

**PART II RULES FOR THE CONSTRUCTION  
AND CLASSIFICATION OF SHIPS IDENTIFIED BY  
THEIR MISSIONS**

**TITLE 21 PASSENGER SHIPS**

**SECTION 6 PIPING**

CAPÍTULOS

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## CHAPTER A APPROACH

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#### A1. APPLICATION

##### 100. Piping systems

101. The present section provides additional requirements to Part II, Title 11, Section 6 of the Rules for the Construction and Classification of Steel Vessels Intended for Navigation on the Open Sea of the RBNA.

102. Unless otherwise stated, all the requirements of Part II, Title 11, Section 6 of the Rules for the Construction and Classification of Steel Vessels Intended for Navigation on the Open Sea of the RBNA are to be complied in their entirety.

#### A2. DEFINITIONS

##### 100. Additional definitions for the present Title 21, Section 6

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

202. **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. The bulkhead deck may be a stepped deck. In a cargo ship the freeboard deck may be taken as the bulkhead deck.

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

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

205. **SOLAS** means the IMO International Convention for the Safety of Life at Sea

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

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

## CHAPTER F

### SHIP PIPING SYSTEMS

#### CHAPTER CONTENTS

- F1. BILGE PIPING AND DRAINAGE
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#### F1. BILGE PIPING AND DRAINAGE [SOLAS II-1/C/35-1]

##### 100. Principles

101 to 104 – See Title 11

105. The present Subchapter F1 includes additional requirements to the regulations of Part II, Title 11, Section 6, Chapter item F.1 101 to 104

##### 200. Arrangement – Passenger ships

201. An efficient bilge pumping system shall be provided, capable of pumping from and draining any watertight compartment other than a space permanently appropriated for the carriage of fresh water, water ballast, oil fuel or liquid cargo and for which other efficient means of pumping are provided, under all practical conditions. Efficient means shall be provided for draining water from insulated holds.

202. Sanitary, ballast and general service pumps may be accepted as independent power bilge pumps if fitted with the necessary connections to the bilge pumping system.

203. All bilge pipes used in or under coal bunkers or fuel storage tanks or in boiler or machinery spaces, including spaces in which oil-settling tanks or oil fuel pumping units are situated, shall be of steel or other suitable material.

204. The arrangement of the bilge and ballast pumping system shall be such as to prevent the possibility of water passing from the sea and from water ballast spaces into the cargo and machinery spaces, or from one compartment to another. Provision shall be made to prevent any deep tank having bilge and ballast connections being inadvertently flooded from the sea when containing cargo, or being discharged through a bilge pump when containing water ballast.

205. All distribution boxes and manually operated valves in connection with the bilge pumping arrangements shall be in positions which are accessible under ordinary circumstances.

206. Provision shall be made for the drainage of enclosed cargo spaces situated on the bulkhead deck of a passenger ship and on the freeboard deck of a cargo ship, provided that the RBNA may permit the means of drainage to be dispensed with in any particular compartment of any ship or class of ship if it is satisfied that by reason of size or internal subdivision of those spaces the safety of the ship is not thereby impaired.

- a. Where the freeboard to the bulkhead deck or the freeboard deck, respectively, is such that the deck edge is immersed when the ship heels more than 5°, the drainage shall be by means of a sufficient number of scuppers of suitable size discharging directly overboard, fitted in accordance with the requirements of SOLAS regulation 15 in the case of a passenger ship and the requirements for scuppers, inlets and discharges of the International Convention on Load Lines in force in the case of a cargo ship.
- b. Where the freeboard is such that the edge of the bulkhead deck or the edge of the freeboard deck, respectively, is immersed when the ship heels 5° or less, the drainage of the enclosed cargo spaces on the bulkhead deck or on the freeboard deck, respectively, shall be led to a suitable space, or spaces, of adequate capacity, having a high water level alarm and provided with suitable arrangements for discharge overboard. In addition it shall be ensured that:
  - b.1. the number, size and disposition of the scuppers are such as to prevent unreasonable accumulation of free water;
  - b.2. the pumping arrangements required by this regulation for passenger ships or cargo ships, as applicable, take account of the requirements for any fixed pressure water-spraying fire extinguishing system;
  - b.3. water contaminated with petrol or other dangerous substances is not drained to machinery spaces or other spaces where sources of ignition may be present; and
  - b.4. where the enclosed cargo space is protected by a carbon dioxide fire extinguishing system

the deck scuppers are fitted with means to prevent the escape of the smothering gas.

- b.5. Provisions for the drainage of closed vehicle and ro-ro spaces and special category spaces shall also comply with SOLAS regulations II-2/20.6.1.4 and II-2/20.6.1.5.

207. For passenger ships, the bilge pumping system required by F1.201 shall be capable of operation under all practicable conditions after a casualty whether the ship is upright or listed. For this purpose wing suction shall generally be fitted except in narrow compartments at the end of the ship where one suction may be sufficient. In compartments of unusual form, additional suction may be required. Arrangements shall be made whereby water in the compartment may find its way to the suction pipes. Where, for particular compartments, the RBNA is satisfied that the provision of drainage may be undesirable, it may allow such provision to be dispensed with if calculations made in accordance with the conditions laid down in Pat II, Title 21, Section 1, H6.300\_H6.800 show that the survival capability of the ship will not be impaired.

### 300. Bilge pumps

301. At least three power pumps shall be fitted connected to the bilge main, one of which may be driven by the propulsion machinery.

302. Where the bilge pump numeral is 30 or more, one additional independent power pump shall be provided.

303. The bilge pump numeral shall be calculated as follows:

304. When  $P_1$  is greater than  $P$

$$\text{Bilge pump numeral} = 72 [(M+2P_1)/(V + P_1 - P)]$$

305. In other cases, bilge pump numeral will be given by the formula:

$$\text{Bilge pump numeral} = 72 [(M+2P_1)/V]$$

where:

$L$  = the length of the ship (metres), as defined in regulation 2;

$M$  = the volume of the machinery space (cubic metres), that is below the bulkhead deck; with the addition thereto of the volume of any permanent oil fuel bunkers which may be situated above the inner bottom and forward of, or abaft, the machinery space;

$P$  = the whole volume of the passenger and crew spaces below the bulkhead deck (cubic metres), which are provided for the accommodation and use of passengers and crew, excluding baggage, store, provision and mail rooms;

V = the whole volume of the ship below the bulkhead deck (cubic metres);

$P1 = KN$ ,  
where:

N = the number of passengers for which the ship is to be certified; and

$K = 0.056L$

306. However, where the value of KN is greater than the sum of P and the whole volume of the actual passenger spaces above the bulkhead deck, the figure to be taken as P1 is that sum or two-thirds KN, whichever is the greater.

307. Where practicable, the power bilge pumps shall be placed in separate watertight compartments and so arranged or situated that these compartments will not be flooded by the same damage. If the main propulsion machinery, auxiliary machinery and boilers are in two or more watertight compartments, the pumps available for bilge service shall be distributed as far as is possible throughout these compartments.

308. On a ship of 91.5 m in length and upwards or having a bilge pump numeral, calculated in accordance with F1.301, of 30 or more, the arrangements shall be such that at least one power bilge pump shall be available for use in all flooding conditions which the ship is required to withstand, as follows:

- a. one of the required bilge pumps shall be an emergency pump of a reliable submersible type having a source of power situated above the bulkhead deck; or
- b. the bilge pumps and their sources of power shall be so distributed throughout the length of the ship that at least one pump in an undamaged compartment will be available.

309. With the exception of additional pumps which may be provided for peak compartments only, each required bilge pump shall be so arranged as to draw water from any space required to be drained in Part II, Title 11, Section 6, Chapter F.1 requires that is to be drained.

310. Each power bilge pump shall be capable of pumping water through the required main bilge pipe at a speed of not less than 2 m/s. Independent power bilge pumps situated in machinery spaces shall have direct suction from these spaces, except that not more than two such suction shall be required in any one space. Where two or more such suction are provided, there shall be at least one on each side of the ship. The RBNA may require independent power bilge pumps situated in other spaces to have separate direct suction. Direct suction shall be suitably arranged and those in a machinery space shall be of a diameter not less than that required for the bilge main.

319. In addition to the direct bilge suction or suction required by item F1.318, a direct suction from the main circulating pump leading to the drainage level of the machinery space and fitted with a non-return valve shall be provided in the machinery space. The diameter of this direct suction pipe shall be at least two thirds of the diameter of the pump inlet in the case of steamships, and of the same diameter as the pump inlet in the case of motorships.

320. Where in the opinion of the RBNA the main circulating pump is not suitable for this purpose, a direct emergency bilge suction shall be led from the largest available independent power driven pump to the drainage level of the machinery space; the suction shall be of the same diameter as the main inlet of the pump used. The capacity of the pump so connected shall exceed that of a required bilge pump by an amount deemed satisfactory by the RBNA.

**400. Diameter of the bilge main  
[MSC.1/Circ.1320]**

401. to 402 – These two items in Part II, Title 11, Section 6, Sub-Chapter F1 do not apply to passenger ships.

402. The diameter d of the bilge main shall be calculated according to the following formula. However, the actual internal diameter of the bilge main may be rounded off to the nearest standard size acceptable to the RBNA:

$$d = 25 + 1,68 L(B + D)$$

where:

**d** is the internal diameter of the bilge main (in millimetres).

**L** and **B** are the length and the breadth of the ship (metres), as defined in Part II, Title 11, Section 1, Chapter A, sub-chapter A.2, and

**D** is the moulded depth of the ship to the bulkhead deck (metres) provided that, in a ship having an enclosed cargo space on the bulkhead deck which is internally drained in accordance with the requirements of F1.222 to 224 above, and which extends throughout the length of the vessel, D shall extend for the full length of the ship, D shall be measured to the next deck above the bulkhead deck. Where the enclosed cargo spaces cover a lesser length, D shall be taken as the moulded depth to the bulkhead deck plus  $l_h/L$  where l and h are the aggregate length and height respectively of the enclosed cargo spaces (metres). The diameter of the bilge branch pipes shall meet the requirements of the RBNA.

**500. Drainage arrangements for passenger ships above the bulkhead deck  
[MSC.1/Circ.1320]**

501. Above the bulkhead deck 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.

502. 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.

503. 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.

504. **Minimum capacity of drains**  
[MSC.1/Circ.1320]

a. The minimum capacity of scuppers, freeing ports or a combination thereof should be determined in accordance with the provisions of paragraphs F1.504.a.i or F1.504.a.ii, respectively.

a.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  $m^2$ ;

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

$h$  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

$\sum h_i$  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  $0.0078 m^2$  or 125 mm diameter piping.

a.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  $m^2$ ;

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

$h_1 - h_2$  is the depth of water on the deck.

b. 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.

**600. Drainage arrangements for passenger ships below the bulkhead deck**  
[MSC.1/Circ.1320]

601. Below the bulkhead deck, except as provided in F1.601 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 F1.603.

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

603. 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).

604. 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 F1.604.a to F1.604.c.

a. 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  $m^3/s$ ;

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



$A_m$  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>.

- b. 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 F1.504 above.
- c. If the drainage system is a combined system, the relevant dimensioning for each part of the system should be determined using F1.604.b

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

606. 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.

### **700. Protection of drain openings [MSC.1/Circ.1320]**

701. 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.

702. 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.

703. 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.

## **F3. BALLAST**

### **100. Application**

101. See Title 11.

102. Water ballast is not in general to be carried in tanks for fuel oil (Part II, Title 11, Section 6, item F3.101). In ships which is not practicable to prevent the ballasting of fuel oil tank, an oily water separator equipment are to be provided to satisfy the Classifier, or other alternative means such as discharge into ground facilities for receiving the oily water acceptable by the Classifier.

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