

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

**TITLE 111      FIRE-FIGHTING (Fi-Fi)**

**SECTION 6      PIPING**

CHAPTERS

- A      APPROACH
- B      MATERIALS AND WORKMANSHIP  
        - See Part II, Title 11, Section 6
- C      PRINCIPLES FOR THE CONSTRUCTION  
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- D      PRINCIPLES FOR THE DIMENSIONING  
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## CHAPTER A APPROACH

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- 

### A1. APPLICATION

#### 100. Application

101. The requirements of this Title 111, Section 6 apply to pipes and equipments for fighting external fires and are complementary to the requirements of Part II, Title 11, Section 6.

## CHAPTER G MACHINERY PIPING

### CHAPTER CONTENTS

- G1. FUEL OIL
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  - G9. USE OF AMMONIA AS A REFRIGERANT  
- See Part II, Title 11
- 

### G1. FUEL OIL

#### 100. Capacity of fuel oil on ships Fi-Fi

101. All vessels with notation Fi-Fi Class1, Class 2 and Class 3 are to be equipped with fuel oil tanks with sufficient capacity to fight fires with monitors operating continuously for a period not less than:

- a. 24 hours for vessels with notation Fi-Fi class 1;
- b. 96 hours for vessels with class notation Fi-Fi-2 and Fi-Fi-3.

102. This capacity is to be added to the capacity required for normal operation of the ship (propulsion, auxiliaries, etc.).

103. The calculation is to be submitted to RBNA for approval.

## CHAPTER I EXTERNAL FIRE-FIGHTING

### CHAPTER CONTENTS

11. EQUIPMENT OF SELF-PROTECTION AND EXTERNAL FIRE-FIGHTING
12. PIPES FOR WATER
13. PUMPS AND MONITORS
14. FOAM MONITOR SYSTEM
15. HIDRANTS AND FIRE BOXES AND FIRE-FIGHTER'S OUTFITS

## 11. EQUIPMENT OF SELF-PROTECTION AND EXTERNAL FIRE FIGHTING

### 100. Characteristics of the equipments

101. The requirements for class notations for fighting external fires and their characteristics are shown in Tables T.II.101.1, T.II.101.2, T.II.101.3 and T.II.101.4.

**TABLE T.II.101.1 – REQUIRED CHARACTERISTICS FOR FIRE FIGHTING SYSTEM WITH WATER MONITORS**

Required	Class 1 Fi-Fi	Class 2 Fi-Fi		Class 3Fi-Fi
Minimum number of monitors	2	3	4	4
Minimum discharge flow per monitor (m <sup>3</sup> /h) (1)	1200	2400	1800	2400
Minimum number of pumps for fighting external fires	1	2		2
Minimum capacity of pumps for fighting external fires (m <sup>3</sup> /h)	2400	7200		9600
Minimum water-jet reach of the monitor (m) (2) (4)	120	150		150
Minimum water-jet height of the monitor (m)(3) (4)	45	70		70

#### Observations

- 1 When the pumps are also used for the self protection spray, their capacity is to be calculated to meet both systems simultaneously at the specified capacity.
- 2 Horizontal distance from the monitor nozzle to the center of the impact area.
- 3 Measured vertically from the water surface, the average horizontal distance to the impact area being measured to 70 meters
- 4 The vertical distance with simultaneous operation of the monitors required acting in the same direction.

**TABLE T.II.101.2 – REQUIRED CHARACTERISTICS FOR FIRE-FIGHTING SYSTEM WITH FOAM MONITORS**

Required	Class 1 Fi-Fi	Class 2 Fi-Fi		Class 3Fi-Fi
Minimum number of monitors	-	-	-	2
Duration time of the foam concentrate on board (min) (1)	-	-	-	30 (1)
Minimum capacity of the foam monitors (l/min)	-	-		5000
(1) Minimum time of delivery with the monitors operating in the nominal capacity				

**TABLE T.II.101.3 – REQUIRED CHARACTERISTICS FOR FIRE-FIGHTING SYSTEM WITH PORTABLE FOAM GENERATORS**

Required	Class 1 Fi-Fi	Class 2 Fi-Fi	Class 3 Fi-Fi
Minimum number of monitors	-	1	1
Duration time of the foam concentrate on board (min) (1)	-	30 (1)	30 (1)
Minimum capacity of the foam generators (m <sup>3</sup> /min)	-	100	100
(1) Minimum time of delivery with the monitors operating in the nominal capacity.			

**TABLE T.II.101.4 – REQUIRED CHARACTERISTICS FOR FIRE-FIGHTING SYSTEM**

Required	Class 1 Fi-Fi	Class 2 Fi-Fi	Class 3 Fi-Fi
Minimum number of hydrants at each side of the ship (units)	4	8	81
Fire-fighter's outfit (complete sets)	4	8	8
Fuel supply (hours of operation)	24	96	96
(1) Minimum time of delivery with the monitors operating in the nominal capacity.			

## 12. SELF PROTECTION WATER SPRAY SYSTEM

### 100. Self protection water spray systems

101. The provisions of this item I1.100 apply to self-protection spray systems for ships with Class 1 notation Fi-Fi. They complement the requirement for fixed fire fighting spray systems of Part II, Title 11, Section 6, Chapter F, item F2.900.

102. The water spray system is to be capable of protecting all external surfaces of ship in the lightweight condition, as well as superstructures and deck houses, the platforms of the monitors and their accesses, the deck areas over machinery spaces and spaces in which combustible material are to be stored. Is to be installed so as not to impair the visibility necessary to the bridge and the to remote control station of the monitors during the spraying operation;

103. The capacity of the spray system is 10 liters per minute per square meter of surface to be protected. In areas where there is A-60 insulation, the capacity of the self protection spray may be reduced to 5 liters per minute per square meter.

104. The self protection spray system is to be divided so that the sections not exposed to radiation due to heat can be isolated and cut off.

105. The nozzles are to be uniformly distributed so that the entire area to be protected is covered by the spray.

106. The pumps supplying the water to monitors might also be used for the spray system since the capacity of these

pumps is increased by a rate at least equal to the increase in demand.

107. The self-protection fixed piping spray system is to be effectively protected against corrosion by means of galvanization or equivalent means.

## 13. WATER PIPING SYSTEMS FOR FIGHTING EXTERNAL FIRE

### 100. Sea chests for the supply of water to the monitors

101. Sea chests to pumps for fire-fighting are not to be used for other applications.

102. They are not to be affected by the movements of ships, or by water jets from side impellers intended to maintain the vessel's position.

103. They are to be located as low as possible and one on each board side.

104. They are to be provided with filters having pass-through area at least twice that of the suction valve.

105. They are to be provided with means for cleaning of sea chests.

### **200. Piping system for the supply of water for fighting external fire**

201. The fire-fighting systems shall be in accordance with Part II, Title 11, Section 6, Sub Chapter D3.

202. The maximum speed of the circulation of water within the pipes is not to exceed 2 m / s.

203. Means are to be provided to ensure adequate protection against corrosion of all pipes from the suction up to the water monitors.

204. It is also to be provided means against external corrosion of pipes exposed to the weather.

205. The suction lines are to be as short as possible.

206. The water supply for the ship's main systems is not to be affected by the operation of the system of fighting external fires.

207. Each one of the pumps supplying the monitors is to be connected to at least one sea chest intended for the system of fighting external fires.

### **300. Valves**

301. Suction valves and distribution valves that have diameters larger than 450 mm are to be provided with electrical or hydraulic systems with remote control as well as a manual overriding device.

302. The control of the suction and distribution valves is to be carried out from the same space.

### **400. Pumps**

401. Means are to be provided to prevent overheating of pumps for fighting of external fires when operating at low flow rates.

402. The pumps supplying the Fi-Fi system are to be installed so that their operation and accessibility be not affected by smoke or radiation during the operation of fire-fighting.

403. The Fi-Fi pumps are to be provided with inter-locking device that prevents starting when the suction valve is closed, or, otherwise, triggers audible and visual alarm.

404. If the vessel be provided with two fire pumps one of them may be used for the spraying system provided that the total capacity of the coupled pumps meets the requirements of users. The pumps of the monitors may also be used for the

spray system. In both cases, they are to be provided with valve for secreting systems.

405. It is to be ensured that half of the hoses can be operated simultaneously with 5 bar pressure at the nozzle exit.

### **500. Monitors**

501. The monitors are to be type approved.

502. The monitors are to be of robust construction to undergo the reaction to the water jet. The foundation for the monitors is to be designed taking into account the efforts exerted by the reaction to the water jet.

503. The monitors are to spurt a concentrated stream of water when operating at rated capacity. The stream is to be continuous without pulsation.

504. The monitors are to be equipped with a remote control system operated from a control station with adequate visibility. Additionally, they are to be equipped with a manual control system for each monitor, enabling the disconnection of the manual control from the control station, and disconnecting the remote control system in a location next to each monitor

505. The control system of the monitors is to be in accordance with the applicable requirements of Part II, Title 52, Chapter A, Sub Chapter A4. They are to be designed with a level of redundancy so that a function that has been lost can be restored within 10 minutes maximum.

506. In the case of hydraulic or pneumatic control systems for the monitors, the generating unit of the control system is to be duplicated.

507. Monitors are to be directed fore and aft. They are to be able to move at an angle of 45 degrees to each side. The angle of vertical movement is to permit that the height specified in Table T.II.101.1 be reached. Within the range of movement of the ship there are to be no obstacles such as masts, deckhouses, stacks, etc..

508. Electric circuits of control are to be independent of each other. In systems with electric control, an independent control circuit is to be provided for each control unit.

509. The valve controls are to be designed and installed so to avoid strong shock loads ("hydraulic hammer").

510. At least two monitors are to be equipped with device for dispersing the jet (jet spray).



## **I4. FOAM MONITOR SYSTEM**

### **100. Application**

101. The foam system is to be in accordance with the requirements of Part II, Title 32, Section 6, Chapter F, Sub Chapter F2, and also the requirements of this Part II, Title 49, Chapter I, Sub Chapter I4.

### **200. Foam monitor fixed system**

201. The foam monitors are to be type approved.

202. The minimum capacity of each monitor of fixed system of foam monitors is to be 5000 liters per minute (300 m<sup>3</sup>/hour) of foam solution.

203. The expansion rate of the foam is not be greater than 12

204. There has to be a sufficient quantity of foam for 30 minutes of fire-fighting. When calculating this capacity, the concentration ratio of the foam is to be assumed to be 5%.

205. The minimum height of the foam jet is to be 50 meters, with both monitors operating simultaneously

206. The concentration of low-expansion foam is to be of the alcohol-resistant type and suitable for fire-fighting oil and chemicals.

207. The installation of foam generation, including the piping, is to be fixed (permanently installed) with a foam concentrate tank, mixers and piping for the separate monitors.

208. Control of foam monitors: it is to be similar to the item I3.500 above.

### **300. Portable equipment for generating foam**

301. It has to be in accordance with the requirements of Part II, Title 32, Section 6, Chapter F, Sub Chapter F2, and also the requirements of this Part II, Title 49, Chapter I, Sub Chapter I4.

302. The portable generators required by Table T.I1.101.3 are to be designed to supply 100 m<sup>3</sup> per minute of high expansion foam.

303. The foam concentrate of high expansion shall be of the type suitable for fires in engine rooms and similar hazard-ous areas.

304. The concentrate foam is to be stored in an easily accessible location in recipients with 20 liter capacity each.

## **I5. HIDRANTS AND FIRE BOXES AND FIRE-FIGHTER'S OUTFITS**

### **100. Hidrants**

101. The allowance of hydrants for Fi-Fi ships is to be in accordance with:

- a. Class 1 notation Fi-Fi: 4 of each side
- b. Class 2 notation Fi-Fi: 8 of each side
- c. Class 3 notation Fi-Fi: 8 of each side (see note)
- d. Cap notation Fi-Fi: 4 of each side

Note: it may be increased to 10 according to the ship's length.

102. At least half of the hydrants specified in I5.101 is to be installed in the weather deck.

103. When the hydrants are connected to monitor's mains, pressure reducing devices are to be installed that permit the safe operation of the hoses.

### **200. Fire hose boxes**

201. It has to be installed at least one hose box for every two hydrants.

202. The boxes are to contain two hoses of 20 meters with a diameter of 45 mm or 70 mm.

203. The boxes are to contain hose nozzles of dual operation (solid jet or fog).

### **300. Fire-fighter's outfits**

301. Fire-fighter's outfits are to be in accordance with SOLAS 88 as amended, Chapter II-2, Regulation 10, paragraph 10 (Part II, Title 11, Section 3, Chapter F, F6.300).

302. Compressed air self-contained breathing device: It is to be equipped with compressed air breathing device with 3600 liters of air for each breathing device, including the reserve cylinders, all of the adequate type and approved. It is to be provided with one compressor with capacity of at least 300 liters per minute with fittings that enable the filling of 4 cylinders simultaneously, installed in an adequate location on the ship.

303. The number of fire-fighter's outfits is given in Table T.I1.101.4, and is not to be less than required by SOLAS 88 as amended, Chapter II-2, Regulation 10, paragraph 10 or by NORMAM 01.

304. The fire-fighter's outfits are to be installed in a special compartment, clearly marked and accessible through the weather deck, ready for immediate use.

305. The storage room of the fire-fighter's outfits is to be adequately ventilated.

## CHAPTER T TESTS

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T1. APPROACH  
- See Title 11

T2. PIPING  
- See Title 11

T3. EQUIPMENTS  
- See Title 11

T4. FITTINGS  
- See Title 11

T5. SPECIAL TESTS FOR LOADING AND  
UNLOADING PIPING SYSTEMS  
- See Title 11

T6. TESTS FOR EXTERNAL FIRE-FIGHTING SYS-  
TEMS

### T6. TESTS FOR EXTERNAL FIRE-FIGHTING SYSTEMS

#### 100. Tests and surveys

101. After completion of the installation, an operational test is to be carried out to confirm system performance.

102. The inclination angle of the ship with monitors in operation is to be determined based on the most unfavorable conditions.

#### 200. Tests in the manufacturer's place

201. The materials used for the fire pumps' casing are to be subjected to mechanical tests at room temperature in accordance with the requirements for testing the pumps and castings (or forged), Part III, Title 62, Section 5, in the Sub Chapter in accordance with the relevant material used and its composition.

202. Materials used in pipe lines, valves and other fittings are to be tested conform the requirements of Part III, Title 62, Section 6 for pipes and fittings.

203. Upon completion of manufacture and before installation on board the pipes, valves, fittings and pump casings are to be subjected to hydrostatic tests in accordance with the requirements of Part III, Title 62, Sections 5 and 6.

#### 300. Initial Tests on Board

301. After assembly on board, the fire water systems and fixed foam system are to be checked for leaks when subjected to pressure of operation.

302. The fire water systems and foam fixed system are to be subjected to an operational test on board to confirm their characteristics and performance.

303. The propulsion system and maneuvers is to be tested for its capacity of maintaining the ship in position with all monitors in operation using no more than 80% of its propulsive power.

#### 400. Annual Survey

401. Annually all the equipments required for the notations Fi-Fi are to be submitted to a visual inspection and an operational test.

#### 500. Renewal Survey

501. During the class renewal survey, the fire pumps and their drive motors are to be inspected in accordance with the criteria of Part I, Title 02, Section 2, Chapter C, C2.500 for pumps and auxiliary engines.

502. The sea chests, valves and filters are to be inspected in accordance with Part I, Title 02, Section 2, Chapter C, C4.200.

503. After the survey, an operational testing is to be carried out.

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