

[in accordance with] guidelines developed by the Organization^{**}."

* Refer to the Performance standards for the systems and services to remain operational on passenger ships for safe return to port and orderly evacuation and abandonment after a casualty (MSC.1/Circ.1214).

** Refer to the Guidelines on operational information for Masters of passenger ships for safe return to port by own power or under tow (MSC.1/Circ.1400).

CHAPTER II-2 CONSTRUCTION – FIRE PROTECTION, FIRE DETECTION AND FIRE EXTINCTION

Part A General

Regulation 1 – Application

2 In paragraph 1.1, the date "1 July 2012" is replaced by the date "[*the date of entry into force*]"^{*}.

3 In paragraph 1.2.2, the date "1 July 2012" is replaced by the date "[*the date of entry into force*]"^{*}.

4 In paragraph 2.1, the date "1 July 2012" is replaced by the date "[*the date of entry into force*]" and the words "and MSC.291(87)" are replaced by the words "MSC.291(87) and MSC.308(88)".

[5 The existing paragraphs 2.2 and 2.3 are deleted, and paragraph 2.4 is renumbered as paragraph 2.2.]

6 In the existing paragraph 2.4, the following new subparagraphs are added after the existing subparagraph .6:

.7 cargo ships of 500 gross tonnage and upwards and passenger ships constructed on or after 1 February 1992 but before 1 July 2002 need not comply with regulation 19.3.3 provided that they comply with regulation 54.2.3 as adopted by resolution MSC.13(57); and

.8 cargo ships of 500 gross tonnage and upwards and passenger ships constructed on or after 1 September 1984 but before 1 July 2002 need not comply with regulations 19.3.1, 19.3.5, 19.3.6, 19.3.9 provided that they comply with regulations 54.2.1, 54.2.5, 54.2.6, 54.2.9 as adopted by resolution MSC.1(XLV)."

7 In paragraph 3.1, the date "1 July 2012" is replaced by the date "[*the date of entry into force*]"^{*}.

8 In paragraph 3.2, the date "1 July 2012" is replaced by the date "[*the date of entry into force*]"^{*}.

Regulation 9 – Containment of fire

9 In table 9.3, column (11) (Special category and ro-ro spaces), row (2) (Corridors), the symbol "A-15" is replaced by the symbol "A-30".

10 In table 9.3, column (11) (Special category and ro-ro spaces), row (4) (Stairways), the symbol "A-15" is replaced by the symbol "A-30".

* It should be noted that amendments to the relevant paragraphs in regulation II-2/1 have been adopted at MSC 88, by resolution MSC.308(88), due to enter into force on 1 July 2012. In this context, the adoption of the proposed amendments by MSC 90 (May 2012) is a procedural matter that should be considered by the Committee prior to the adoption of the draft amendments.

11 In table 9.3, column and row (11) (Special category and ro-ro spaces), the symbol "A-0" is replaced by the symbol "A-30".

12 In table 9.4, column (11) (Special category and ro-ro spaces), row (1) (Control stations), the symbol "A-30" is replaced by the symbol "A-60".

13 In table 9.4, column (11) (Special category and ro-ro spaces), row (2) (Corridors), the symbol "A-0" is replaced by the symbol "A-30".

14 In table 9.4, column (11) (Special category and ro-ro spaces), row (4) (Stairways), the symbol "A-0" is replaced by the symbol "A-30".

15 In table 9.4, column and row (11) (Special category and ro-ro spaces), the symbol "A-0" is replaced by the symbol "A-30".

16 In table 9.4, column (2) (Corridors), row (11) (Special category and ro-ro spaces), the symbol "A-15" is replaced by the symbol "A-30".

17 In table 9.4, column (4) (Stairways), row (11) (Special category and ro-ro spaces), the symbol "A-15" is replaced by the symbol "A-30".

18 In table 9.4, column (6) (Machinery spaces of category A), row (11) (Special category and ro-ro spaces), the symbol "A-30" is replaced by the symbol "A-60".

19 In table 9.5, column and row (11) (Ro-ro and vehicle spaces), the symbol "*" is replaced by the symbol "A-30".

20 In table 9.6, column (11) (Ro-ro and vehicle spaces), row (10) (Open decks), the symbol "*" is replaced by the symbol "A-0".

21 In table 9.6, column and row (11) (Ro-ro and vehicle spaces), the symbol "*" is replaced by the symbol "A-30".

22 In table 9.6, column (10) (Open decks), row (11) (Ro-ro and vehicle spaces), the symbol "*" is replaced by the symbol "A-0".

23 Paragraphs 6.2 and 6.3 are deleted and the subsequent paragraphs are renumbered accordingly.

Regulation 10 – Fire fighting

24 In paragraph 5.6.3, in subparagraph .1, the words "used for the ship's main propulsion and power generation" are deleted.

Regulation 20 – Protection of vehicle, special category and ro–ro spaces

25 The existing paragraphs 6.1.1 and 6.1.2 are replaced by the following:

"6.1 Fixed fire-extinguishing systems

6.1.1 Vehicle spaces and ro-ro spaces which are capable of being sealed from a location outside of the cargo spaces, shall be fitted with one of the following fixed fire-extinguishing systems:

- .1 a fixed gas fire-extinguishing system complying with the provisions of the Fire Safety Systems Code;
- .2 a fixed high-expansion foam fire-extinguishing system complying with the provisions of the Fire Safety Systems Code;
- .3 an approved fixed pressure water-spraying fire-extinguishing system for manual operation complying with the provisions of the Fire Safety Systems Code and paragraphs 6.1.2.1 to 6.1.2.4; or
- .4 a fixed water-based fire-fighting system for ro-ro spaces and special category spaces equivalent to that referred to in resolution A.123(V) complying with the provisions of the Fire Safety Systems Code.

6.1.2 Ro-ro and vehicle spaces not capable of being sealed shall be fitted with an approved fixed pressure water-spraying fire-extinguishing system for manual operation complying with the provisions of the Fire Safety Systems Code which shall protect all parts of any deck and vehicle platform in such spaces. Such water spray system shall have:

- .1 a pressure gauge on the valve manifold;
- .2 clear marking on each manifold valve indicating the spaces served;
- .3 instructions for maintenance and operation located in the valve room; and
- .4 a sufficient number of drainage valves."

26 The following new paragraph 6.1.3 is inserted after paragraph 6.1.2 and the subsequent paragraphs are renumbered accordingly:

"6.1.3 Special category spaces shall be fitted with one of the following fixed fire-extinguishing systems:

- .1 an approved fixed pressure water-spraying fire-extinguishing system for manual operation complying with the provisions of the Fire Safety Systems Code and paragraphs 6.1.2.1 to 6.1.2.4; or
- .2 a fixed water-based fire-fighting system for ro-ro spaces and special category spaces equivalent to that referred to in resolution A.123(V) complying with the provisions of the Fire Safety Systems Code."

CHAPTER III LIFE-SAVING APPLIANCES AND ARRANGEMENTS

Part B Requirements for ships and life-saving appliances

Regulation 20 – Operational readiness, maintenance and inspections

27 In paragraph 11.2, the following new subparagraph .4 is added after the existing subparagraph .3:

- "4 notwithstanding subparagraph .3 above, the operational testing of free-fall lifeboat release systems shall be performed either by free-fall launch with only the operating crew on board or by a simulated launching carried out based on guidelines developed by the Organization*."

* Refer to Measures to prevent accidents with lifeboats (MSC.1/Circ.1206/Rev.1).

CHAPTER V SAFETY OF NAVIGATION

Regulation 14 – Ships' manning

28 The existing paragraph 2 is replaced by the following new paragraph:

- "2 For every ship to which chapter I applies, the Administration shall:
- .1 establish appropriate minimum safe manning following a transparent procedure taking into account the relevant guidance adopted by the Organization* ; and
 - .2 issue an appropriate minimum safe manning document or equivalent as evidence of the minimum safe manning considered necessary to comply with the provisions of paragraph 1."

* Refer to the Principles of minimum safe manning, adopted by resolution [A...(27)].

CHAPTER VI CARRIAGE OF CARGOES

Part A General provisions

29 The following new regulation 5-2 is added after the existing regulation 5-1:

Regulation 5-2 – Prohibition of the blending of bulk liquid cargoes during the sea voyage

1 The physical blending of bulk liquid cargoes during a sea voyage is prohibited. Physical blending refers to the process whereby the ship's cargo pumps and pipelines are used to internally circulate two or more different cargoes with the intent to achieve a cargo with a new product designation. This prohibition does not preclude the master from undertaking cargo transfers for the safety of the ship or protection of the marine environment.

2 The above prohibition does not apply to the blending of products for use in the search and exploitation of sea-bed mineral resources on board ships used to facilitate such operations."

**CHAPTER VII
CARRIAGE OF DANGEROUS GOODS**

**Part A
Carriage of dangerous goods in packaged form**

Regulation 4 – Documents

30 The text of the regulation is replaced by the following:

"1 Transport information relating to the carriage of dangerous goods in packaged form and the container/vehicle packing certificate shall be in accordance with the relevant provisions of the IMDG Code and shall be made available to the person or organization designated by the port State authority.

2 Each ship carrying dangerous goods in packaged form shall have a special list, manifest or stowage plan setting forth, in accordance with the relevant provisions of the IMDG Code, the dangerous goods on board and the location thereof. A copy of one of these documents shall be made available before departure to the person or organization designated by the port State authority."

**CHAPTER XI-1
SPECIAL MEASURES TO ENHANCE MARITIME SAFETY**

Regulation 2 – Enhanced surveys

31 The words "the guidelines adopted by the Assembly of the Organization by resolution A.744(18)" are replaced by the words "the International Code on the Enhanced Programme of Inspections during Surveys of Bulk Carriers and Oil Tankers, 2011 (2011 ESP Code), adopted by the Assembly of the Organization by resolution A.[...(27)]".

ANNEX 2

**DRAFT AMENDMENTS TO THE INTERNATIONAL CODE OF SAFETY FOR
HIGH-SPEED CRAFT, 2000 (2000 HSC CODE)**

Chapter 14 – Radiocommunications

In paragraph 14.15.10, subparagraph .1.1 is replaced by the following:

- ".1.1 on passenger craft, within 3 months before the expiry date of the High-Speed Craft Safety Certificate or the anniversary date of the certificate; and"

ANNEX 3

DRAFT AMENDMENTS TO THE INTERNATIONAL CODE FOR FIRE SAFETY SYSTEMS (FSS CODE)

CHAPTER 5 FIXED GAS FIRE-EXTINGUISHING SYSTEMS

1 The following new paragraph 2.2.1.2 is inserted after the existing paragraph 2.2.1.1 and the subsequent paragraphs are renumbered accordingly:

"2.2.1.2 For vehicle spaces and ro-ro spaces which are not special category spaces, the quantity of carbon dioxide available shall be at least sufficient to give a minimum volume of free gas equal to 45% of the gross volume of the largest such cargo space which is capable of being sealed, and the arrangements shall be such as to ensure that at least two-thirds of the gas required for the relevant space shall be introduced within 10 min. Carbon dioxide systems shall not be used for the protection of special category spaces."

2 The following new paragraph 2.2.1.7 is added after the renumbered paragraph 2.2.1.6:

"2.2.1.7 For container and general cargo spaces (primarily intended to carry a variety of cargoes separately secured or packed) the fixed piping system shall be such that at least two-thirds of the gas can be discharged into the space within 10 min. For solid bulk cargo spaces the fixed piping system shall be such that at least two-thirds of the gas can be discharged into the space within 20 min. The system controls shall be arranged to allow one-third, two-thirds or the entire quantity of gas to be discharged based on the loading condition of the hold."

3 The existing text of section 2.4 is deleted and section 2.5 is renumbered accordingly.

CHAPTER 6 FIXED FOAM FIRE-EXTINGUISHING SYSTEMS

4 The existing text of the chapter is replaced by the following:

"1 APPLICATION

This chapter details the specifications for fixed foam fire-extinguishing systems for the protection of machinery spaces in accordance with SOLAS regulation II-2/10.4.1.1.2 of this Convention, cargo spaces in accordance with regulation II-2/10.7.1.1, cargo pump-rooms in accordance with regulation II-2/10.9.1.2 and vehicle, special category and ro-ro spaces in accordance with regulation II-2/20.6.1.3. This chapter does not apply to cargo pump-rooms of chemical tankers carrying liquid cargoes referred to in regulation II-2/1.6.2 of the Convention, unless the Administration specifically accepts the use of these systems based on additional tests with alcohol-based fuel and alcohol resistant foam. Unless expressly provided otherwise, the requirements of this chapter shall apply to ships constructed on or after [*date of entry into force*].

2 DEFINITIONS

- 2.1 *Design filling rate* is at least the minimum nominal filling rate used during the approval tests.
- 2.2 *Foam* is the extinguishing medium produced when foam solution passes through a foam generator and is mixed with air.
- 2.3 *Foam solution* is a solution of foam concentrate and water.
- 2.4 *Foam concentrate* is a liquid which, when mixed with water in the appropriate concentration forms a foam solution.
- 2.5 *Foam delivery ducts* are supply ducts for introducing high-expansion foam into the protected space from foam generators located outside the protected space.
- 2.6 *Foam mixing rate* is the percentage of foam concentrate mixed with water forming the foam solution.
- 2.7 *Foam generators* are discharge devices or assemblies through which high-expansion foam solution is aerated to form foam that is discharged into the protected space. Foam generators using inside air typically consist of a nozzle or set of nozzles and a casing. The casing is typically made of perforated steel/stainless steel plates shaped into a box that enclose the nozzle(s). Foam generators using outside air typically consist of nozzles enclosed within a casing that spray onto a screen. An electric, hydraulic or pneumatically driven fan is provided to aerate the solution.
- 2.8 *High-expansion foam fire-extinguishing systems* are fixed total flooding extinguishing systems that use either inside air or outside air for aeration of the foam solution. A high-expansion foam system consists of both the foam generators and the dedicated foam concentrate approved during the fire testing specified in 3.1.3.
- 2.9 *Inside air foam system* is a fixed high-expansion foam fire-extinguishing system with foam generators located inside the protected space and drawing air from that space.
- 2.10 *Nominal flow rate* is the foam solution flow rate expressed in l/min.
- 2.11 *Nominal application rate* is the nominal flow rate per area expressed in l/min/m².
- 2.12 *Nominal foam expansion ratio* is the ratio of the volume of foam to the volume of foam solution from which it was made, under non-fire conditions, and at an ambient temperature of e.g., ± 20°C.
- 2.13 *Nominal foam production* is the volume of foam produced per time unit, i.e. nominal flow rate times nominal foam expansion ratio, expressed in m³/min.
- 2.14 *Nominal filling rate* is the ratio of nominal foam production to the area, i.e. expressed in m/min.

2.15 *Nominal filling time* is the ratio of the height of the protected space to the nominal filling rate, i.e. expressed in minutes.

2.16 *Outside air foam system* is a fixed high-expansion foam system with foam generators installed outside the protected space that are directly supplied with fresh air.

3 FIXED HIGH-EXPANSION FOAM FIRE-EXTINGUISHING SYSTEMS

3.1 Principal performance

3.1.1 The system shall be capable of manual release, and shall be designed to produce foam at the required application rate within 1 minute of release. Automatic release of the system shall not be permitted unless appropriate operational measures or interlocks are provided to prevent any local application systems required by regulation II-2/10.5.6 of the Convention from interfering with the effectiveness of the system.

3.1.2 The foam concentrates shall be approved by the Administration based on the guidelines developed by the Organization*. Different foam concentrate types shall not be mixed in a high-expansion foam system.

3.1.3 The system shall be capable of fire extinction and manufactured and tested to the satisfaction of the Administration based on the guidelines developed by the Organization**.

3.1.4 The system and its components shall be suitably designed to withstand ambient temperature changes, vibration, humidity, shock, clogging and corrosion normally encountered on ships. Piping, fittings and related components inside the protected spaces (except gaskets) shall be designed to withstand 925°C.

3.1.5 System piping, foam concentrate storage tanks, components and pipe fittings in contact with the foam concentrate shall be compatible with the foam concentrate and be constructed of corrosion resistant materials such as stainless steel, or equivalent. Other system piping and foam generators shall be full galvanized steel or equivalent. Distribution pipework shall have self draining capability.

3.1.6 Means for testing the operation of the system and assuring the required pressure and flow shall be provided by pressure gauges at both inlets (water and foam concentrate supply) and at the outlet of the foam proportioner. A test valve shall be installed on the distribution piping downstream of the foam proportioner, along with orifices which reflect the calculated pressure drop of the system. All sections of piping shall be provided with connections for flushing, draining and purging with air. All nozzles shall be able to be removed for inspection in order to prove clear of debris.

3.1.7 Means shall be provided for the crew to safely check the quantity of foam concentrate and take periodic control samples for foam quality.

3.1.8 Operating instructions for the system shall be displayed at each operating position.

* Refer to the Guidelines for the performance and testing criteria and surveys of high-expansion foam concentrates for fixed fire-extinguishing systems (MSC/Circ.670).
** Refer to the Guidelines for the approval of fixed high-expansion foam systems (MSC.1/Circ.1384).

- 3.1.9 Spare parts shall be provided based on the manufacturer's instruction.
- 3.1.10 If an internal combustion engine is used as a prime mover for the seawater pump for the system, the fuel oil tank to the prime mover shall contain sufficient fuel to enable the pump to run on full load for at least 3 h and sufficient reserves of fuel shall be available outside the machinery space of category A to enable the pump to be run on full load for an additional 15 h. If the fuel tank serves other internal combustion engines simultaneously, the total fuel tank capacity shall be adequate for all connected engines.
- 3.1.11 The arrangement of foam generators and piping in the protected space shall not interfere with access to the installed machinery for routine maintenance activities.
- 3.1.12 The system source of power supply, foam concentrate supply and means of controlling the system shall be readily accessible and simple to operate, and shall be arranged at positions outside the protected space not likely to be cut off by a fire in the protected space. All electrical components directly connected to the foam generators shall have at least an IP 54 rating.
- 3.1.13 The piping system shall be sized in accordance with a hydraulic calculation technique* to ensure availability of flows and pressures required for correct performance of the system.
- 3.1.14 The arrangement of the protected spaces shall be such that they may be ventilated as the space is being filled with foam. Procedures shall be provided to ensure that upper level dampers, doors and other suitable openings are kept open in case of a fire. For inside air foam systems, spaces below 500 m³ need not comply with this requirement.
- 3.1.15 Onboard procedures shall be established to require personnel re-entering the protected space after a system discharge to wear breathing apparatus to protect them from oxygen deficient air and products of combustion entrained in the foam blanket.
- 3.1.16 Installation plans and operating manuals shall be supplied to the ship and be readily available on board. A list or plan shall be displayed showing spaces covered and the location of the zone in respect of each section. Instructions for testing and maintenance shall be available on board.
- 3.1.17 All installation, operation and maintenance instructions/plans for the system shall be in the working language of the ship. If the working language of the ship is not English, French, nor Spanish, a translation into one of these languages shall be included.
- 3.1.18 The foam generator room shall be ventilated to protect against overpressure, and shall be heated to avoid the possibility of freezing.

* 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:

<i>Pipe type</i>	<i>C</i>
Black or galvanized mild steel	100
Copper or copper alloys	150
Stainless steel	150

3.1.19 The quantity of foam concentrate available shall be sufficient to produce a volume of foam equal to at least five times the volume of the largest protected space enclosed by steel bulkheads, at the nominal expansion ratio, or enough for 30 min of full operation for the largest protected space, whichever is greater.

3.1.20 Machinery spaces, cargo pump-rooms, vehicle spaces, ro-ro spaces and special category spaces shall be provided with audible and visual alarms within the protected space warning of the release of the system. The alarms shall operate for the length of time needed to evacuate the space, but in no case less than 20 s.

3.2 Inside air foam systems

3.2.1 *Systems for the protection of machinery spaces and cargo pump-rooms*

3.2.1.1 The system shall be supplied by both main and emergency sources of power. The emergency power supply shall be provided from outside the protected space.

3.2.1.2 Sufficient foam-generating capacity shall be provided to ensure the minimum design filling rate for the system is met and in addition shall be adequate to completely fill the largest protected space within 10 min.

3.2.1.3 The arrangement of foam generators shall in general be designed based on the approval test results. A minimum of two generators shall be installed in every space containing combustion engines, boilers, purifiers, and similar equipment. Small workshops and similar spaces may be covered with only one foam generator.

3.2.1.4 Foam generators shall be uniformly distributed under the uppermost ceiling in the protected spaces including the engine casing. The number and location of foam generators shall be adequate to ensure all high risk areas are protected in all parts and at all levels of the spaces. Extra foam generators may be required in obstructed locations. The foam generators shall be arranged with at least 1 m free space in front of the foam outlets, unless tested with less clearance. The generators shall be located behind main structures, and above and away from engines and boilers in positions where damage from an explosion is unlikely.

3.2.2 *Systems for the protection of vehicle, ro-ro, special category and cargo spaces*

3.2.2.1 The system shall be supplied by the ship's main power source. An emergency power supply is not required.

3.2.2.2 Sufficient foam-generating capacity shall be provided to ensure the minimum design filling rate for the system is met and in addition shall be adequate to completely fill the largest protected space within 10 min, except that, for systems for the protection of vehicle and ro-ro spaces and special category spaces with the deck height of 3 metres or less, the filling rate shall be not less than two thirds of the design filling rate and in addition sufficient to fill the largest protected space within 10 min.

3.2.2.3 The system may be divided into sections, however, the capacity and design of the system shall be based on the protected space demanding the greatest volume of foam. Adjacent protected spaces need not be served simultaneously if the boundaries between the spaces are "A" class divisions.

3.2.2.4 The arrangement of foam generators shall in general be designed based on the approval test results. The number of generators may be different, but the minimum design filling rate determined during approval testing shall be provided by the system. A minimum of two generators shall be installed in every space. The foam generators shall be arranged to uniformly distribute foam in the protected spaces, and the layout shall take into consideration obstructions that can be expected when cargo is loaded on board. As a minimum, generators shall be located on every second deck, including movable decks. The horizontal spacing of the generators shall ensure rapid supply of foam to all parts of the protected space. This shall be established on the basis of full scale tests.

3.2.2.5 The foam generators shall be arranged with at least 1 m free space in front of the foam outlets, unless tested with less clearance.

3.3 Systems using outside air

3.3.1 *Systems for the protection of machinery spaces and cargo pump-rooms*

3.3.1.1 The system shall be supplied by both main and emergency sources of power. The emergency power supply shall be provided from outside the protected machinery space.

3.3.1.2 Sufficient foam-generating capacity shall be provided to ensure the minimum design filling rate for the system is met and in addition shall be adequate to completely fill the largest protected space within 10 min.

3.3.1.3 The arrangement of foam delivery ducts shall in general be designed based on the approval test results. The number of ducts may be different, but the minimum design filling rate determined during approval testing shall be provided by the system. A minimum of two ducts shall be installed in every space containing combustion engines, boilers, purifiers, and similar equipment. Small workshops and similar spaces may be covered with only one duct.

3.3.1.4 Foam delivery ducts shall be uniformly distributed under the uppermost ceiling in the protected spaces including the engine casing. The number and location of ducts shall be adequate to ensure all high risk areas are protected in all parts and at all levels of the spaces. Extra ducts may be required in obstructed locations. The ducts shall be arranged with at least 1 m free space in front of the foam delivery ducts, unless tested with less clearance. The ducts shall be located behind main structures, and above and away from engines and boilers in positions where damage from an explosion is unlikely.

3.3.1.5 The arrangement of the foam delivery ducts shall be such that a fire in the protected space will not affect the foam-generating equipment. If the foam generators are located adjacent to the protected space, foam delivery ducts shall be installed to allow at least 450 mm of separation between the generators and the protected space, and the separating divisions shall be class "A-60" rated. Foam delivery ducts shall be constructed of steel having a thickness of not less than 5 mm. In addition, stainless steel dampers (single or multi-bladed) with a thickness of not less than 3 mm shall be installed at the openings in the boundary bulkheads or decks between the foam generators and the protected space. The dampers shall be automatically operated (electrically, pneumatically or hydraulically) by means of remote control of the foam generator related to them, and arranged to remain closed until the foam generators begin operating.

3.3.1.6 The foam generators shall be located where an adequate fresh air supply can be arranged.

3.3.2 *Systems for the protection of vehicle and ro-ro spaces and special category and cargo spaces*

3.3.2.1 The system shall be supplied by the ship's main power source. An emergency power supply is not required.

3.3.2.2 Sufficient foam-generating capacity shall be provided to ensure the minimum design filling rate for the system is met and in addition shall be adequate to completely fill the largest protected space within 10 min, except that, for systems for the protection of vehicle and ro-ro spaces and special category spaces with the deck height of 3 m or less, the filling rate shall be not less than two-thirds of the design filling rate and in addition sufficient to fill the largest protected space within 10 min.

3.3.2.3 The system may be divided into sections, however, the capacity and design of the system shall be based on the protected space demanding the greatest volume of foam. Adjacent protected spaces need not be served simultaneously if the boundaries between the spaces are "A" class divisions.

3.3.2.4 The arrangement of foam delivery ducts shall in general be designed based on the approval test results. The number of ducts may be different, but the minimum design filling rate determined during approval testing shall be provided by the system. A minimum of two ducts shall be installed in every space. The foam generators shall be arranged to uniformly distribute foam in the protected spaces, and the layout shall take into consideration obstructions that can be expected when cargo is loaded on board. As a minimum, ducts shall be led to every second deck, including movable decks. The horizontal spacing of the ducts shall ensure rapid supply of foam to all parts of the protected space. This shall be established on the basis of full scale tests.

3.3.2.5 The system shall be arranged with at least 1 m free space in front of the foam outlets, unless tested with less clearance.

3.3.2.6 The arrangement of the foam delivery ducting shall be such that a fire in the protected space will not affect the foam-generating equipment. If the foam generators are located adjacent to the protected space, foam delivery ducts shall be installed to allow at least 450 mm of separation between the generators and the protected space, and the separating divisions shall be class "A-60" rated. Foam delivery ducts shall be constructed of steel having a thickness of not less than 5 mm. In addition, stainless steel dampers (single or multi-bladed) with a thickness of not less than 3 mm shall be installed at the openings in the boundary bulkheads or decks between the foam generators and the protected space. The dampers shall be automatically operated (electrically, pneumatically or hydraulically) by means of remote control of the foam generator related to them, and arranged to remain closed until the foam generators begin operating.

3.3.2.7 The foam generators shall be located where an adequate fresh air supply can be arranged.

3.4 Installation testing requirements

3.4.1 After installation, the pipes, valves, fittings and assembled systems shall be tested to the satisfaction of the Administration, including functional testing of the power and control systems, water pumps, foam pumps, valves, remote and local release stations and alarms. Flow at the required pressure shall be verified for the system using orifices fitted to the test line. In addition, all distribution piping shall be flushed with freshwater and blown through with air to ensure that the piping is free of obstructions.

3.4.2 Functional tests of all foam proportioners or other foam mixing devices shall be carried out to confirm that the mixing ratio tolerance is within + 30 to -0% of the nominal mixing ratio defined by the system approval. For foam proportioners using foam concentrates of Newtonian type with kinematic viscosity equal to or less than 100 cSt at 0°C and density equal to or less than 1.1 kg/dm³, this test can be performed with water instead of foam concentrate. Other arrangements shall be tested with the actual foam concentrate.

3.5 Systems using outside air with generators installed inside the protected space

Systems using outside air but with generators located inside the protected space and supplied by fresh air ducts may be accepted by the Administration provided that these systems have been shown to have performance and reliability equivalent to systems defined in 3.3. For acceptance, the Administration should consider the following minimum design features:

- .1 lower and upper acceptable air pressure and flow rate in supply ducts;
- .2 function and reliability of damper arrangements;
- .3 arrangements and distribution of air delivery ducts including foam outlets; and
- .4 separation of air delivery ducts from the protected space.

4 FIXED LOW-EXPANSION FOAM FIRE-EXTINGUISHING SYSTEMS

4.1 Quantity and foam concentrates

4.1.1 The foam concentrates of low-expansion foam fire-extinguishing systems shall be approved by the Administration based on the guidelines adopted by the Organization*. Different foam concentrate types shall not be mixed in a low-expansion foam system. Foam concentrates of the same type from different manufacturers shall not be mixed unless they are approved for compatibility.

4.1.2 The system shall be capable of discharging through fixed discharge outlets, in no more than 5 min, a quantity of foam sufficient to produce an effective foam blanket over the largest single area over which oil fuel is liable to spread.

* Refer to the Revised Guidelines for the performance and testing criteria and surveys of low-expansion foam concentrates for fixed fire-extinguishing systems (MSC.1/Circ.1312).

4.2 Installation requirements

4.2.1 Means shall be provided for effective distribution of the foam through a permanent system of piping and control valves or cocks to suitable discharge outlets, and for the foam to be effectively directed by fixed sprayers onto other main fire hazards in the protected space. The means for effective distribution of the foam shall be proven acceptable to the Administration through calculation or by testing.

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

5 The following new paragraphs 2.4 and 2.5 are added after the existing paragraph 2.3:

"2.4 Fixed pressure water-spraying fire-extinguishing systems for vehicle, ro-ro and special category spaces

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

2.5 Fixed water-based fire-fighting systems for ro-ro spaces and special category spaces equivalent to that referred to in resolution A.123(V)

Fixed water-based fire-fighting systems for ro-ro and special category spaces equivalent to that referred to in resolution A.123(V) shall be approved by the Administration based on guidelines developed by the Organization^{**} ."

* Refer to the Recommendation on fixed fire-extinguishing systems for special cargo spaces adopted by the Organization by resolution A.123(V).

** Refer to the Guidelines for approval of fixed water-based fire-fighting systems for ro-ro spaces and special category spaces equivalent to that referred to in resolution A.123(V) (MSC.1/Circ.1272).

CHAPTER 8 AUTOMATIC SPRINKLER, FIRE DETECTION AND FIRE ALARM SYSTEMS

6 In paragraph 2.1.1, after the first sentence, the following words are inserted:

"Control stations, where water may cause damage to essential equipment, may also be fitted with dry pipe sprinklers as permitted by regulation II-2/10.6.1.1 of the Convention."