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**GUIDELINES FOR THE DRAINAGE OF FIRE-FIGHTING WATER FROM  
CLOSED VEHICLE AND RO-RO SPACES AND SPECIAL CATEGORY  
SPACES OF PASSENGER AND CARGO SHIPS**

1 The Committee, at its eighty-sixth session (27 May to 5 June 2009), having considered the proposal by the Sub-Committee on Fire Protection, at its the fifty-third session, with regard to the amendments to SOLAS regulation II-2/20 adopted by resolution MSC.256(84), approved Guidelines for the drainage of fire-fighting water from closed vehicle and ro-ro spaces and special category spaces of passenger and cargo ships, as set out in the annex.

2 Member Governments are invited to apply the annexed Guidelines when approving the drainage systems of fire-fighting water from closed vehicle and ro-ro spaces and special category spaces of passenger and cargo ships, in accordance with paragraphs 6.1.4 and 6.1.5 of SOLAS regulation II-2/20 (resolution MSC.256(84)), and bring them to the attention of ship designers, shipowners, equipment manufacturers, test laboratories and other parties concerned.

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## ANNEX

### GUIDELINES FOR THE DRAINAGE OF FIRE-FIGHTING WATER FROM CLOSED VEHICLE AND RO-RO SPACES AND SPECIAL CATEGORY SPACES OF PASSENGER AND CARGO SHIPS

#### 1 GENERAL

##### 1.1 Purpose

1.1.1 When fixed water-based fire-extinguishing systems are provided for the protection of closed vehicle and ro-ro spaces and special category spaces, adequate drainage facilities, as required by SOLAS regulation II-2/20.6.1.4, should be provided to prevent the accumulation of significant quantities of water on decks and the build-up of free surfaces. In addition, SOLAS regulation II-2/20.6.1.5 requires effective measures to be taken to ensure that floating debris does not cause blockage of the drains.

1.1.2 When the direct overboard discharge provisions or the bilge system required by SOLAS regulation II-1/35-1 have a capacity sufficient for the additional flow from the fixed fire-extinguishing system and the required number of fire hoses, as determined by these Guidelines, additional drainage facilities are not required.

1.1.3 Scuppers, freeing ports, discharges and bilge systems should be installed in accordance with SOLAS regulation II-1/35-1, the relevant regulations of the International Convention on Load Lines, 1966 (ICLL 66), and these Guidelines.

1.1.4 *In lieu* of the above, the Administration, after having given consideration to the ship's arrangement and equipment, may accept other fixed installations if they afford equivalent protection. Any equivalent protection should demonstrate the capability to rapidly drain fire-fighting water from the affected decks and prevent the build-up of free surfaces under expected conditions of trim and list, for as long as the fire-extinguishing system is in operation.

##### 1.2 Application

These Guidelines apply to the design of drainage systems in closed vehicle and ro-ro spaces and special category spaces required by SOLAS regulation II-2/20.6.1.4, and to the protection of drain openings required by SOLAS regulation II-2/20.6.1.5.

#### 2 DEFINITIONS

2.1 *Bilge wells* are recessed areas where water accumulates before entering the bilges.

2.2 *Bulkhead deck* in a passenger ship means the uppermost deck at any point in the subdivision length ( $L_s$ ) to which the main bulkheads and the ship's shell are carried watertight and the lowermost deck from which passenger and crew evacuation will not be impeded by water in any stage of flooding for damage cases defined in regulation 8 and in part B-2 of SOLAS chapter II-1. The bulkhead deck may be a stepped deck. In a cargo ship the freeboard deck may be taken as the bulkhead deck.

2.3 *Drains*, as used in these Guidelines, refer to either scupper wells and scuppers, freeing ports, or bilge wells and drain pipes.

2.4 *Freeing ports* are openings in the bulwarks on the open deck to allow water to drain directly overboard.

2.5 *Scuppers* are a system of gravity deck drains and connected piping leading from scupper wells to the sideshell of the ship or to the bilge system.

2.6 *Scupper wells* are recessed areas in the deck where water accumulates before entering the scuppers.

### 3 DRAINAGE ARRANGEMENTS FOR PASSENGER SHIPS

#### 3.1 Arrangements above the bulkhead deck

3.1.1 Above the bulkhead deck, except as provided in paragraph 1.1.2 above, an adequate number of properly-sized drains should be provided on each deck to ensure that the combined water flow from the fixed fire-extinguishing system and the required number of fire hoses can be rapidly discharged overboard or drain to a bilge system with a reservoir tank fitted with a high water level alarm.

3.1.2 At least four drains should be located on each side of the protected space, uniformly distributed fore and aft. Freeing ports should not be installed in enclosed superstructures, as defined by regulation 3.10 of the ICLL 66.

3.1.3 The drainage system on each side of the deck should have an aggregate capacity of not less than 125% of the maximum flow rate of the fixed fire-extinguishing system water pumps plus the flow from two fire hoses (four if required by SOLAS regulation II-2/19.3.1.2). In case an automatic deep well or submersible pumping system is installed, the bilge pump capacity can be subtracted from the required drainage capacity.

##### 3.1.4 *Minimum capacity of drains*

The minimum capacity of scuppers, freeing ports or a combination thereof should be determined in accordance with the provisions of paragraphs 3.1.4.1 or 3.1.4.2, respectively.

3.1.4.1 The minimum required area of scuppers and connected piping should be determined by the following formula:

$$A = \frac{Q}{0.5\sqrt{19.62(h - \sum h_i)}}$$

where:

$A$  is the total required sectional area of the drains on each side of the deck in m<sup>2</sup>;

$Q$  is the combined waterflow from the fixed fire-extinguishing system and the required number of fire hoses in m<sup>3</sup>/s;

$h$  is the elevation head difference between the bottom of the scupper well or suction level and the overboard discharge opening or highest approved load line in m; and

$\sum h_l$  is the summation of head losses corresponding to scupper piping, fittings and valves in m.

In no case should the area of each individual drain be less than 0.0078 m<sup>2</sup> or 125 mm diameter piping.

3.1.4.2 The minimum required area of freeing ports should be determined by the following formula:

$$A = \frac{Q}{0.5\sqrt{19.62(h_1 - h_2)}}$$

where:

$A$  is the total required sectional area of freeing ports on each side of the ship in m<sup>2</sup>;

$Q$  is the combined waterflow from the fixed fire-extinguishing system and the required number of fire hoses in m<sup>3</sup>/s; and

$h_1-h_2$  is the depth of water on the deck determined in accordance with paragraph 4.2.

If the cross-sectional area of freeing ports required by the ICLL 66 is equal to or greater than determined above, additional freeing ports are not required.

## 3.2 Arrangements below the bulkhead deck

3.2.1 Below the bulkhead deck, except as provided in paragraph 1.1.2 above, an efficient bilge pumping system should be provided to ensure that the combined waterflow from the fixed fire-extinguishing system and the required number of fire hoses can be rapidly collected and led to suitable arrangements for discharge overboard. The bilge system capacity should be not less than that required by paragraph 3.2.3.

3.2.2 The bilge piping system should be arranged in accordance with SOLAS chapter II-1. At least four bilge wells should be located on each side of the protected space, uniformly distributed fore and aft.

3.2.3 The bilge pumping system on each side of the ship should have an aggregate capacity of not less than 125% of the maximum flow rate of the fixed fire-extinguishing system water pumps plus the flow from two fire hoses (four, if required by SOLAS regulation II-2/19.3.1.2).

3.2.4 The required area of the main and branch bilge pipes for the protected space should be adequate to ensure a maximum waterflow of 2 m/s in each section of piping in accordance with paragraphs 3.2.4.1 to 3.2.4.3.

3.2.4.1 If the drainage system is a bilge pumping system, the following three criteria should be satisfied:

$$\sum Q_{bpump} \geq 1,25Q$$

$$A_M \geq 0,625Q \text{ \&}$$

$$\sum A_B \geq 0,625Q$$

where:

$Q_{bpump}$  is the combined capacity of all power bilge pumps except the emergency bilge pump in m<sup>3</sup>/s;

$Q$  is the combined waterflow from the fixed fire-extinguishing system and the required number of fire hoses in m<sup>3</sup>/s;

$A_M$  is the sectional area of the main bilge pipe of the protected space in m<sup>2</sup>;

$\sum A_B$  is the total sectional area of branched bilge pipes for each side in m<sup>2</sup>.

3.2.4.2 If the drainage system is based on gravity drains leading to a reservoir tank, the minimum required area of drains and connected piping should be determined by paragraph 3.1.4.

3.2.4.3 If the drainage system is a combined system, the relevant dimensioning for each part of the system should be determined using paragraphs 3.2.4.1 and 3.2.4.2.

3.2.5 The required capacity of each bilge well should be at least 0.15 m<sup>3</sup>.

3.2.6 If the system includes a reservoir tank, the tank should have adequate capacity for at least 20 min of operation at the required drainage capacity for the affected space.

#### **4 DRAINAGE ARRANGEMENTS FOR CARGO SHIPS**

4.1 In cargo ships, the drainage and pumping arrangements should be such as to prevent the build-up of free surfaces in accordance with paragraph 3.1 or 3.2, as appropriate.

4.2 If the abovementioned pumping arrangement is not possible, the adverse affect upon stability of the added weight and free surface of water should be taken into account according to the International Code on Intact Stability, 2008, chapter 3.

For that purpose, the depth of water ( $h_1 - h_2$ ) on each deck should be calculated by multiplying the maximum flow rate of the installed fire-extinguishing system water pumps plus the flow from two fire hoses (four if required by SOLAS regulation II-2/19.3.1.2) by an operating time of 30 min. This volume of water should be divided by the area of the affected deck.

## **5 PROTECTION OF DRAIN OPENINGS**

5.1 An easily removable grating, screen or other means should be installed over each drain opening in the protected spaces to prevent debris from blocking the drain. The total open area ratio of the grating to the attached drain pipe should be at least 6 to 1. The grating should be raised above the deck or installed at an angle to prevent large objects from blocking the drain. No dimension of the individual openings in the grating should be more than 25 mm.

5.2 No grating or screen is required when a fixed mechanical system is provided to unblock the drainage system, or when other than a gravity drain system is provided with its own filter.

5.3 A clearly visible sign or marking should be provided not less than 1,500 mm above each drain opening stating, "Drain opening – do not cover or obstruct". The marking should be in letters at least 50 mm in height.

## **6 TESTING**

The drainage facilities on ro-ro passenger ships should be functionally tested before the ship enters service to verify that the capacity of the system is adequate. The drainage facilities on all ships should be periodically visually examined for blockage or other damage and should be flushed with fire hoses or similar means to verify that the system is functional, if obstructions are noted.

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