

# RUSSIAN MARITIME REGISTER OF SHIPPING

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## RULES FOR THE EQUIPMENT OF SEA-GOING SHIPS

### PART IV RADIO EQUIPMENT

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Rules for the Equipment of Sea-Going Ships of Russian Maritime Register of Shipping have been approved in accordance with the established approval procedure and come into force on 1 January 2019.

The present edition of the Rules is based on the 2018 edition taking into account the amendments developed immediately before publication.

The unified requirements, interpretations and recommendations of the International Association of Classification Societies (IACS) and the relevant resolutions of the International Maritime Organization (IMO) have been taken into consideration.

The Rules are published in the following parts:

Part I "Survey Regulations";

Part II "Life-Saving Appliances";

Part III "Signal Means";

Part IV "Radio Equipment";

Part V "Navigational Equipment".

All parts of the Rules are published in electronic format in Russian and English. In case of discrepancies between the Russian and English versions, the Russian version shall prevail.

*As compared to the 2018 edition, the present edition of the Rules contains the following amendments.*

## **RULES FOR THE EQUIPMENT OF SEA-GOING SHIPS**

### **PART IV. RADIO EQUIPMENT**

**1.** Section 6 has been supplemented by Chapter 6.13 in compliance with the requirements to Ship Earth Stations (SES) for using in the GMDSS depending on the date of installation.

**2.** Section 8: para 8.1.21 has been amended;

para 8.1.23 has been amended by the requirements to NAVTEX receivers in compliance with the requirements of IMO resolution MSC.430(98);

paras 8.2.2, 8.2.12, 8.2.13, 8.2.14 have been amended by the requirements to emergency group call (EGC) receiver in compliance with the provisions of IMO resolution MSC.431(98);.

**3.** Editorial amendments have been made.

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# PART IV. RADIO EQUIPMENT

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## 1 GENERAL

### 1.1 APPLICATION

**1.1.1** The requirements of the present Part of the Rules apply to:

- .1** passenger and cargo ships engaged and not engaged in international voyages;
- .2** catching ships (fishing vessels, taking-over and transport ships, auxiliary and special purpose ships);
- .3** ships of river-sea navigation;
- .4** non-self-propelled ships with people on board towed or pushed at sea, or intended for prolonged anchorage outside the port water area and roads.

**1.1.2** The requirements of the present Part of the Rules apply to radio equipment which is subject to survey by the Register and intended for installation on board ships.

**1.1.3** The present Part of the Rules defines the technical requirements which the radio equipment shall comply with and specifies the list of such equipment, its arrangement on board and the maintenance and repair methods.

**1.1.4** The requirements of the present Part of the Rules apply to the ships and radio equipment whose technical documentation was submitted to the Register for review and approval after the entry into force of the Rules.

Ships under construction and the radio equipment whose technical documentation was approved by the Register prior to the entry into force of the Rules shall be subject to the Rules in force at the time of approval of the documentation unless specified otherwise in the relevant sections and chapters of the Rules.

**1.1.5** No provision in this part of the Rules shall prevent the use by any ship, survival craft or person in distress, of any means at their disposal to attract attention, make known their position and obtain help.

### 1.2 DEFINITIONS AND EXPLANATIONS

**1.2.1** Definitions and explanations relating to general and technical terminology of the Rules are given in Part I "Classification" of the Rules for the Classification and Construction of Sea-Going Ships, in Part I "General Regulations for Technical Supervision" of the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships and in Radio Regulations accordingly.

**1.2.2** For the purpose of the present Part of the Rules, the following definitions have been adopted.

**Emergency position-indicating radio beacon (EPIRB)** is a station of the mobile service the emissions of which serve to facilitate search and rescue.

**Starting period** is the time necessary for radio equipment to become operational as measured from the moment of switching on the source of electrical power.

**Secondary means of alerting** is the means of initiating the transmission of ship-to-shore distress alerts by a separate and independent system.

**Global Maritime Distress and Safety System (GMDSS)** is an international radio communication system developed by the International Maritime Organization (IMO) whose requirements are brought to Amendments 1988-1989 to Chapter IV "Radio Communication" of the International Convention for the Safety of Life at Sea, 1974, and in present Part of the Rules.

**Two independent actions to initiate the distress alert:** lifting of the protective lid or cover is considered as the first independent action. Pressing the dedicated button for initiating the distress alert is considered as the second independent action.

**Additional channel** is the channel which is used in the absence of a signal at the priority channel.

**Global Maritime Distress and Safety System identities** means maritime mobile services identity, the ship's call sign, INMARSAT identities and serial number identity which may be transmitted by the ship's equipment and used to identify the ship.

**Radiated interference** is interference radiated by the casings of equipment, except for radiation of aerials.

**INMARSAT** is the Organization established by the Convention on the International Maritime Satellite Organization (INMARSAT) adopted on 3 September 1976. Since 9 December 1994 International Mobile Satellite Organization.

**Maritime safety information (MSI)** means navigational and meteorological warnings, meteorological forecasts and other urgent safety related messages broadcast to ships.

**Public address system** is an installation enabling the broadcast of the ship's officers instructions into accommodation, service and public spaces as well as the ship's open decks.

**Conducted interference** is interference from equipment at the electric power supply terminals.

**COSPAS-SARSAT** is an international search and rescue system using polar orbitory satellite service for ships and aircraft in distress.

**Gain of aerial** is the ratio, usually expressed in decibels, of the power required at the input of a loss-free reference aerial to the power supplied to the input of the given aerial to produce, in a given direction, the same field strength or the same power flux-density at the same distance. When not specified otherwise, the gain refers to the direction of maximum radiation. The gain may be considered for a specified polarization.

**International NAVTEX Service** means the coordinated broadcast and automatic reception on 518 kHz of maritime safety information by means of narrow-band direct-printing telegraphy using the English language.

**International voyage of a fishing vessel** is a voyage with a call at a port of another Flag State.

**Navigation bridge** is the position from which the ship is normally navigated.

**Sea area A1** is an area within the radio- telephone coverage of at least one VHF coast station in which continuous digital selective calling (DSC) alerting is available.

**Sea area A2** is an area, excluding sea area A1, within the radiotelephone coverage of at least one MF coast station in which continuous DSC alerting is available.

**Sea area A3** is an area, excluding sea areas A1 and A2, within the coverage of an INMARSAT geostationary satellites in which continuous alerting is available.

**Sea area A4** is an area outside sea areas A1, A2 and A3.

Information for sea area definition is placed in the Appendix.

**Effective radiated power** is the product of the power supplied to the aerial and the gain of this aerial with reference to a half-wave dipole in the prescribed direction.

**Carrier power of a radio transmitter** is the average power supplied to the aerial transmission line by a transmitter during high frequency cycle under conditions of no modulation.

This definition does not apply to pulse modulated emissions.

**Rated power of radio transmitter** is the minimum power within the frequency range of the transmitter transferred to the aerial or to the artificial aerial under normal operating and climatic conditions.

**Peak envelope power of radio transmitter** is the power supplied to the aerial transmission line by a transmitter averaged during one radio frequency cycle at the highest crest of the modulation envelope under normal climatic conditions.

**Mean power of radio transmitter** is the power supplied to the aerial transmission line by a transmitter averaged over the time sufficiently long compared with the lowest frequency encountered in the modulation under normal operating conditions.

**Multiplexing** is the ability of the ship security surveillance TV system to simultaneously reproduce information from several TV cameras on the video display unit.

**C**ontinuous watch means that the radio watch concerned shall not be interrupted other than for brief intervals when the ship's receiving capability is impaired or blocked by its own communications or when the radio equipment is under periodical maintenance, repair or checks.

**M**obile radiotelephone station is a radiotelephone station, providing operation while carrying and being fixed, and supplied from own source of electrical power.

**L**ocating means the finding of ships, aircraft, units or persons in distress.

**I**nterference is the influence of unwanted energy on reception in the radio communication system resulting in impaired quality, errors or loss of information that could have been avoided in the absence of influence of such unwanted energy.

**I**nterruption (termination) of the distress alert initiation at any time means the interruption of the retry of the distress alert. This action shall not interrupt the distress alert transmission or distress message during its transmission but shall preclude the retry of the distress alert.

**P**riority channel means the channel which is listened to during the whole period of reception of a signal at the additional channel.

**N**ew radio equipment is radio equipment developed in compliance with the technical documentation submitted after the date of coming into force of the Rules.

**E**xisting radio equipment is radio equipment which is not new radio equipment.

**G**eneral radiocommunication means operational and public correspondence traffic, other than distress, urgency and safety messages, conducted by radio.

**E**nhanced group calling (EGC) means the system for broadcast transmit of urgency, distress and safety messages by mobile satellite communication system of INMARSAT.

**R**adio Regulations means the Radio Regulations annexed to, or regarded as being annexed to, the most recent International Telecommunication Convention which is in force at any time.

**F**ishing vessel is a vessel used directly for catching or for catching and processing the catch (fish, whales, seals, walrus or other living resources of the sea).

**B**ridge-to-bridge communications means safety communications between ships from the position from which the ships are normally navigated.

**S**hip security alert system is a system, which provides the generation and transmission of covert security alert or report to indicate a competent organization designated by the Flag State Administration that the security of the ship is under the threat.

**P**olar orbiting satellite service means a service which is based on polar orbiting satellites which receive and relay distress alerts from satellite EPIRBs and which provides their position.

**R**escue unit is a unit with full complement of trained persons and equipment available for rapid carrying out search and rescue operations.

**A** dedicated distress alert button is an unique clearly indicated button physically separated from the controls (buttons, keys of keyboards used for normal operation of equipment and not intended for any other purposes except distress alert initiation. This button shall be red in colour and marked "DISASTER" (or "DISTRESS"). If the button is protected from the unintended activation by opaque cap or cover, an inscription "DISASTER" (or "DISTRESS") shall be also made on it.

**S**atellite radio communication facilities are radio communication facilities intended for transmitting or receiving messages within the frequency range of 1500 to 1700 MHz, with the use of artificial earth satellites as relays of the transmitted radio signals.

**S**hips constructed are ships at the following stage of the construction:

the keel is laid;

construction identifiable with a specific ship is started;

assembly of that ship has commenced comprising at least 50 tons or 1 % of the estimated mass of all structural material, whichever is less.

**S**hip Earth Station is a mobile earth station of the Maritime Mobile Satellite Service fitted on board a ship.

**S**hip security surveillance TV system is a video surveillance system capable of displaying and storing video information received from TV cameras.

Narrow-band direct-printing telegraphy (NDPT) is a communication technique using automated telegraphy facilities which comply with the relevant recommendations of the International Telecommunication Union (ITU).

Two-way VHF radiotelephone apparatus is an apparatus intended for communication between survival craft, between survival craft and ship, between survival craft and rescue unit, and between ship and aircraft.

Digital selective calling (DSC) means a technique using digital codes which enables a radio station to establish contact with, and transfer information to, another station or group of stations, and complying with the relevant recommendations of the International Telecommunication Union (ITU).

Equivalent isotropically radiated power is the product of the power supplied to the aerial and the amplification factor of this aerial in the prescribed direction about the isotropic aerial.

### **1.3 SCOPE OF SURVEY**

**1.3.1** General provisions for the procedure of survey of the radio equipment, as well as the requirements for the technical documentation to be submitted for review to the Register, and information on documents for radio equipment issued by the Register, are set out in General Regulations for the Classification and Other Activity, Part II "Technical Documentation" of the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships and Part I "Survey Regulations".

**1.3.2** The Register carries out technical supervision during design and survey during manufacture, installation and operation of the following shipboard radio equipment:

**1.3.2.1** Radio communication facilities:

**.1** VHF radio installation:

DSC encoder,  
DSC watch receiver,  
radiotelephone station;

**.2** MF radio installation:

DSC encoder,  
DSC watch receiver,  
radiotelephone station;

**.3** MF/HF radio installation:

DSC encoder,  
DSC watch receiver,  
telephony and narrow-band direct-printing (NBDP) receiver,  
telephony and NBDP transmitter,  
direct-printing apparatus of improved fidelity,  
terminal printing device;

**.4** INMARSAT ship earth station;

**.5** main, operational and portable VHF radiotelephone station in the frequency bands of 300,025 to 300,500 MHz and 336,025 to 336,500 MHz;

**.6** two-way VHF radiotelephone apparatus for communication with aircraft;

**.7** radiotelephone station intended for internal service communication.

**1.3.2.2** Facilities for reception of maritime safety information:

**.1** NAVTEX service receiver;

**.2** enhanced group calling (EGC) receiver;

**.3** HF direct-printing telegraph receiver.

**1.3.2.3** COSPAS-SARSAT satellite EPIRB.

**1.3.2.4** VHF EPIRB.

**1.3.2.5** Ship's search and rescue locating device:

- .1 ship's radar search and rescue transponder (ship's SART);
- .2 ship's AIS search and rescue transmitter (ship's AIS-SART).

**1.3.2.6** Public address system.

**1.3.2.7** Survival craft radio equipment:

- .1 survival craft search and rescue locating device:  
survival craft radar search and rescue transponder (survival craft SART);  
survival craft AIS search and rescue transmitter (survival craft AIS-SART);

- .2 two-way VHF radiotelephone apparatus.

**1.3.2.8** Ship security equipment:

- .1 ship security alert system;
- .2 ship security surveillance TV system.

**1.3.2.9** Portable two-way VHF radiotelephone apparatus of explosion-proof or intrinsically-safe type (for emergency fire brigades).

**1.3.2.10** Facsimile receiving device.

**1.3.2.11** Source of electrical power.

**1.3.2.12** Automatic battery charger.

**1.3.2.13** Uninterruptible power supply unit.

**1.3.2.14** Aerial.

**1.3.2.15** Cabling.

**1.3.2.16** Earthing.

**1.3.2.17** Systems, radio equipment and arrangements other than those stated above if required by the Register.

**1.3.3** Technical supervision during design and survey during manufacture of shipborne radio equipment by the Register covers:

- .1 review of technical documentation for radio equipment;
- .2 review of the programme and procedure of works tests of an experimental model;
- .3 survey during works tests of the experimental model;
- .4 review of the programme and procedure of shipboard tests of the experimental model;
- .5 survey during shipboard tests of the experimental model;
- .6 review of technical documentation reflecting changes made upon results of the works and shipboard tests of the experimental model;
- .7 survey during the manufacture of radio equipment under serial production.

**1.3.4** 1.3.4 The technical documentation for radio equipment submitted to the Register for review shall contain (where applicable) the following information:

- .1 technical description;
- .2 block diagram;
- .3 general view drawing;
- .4 operation manual;
- .5 installation manual;
- .6 list of spare parts.

Together with the technical documentation the records of the tests performed as well as the available certificates may be submitted. Depending on a type of the radio equipment, the Register may require the additional technical documentation to be submitted. Upon review of the technical documentation submitted, the applicant shall agree and submit for approval the test program..

**1.3.5** The experimental model of radio equipment, developed and manufactured in compliance with the technical documentation, shall be subjected to works and shipboard tests for the purpose of verifying the performance characteristics being in compliance with the Rules and the technical documentation. The tests shall be carried out under the technical supervision of the Register.

**1.3.6** On completion of the works and shipboard tests of the radio equipment experimental models, all test reports and records as well as photos of new radio equipment shall be submitted to

the Register. All these materials are kept at the Register and they serve as a basis for conclusion whether this radio equipment may be applied on ships with the relevant documents being issued.

**1.3.7** Acceptance of new and existing radio equipment developed not under the technical supervision of the Register is carried out on the ground of review of technical documentation (description, diagrams, test records, etc.) and performance of the tests in compliance with the requirements specified in the present Part of the Rules.

**1.3.8** When new radio equipment is fitted or outdated (broken-down and unrepairable) equipment is replaced on ships in service, the installation technical design and working drawings shall be submitted to the Register for review prior to the commencement of survey of the radio equipment.

The technical design shall contain information on the sea areas where the ship is intended to operate and on the radio equipment maintenance and repair methods.

After the approval of the technical design and working drawings, the radio equipment fitted on board shall be surveyed and tested in operation.

**1.3.9** On ships under construction, the operation tests of radio equipment and the tests for electromagnetic compatibility with other electrical and electronic equipment shall be carried out during mooring and sea trials according to the programs approved by the Register.

## **2 FUNCTIONAL REQUIREMENTS FOR RADIO EQUIPMENT, ITS COMPOSITION, MAINTENANCE AND REPAIR**

### **2.1 FUNCTIONAL REQUIREMENTS**

**2.1.1** Every ship, while at sea, shall be capable:

**.1** of transmitting ship-to-shore distress alerts by at least two separate and independent means, each using a different radiocommunication service.

If the serviceability of the radio equipment fitted on board is ensured by a means such as duplication of equipment, the above requirements shall be considered fulfilled (refer also to Note 1 to Table 2.2.1);

**.2** of receiving shore-to-ship distress alerts;

**.3** of transmitting and receiving ship-to-ship distress alerts;

**.4** of transmitting and receiving search and rescue co-ordinating communications;

**.5** of transmitting and receiving on-scene communications;

**.6** of transmitting and receiving signals for locating;

**.7** of transmitting and receiving maritime safety information, also having regard to the need for reception of such information by ships in port;

**.8** of transmitting and receiving general radiocommunications to and from shore-based systems or networks;

**.9** of transmitting and receiving bridge-to-bridge communications.

**2.1.2** In fulfilling the functional requirements for radio equipment, care shall be taken to preclude the transmission of false distress signals.

### **2.2 LIST OF RADIO EQUIPMENT**

**2.2.1** The minimum list of radio equipment is determined by the sea areas where the ship is intended to operate: A1; A1 and A2; A1, A2 and A3; A1, A2, A3 and A4. Every ship, except for the ships mentioned in 2.2.4 and 2.2.5 according to the navigation areas shall be fitted with the radio equipment in compliance with Table 2.2.1.

**2.2.2** In addition to the requirements of Table 2.2.1, it is recommended that ships shall be equipped with security surveillance TV system and facsimile receiving equipment.

**2.2.3** In addition to the requirements of Table 2.2.1, every ship of river-sea navigation engaged in voyages along inland waterways shall be fitted with:

**.1** main VHF radiotelephone station (300,025 MHz to 300,500 MHz);

**.2** operational VHF radiotelephone station (300,025 –300,500 MHz; 336,025 – 336,500 MHz). It is required for passenger ships, ships having the length of 25 m and above, ships with the main engines output of 367 KW and above;

**.3** portable VHF radiotelephone station (300,025 to 300,225 MHz) — 2 sets;

**.4** public address system.

The type of the VHF radiotelephone station shall be determined by the shipowner based on the system of communications established in the ship's operational area.

**2.2.4** Every fishing and cargo ship of under 300 gross tonnage, non-self-propelled ship with people on board towed or pushed at sea, or intended for the prolonged anchorage outside the port water area and roads, as well as to ships not engaged in international voyages while navigating in sea area A1 shall be fitted with the equipment as listed in Table 2.2.1:

**.1** VHF radio installation;

**.2** float-free COSPAS-SARSAT satellite EPIRB;

**.3** ship's and survival craft search and rescue locating device (SART or AIS-SART);

Table 2.2.1

Nos.	Radio equipment <sup>1</sup>	Amount of equipment for ships sea areas			
		A1	A1 and A2	A1, A2 and A3	A1, A2, A3 and A4
1	2	3	4	5	6
<b>1</b>	VHF radio installation <sup>2</sup> : DSC encoder DSC watch receiver radiotelephone station <sup>3</sup>	1 1 1	1 1 1	1 1 1	1 1 1
<b>2</b>	MF radio installation <sup>2, 4</sup> : DSC encoder DSC watch receiver radiotelephone station	— — —	1 1 1 <sup>5</sup>	1 1 1	— — —
<b>3</b>	MF/HF radio installation <sup>2</sup> : DSC encoder DSC watch receiver telephony and NBDP receiver telephony and NBDP transmitter direct-printing apparatus of improved fidelity terminal printing device	— — — — — —	— — — — — —	1 <sup>6</sup> 1 <sup>6</sup> 1 <sup>6, 7</sup> 1 <sup>6, 7</sup> 1 <sup>6</sup> 1 <sup>6</sup>	1 1 1 <sup>7</sup> 1 <sup>7</sup> 1 1
<b>4</b>	INMARSAT ship earth station	—	—	1 <sup>4</sup>	—
<b>5</b>	Ship security alert system	1 <sup>8</sup>	1 <sup>8</sup>	1 <sup>8</sup>	1 <sup>8</sup>
<b>6</b>	NAVTEX service receiver	1 <sup>9</sup>	1 <sup>9</sup>	1 <sup>9</sup>	1 <sup>9</sup>
<b>7</b>	EGC receiver	1 <sup>10, 11</sup>	1 <sup>10, 11</sup>	1 <sup>10, 11</sup>	1 <sup>10, 11</sup>
<b>8</b>	HF direct-printing telegraph receiver for reception of maritime safety information	1 <sup>12</sup>	1 <sup>12</sup>	1 <sup>12</sup>	1 <sup>12</sup>
<b>9</b>	COSPAS-SARSAT satellite EPIRB <sup>13</sup>	2 <sup>14</sup>	2 <sup>14</sup>	2 <sup>14</sup>	2
<b>10</b>	VHF EPIRB	1 <sup>15</sup>	—	—	—
<b>11</b>	Ship's search and rescue locating device: ship's radar search and rescue transponder (ship's SART) or ship's AIS search and rescue transmitter (ship's AIS-SART)	1 <sup>16</sup>	1 <sup>16</sup>	1 <sup>16</sup>	1 <sup>16</sup>
<b>12</b>	Two-way VHF radiotelephone apparatus for communication with aircraft <sup>17</sup>	1 <sup>18</sup>	1 <sup>18</sup>	1 <sup>18</sup>	1 <sup>18</sup>
<b>13</b>	Public address system <sup>20</sup>	1 <sup>19</sup>	1 <sup>19</sup>	1 <sup>19</sup>	1 <sup>19</sup>
<b>14</b>	Survival craft search and rescue locating device: survival craft radar search and rescue transponder (survival craft SART) or survival craft AIS search and rescue transmitter (survival craft AIS-SART)	— <sup>21</sup>	— <sup>21</sup>	— <sup>21</sup>	— <sup>21</sup>
<b>15</b>	Two-way VHF radiotelephone apparatus	— <sup>21</sup>	— <sup>21</sup>	— <sup>21</sup>	— <sup>21</sup>
<b>16</b>	Portable two-way VHF radiotelephone apparatus of explosion-proof or intrinsically-safe type (for emergency fire brigades) <sup>22</sup>	— <sup>23</sup>	— <sup>23</sup>	— <sup>23</sup>	— <sup>23</sup>

<sup>1</sup> In addition to the radio equipment required under 2.2.1, every ship shall be fitted with the second independent facility of transmission of distress alerts.

If a ship is engaged in voyages in sea area A1, then for this area a second VHF radio installation using DSC without a special receiver capable of maintaining a continuous DSC watch on channel 70, or a VHF EPIRB, or a MF radio installation using DSC (if a ship is engaged in voyages in the sea area covered by shore-based MF stations using DSC), or a HF radio installation using DSC, or an INMARSAT ship earth station, or a COSPAS-SARSAT satellite EPIRB may be used as a second independent facility of transmission of distress alerts.

If a ship is engaged in voyages in sea areas A1 and A2 or A1, A2 and A3, then for these sea areas an additional INMARSAT ship earth station, or COSPAS-SARSAT satellite EPIRB, or a HF radio installation using DSC (unless it is installed as the basic one required under 2.2.1 for sea areas A1, A2 and A3) may be used as a second independent facility of transmission of distress alerts.

If a ship is engaged in voyages in sea areas A1, A2, A3 and A4, then for these sea areas a COSPAS-SARSAT satellite EPIRB may be used as a second independent facility of transmission of distress alerts.

If the serviceability of the equipment fitted in accordance with 2.2.1. is ensured by its duplication, the second independent facility of transmission of distress alerts need not be fitted (reference is made to 2.6.3) provided that there is a second independent facility in the duplicated equipment.

<sup>2</sup> A combined radio installation or in the form of separate devices may be permitted.

<sup>3</sup> Continuous listening watch on channel 16 shall not be limited by any date of discontinuation.

<sup>4</sup> Not required with the MF/HF radio installation.

<sup>5</sup> If the radiotelephone station is not capable of transmitting and receiving general radiocommunications on working frequencies within the range of 1605 to 4000 kHz, a separate radio installation or MF/HF radio installation capable of transmitting and receiving general radiocommunications using radiotelephony or direct-printing telegraphy, or an INMARSAT ship earth station shall be provided.

<sup>6</sup> Not required with an INMARSAT ship earth station.

<sup>7</sup> If the MF/HF radio installation is not capable of transmitting and receiving general radiocommunications on working frequencies within the range of 1605 to 4000 kHz and 4000 to 27500 kHz, a separate radio installation capable of transmitting and receiving general radiocommunications using radiotelephony and direct-printing telegraphy shall be provided.

<sup>8</sup> Required for the following types of ships engaged on international voyages: all passenger ships including high-speed passenger craft, cargo ships including high-speed craft, of 500 gross tonnage and upwards.

<sup>9</sup> Installation of the receiver is obligatory if the ship is engaged in voyages in any area in which an International NAVTEX service is provided.

<sup>10</sup> Allowed as a part of an INMARSAT ship earth station.

<sup>11</sup> Installation of the receiver is obligatory if the ship is engaged in voyages in any area within coverage of an INMARSAT geostationary satellites in which an International NAVTEX service is not provided. Installation of the receiver is not obligatory if the ships are engaged exclusively in the areas where an International NAVTEX service is provided and which may be announced by means of individual calling.

<p><sup>12</sup> It is allowed to install this receiver instead of the EGC receiver on the ships engaged exclusively in voyages in an area in which a HF direct-printing telegraphy maritime safety information service is provided.</p> <p><sup>13</sup> One of them shall be float-free.</p> <p><sup>14</sup> Single EPIRB may be installed (see 3.6.2) if the position from which the ship is normally navigated is capable of transmitting distress alerts by at least two separate and independent facilities, each using different types of communication suitable for the ship's navigation area (see Note 1).</p> <p><sup>15</sup> It is allowed on the ships engaged exclusively on voyages in sea area A1, upon agreement with the Register, to install a VHF EPIRB in lieu of the COSPAS-SARSAT EPIRBs.</p> <p><sup>16</sup> Ship's SART capable of operating either in the 9 GHz band, or ship's AIS-SART capable of operating on international frequencies dedicated for AIS may be used as ship's search and rescue locating device. Ship's search and rescue locating device may be one of these survival craft search and rescue locating devices (survival craft SART or AIS-SART) required by Part II "Life-Saving Appliances".</p> <p><sup>17</sup> Required for passenger ships.</p> <p><sup>18</sup> Two sets are recommended, one set being mobile.</p> <p><sup>19</sup> Cargo ships are exempted from the requirement for installation of public address system.</p> <p><sup>20</sup> It is recommended to install public address system on cargo ships.</p> <p><sup>21</sup> Provisions for fitting the ships with radio equipment for survival craft (survival craft search and rescue locating device and two-way VHF radiotelephone apparatus) are specified in Part II "Life-Saving Appliances".</p> <p><sup>22</sup> Ships constructed before 1 July 2014 shall be fitted with the two-way VHF radiotelephone apparatus not later than the first survey after 1 July 2018. Two-way VHF radiotelephone apparatus (refer to item 15 of the Table) may not be considered the portable two-way VHF radiotelephone apparatus for emergency fire brigades.</p> <p><sup>23</sup> At least two two-way VHF radiotelephone apparatuses shall be provided for each emergency fire brigade.</p>
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**.4** two-way VHF radiotelephone apparatus (2 sets).

In addition to the above-said the following equipment shall be fitted:

for the ships intended for navigation in sea areas A1 and A2:

MF radio installation;

NAVTEX service receiver or EGC receiver if the ship operates in areas not covered by the international NAVTEX service;

for ships intended for navigation in sea areas A1, A2 and A3 and in sea areas A1, A2, A3 and A4:

MF radio installation;

INMARSAT ship earth station and EGC receiver or MF/HF radio installation and maritime safety information receiver;

NAVTEX service receiver, except for the ships continually operated outside the coverage of this service.

**2.2.5** Every ship intended for navigation inside the port water area on the inner road within the harbor water area (regardless of the established sea area), shall be fitted with the following equipment as listed in Table 2.2.1:

**.1** VHF radio installation;

**.2** ship's and survival craft search and rescue locating device (SART or AIS-SART);

**.3** two-way VHF radiotelephone apparatus (1 set).

In addition to the list of equipment as indicated every ship intended for navigation outside the port water area on the outer road within the harbor water area, shall be fitted with a free-floating COSPAS-SARSAT satellite EPIRB. It is permitted to install a VHF EPIRB in lieu of the COSPAS-SARSAT satellite EPIRB if the outer road within the harbor water area corresponds to sea area A1.

**2.2.6** In oil tankers (irrespective of a flash point of oil products), oil recovery vessels (irrespective of a flash point of oil products), gas carriers and chemical tankers, the aerial power of transmitters on carrier frequency shall not exceed 500 W. In this case, the peak power of the transmitter shall not exceed 1000 W.

Portable radio equipment (two-way VHF radiotelephone apparatus with a replaceable accumulator battery, VHF radiotelephone station, VHF radiotelephone station for service communication) used in the following ship types shall be of intrinsically safe type:

**.1** oil tankers intended for the carriage of oil products having a flash point of 60 °C and below or for the carriage of oil products having a flash point over 60 °C, which shall be heated up to a temperature less than by 15 °C below the flash point;

**.2** oil recovery vessels intended for the recovery and transportation of crude oil and/or oil products spread over the sea surface;

.3 gas carriers;

.4 chemical tankers intended for the carriage of cargoes having a flash point of 60 °C and below.

The two-way VHF radiotelephone apparatus, wherein replaceable accumulator batteries are not used, of a type other than intrinsically safe may be fitted in the above ships, provided that it is used as the radio equipment of life-saving appliances only. In this case, such equipment shall be stored in a way to preclude its use onboard the ship, and the route to the life-saving appliance outside dangerous areas shall be developed, agreed with the Register and prominently displayed near the storage area.

**2.2.7** Radio equipment not specified in this Section may be accepted for installation on board ships as additional equipment, provided that it complies with the requirements of 5.1 and its operation does not affect the operation of the main radio equipment or impair safety of navigation.

**2.2.8** Every ship, while at sea shall maintain a continuous watch:

.1 on VHF DSC channel 70, if the ship, in accordance with the requirements of the Rules for all sea areas, is fitted with a VHF radio installation;

.2 on the distress and safety DSC frequency 2187,5 kHz, if the ship, in accordance with the requirements of the Rules for sea areas A1 and A2 or A1, A2 and A3, is fitted with a MF radio installation;

.3 on the distress and safety DSC frequencies 2187,5 kHz and 8414,5 kHz and also on one of the distress and safety DSC frequencies 4207,5 kHz, 6312 kHz, 12577 kHz or 16804,5 kHz, appropriate to the time of the day and the geographical position of the ship, if the ship, in accordance with the requirements of the Rules for sea areas A1, A2 and A3 or A1, A2, A3 and A4, is fitted with a MF/HF radio installation. This watch may be kept by means of a scanning receiver;

.4 for shore-to-ship distress alerts, if the ship, in accordance with the requirements of the Rules for sea areas A1, A2, A3 and A4, is fitted with an INMARSAT ship earth station.

**2.2.9** Every ship, while at sea, shall maintain a radio watch for broadcasts of maritime safety information on the appropriate frequency or frequencies on which such information is broadcast for the sea area in which the ship is navigating.

**2.2.10** Every ship while at sea shall maintain, when practicable, a continuous listening watch on VHF Channel 16. This watch shall be kept at the position from which the ship is normally navigated.

**2.2.11** Every ship which after completion of construction shall undertake a single voyage to the place of its supplementary outfitting may be exempted from the requirement for installation of the full complement of the statutory radio equipment, if it is capable of transmitting shore-to-ship distress alerts by at least two separate and independent facilities, each using different types of radio communication.

The full complement of the radio equipment shall be approved at the review of the draft passage of the ship.

## **2.3 SOURCES OF POWER**

**2.3.1** There shall be available at all times, while the ship is at sea, a supply of electrical energy sufficient to operate the radio equipment as well as to charge a reserve source of electrical power.

**2.3.2** Conditions for providing power supply of radio equipment from an emergency source of power in cases when the supply of electrical power from the main sources of power is discontinued are regulated in Part XI "Electrical Equipment" of the Rules for the Classification and Construction of Sea-Going Ships.

**2.3.3** A reserve source of electrical power shall be provided on every ship to supply radio installation, for the purpose of conducting distress and safety radiocommunications, in the event of failure of the ship's main and emergency sources of electrical power.

In this case, the provision shall be made for visual and audible signalling system for switching to a reserve source of electrical power at the position from which the ship is normally navigated.

Electrical power shall be supplied to this signalling system by means of the emergency source of electrical power.

The signalling system shall be non-disconnectable and capable of being automatically reset after the power supply from the ship mains has been restored. Provision shall be made for manual acknowledgement of audible signals.

Where a manual switch is used for changing-over to a reserve source of electrical power to supply radio installation, it shall be fitted at the position from which the ship is normally navigated and shall be distinctly marked and readily accessed.

Changing-over to a reserve source of electrical power shall not result in the loss of data stored in the equipment memory.

The reserve source of electrical power shall be independent of the propelling power of the ship and the ship's electrical network.

A rechargeable accumulator battery with an automatic charging device or a source of uninterruptable power supply may be provided as the reserve source of power.

**2.3.4** The sources of electrical power for radio equipment shall comply with the requirements specified in Table 2.3.4.

**2.3.5** The reserve source of electrical power shall be capable of simultaneously operating the radio equipment in compliance with Table 2.3.4 and, as appropriate, for the sea area or sea areas for which the ship is equipped and any of the additional loads mentioned in 2.3.8 and 2.3.9 for a period of at least:

**.1** one hour on ships provided with an emergency source of electrical power, if such source of power complies fully with all relevant requirements of Part XI "Electrical Equipment" of the Rules for the Classification and Construction of Sea-Going Ships;

**.2** six hours on ships not provided with an emergency source of electrical power complying fully with all relevant requirements of Part XI "Electrical Equipment" of the Rules for the Classification and Construction of Sea-Going Ships;

**.3** one hour on all ships intended for navigation within the inner and/or outer road of the port basin.

**2.3.6** Capacity of accumulator battery used as reserve source of electrical power shall be determined proceeding from the minimum required period of power supply required by the equipment connected (during 1 h or 6 h) and the maximum possible current utilized by all the equipment connected to the battery (refer to Table 2.3.4) with regard to the sum of three values:

1/2 of the current consumed for transmission mode;

current consumed for reception mode;

current consumed by additional loads (lighting, GNSS GPS receiver).

When defining the minimum required capacity of the battery used as reserve source of electrical power, consideration shall be given to the following:

the capacity of a lead acid battery is normally quoted at 20 h of discharge at an operational temperature of 20 °C;

the capacity of a lead acid battery at 1 h dis-charge is approximately 50 % of the capacity at 20 h discharge;

the capacity of a lead acid battery at 6 h dis-charge is approximately 80 % of the capacity at 20 h discharge;

for batteries other than the lead acid type the capacity at 1 hour discharge is approximately 60 per cent of the capacity at 10 hours discharge and 6 h discharge will be approximately 92 % of the capacity at 10 h discharge.

When defining the final value capacity of the battery used as reserve source of electrical power, consideration shall be given to the expected extreme temperatures for the location of the battery and reduction of its capacity during its operation (battery ageing).

To consider possible reduction of the battery capacity during its operation (battery ageing), an extra 40 % capacity shall be added to the calculated battery capacity.

**2.3.7** The capacity of the accumulator battery shall be checked using a relevant method at intervals not exceeding 12 months, when the ship is not at sea.

When installed on board, accumulator batteries shall always have a clear marking containing the following data:

**.1** type of the battery or a construction;

**.2** date when the battery or construction was installed;

Table 2.3.4

Nos.	Radio equipment	Main source	Emergency source	Reserve source to supply radio installation	Feed source integrated in radio equipment built in radio equipment
1	2	3	4	5	6
<b>1</b>	VHF radio installation:				
	DSC encoder	+	+ <sup>1, 2</sup>	+	—
	DSC watch receiver	+	+ <sup>1, 2</sup>	+	—
	radiotelephone station	+	+ <sup>1, 2</sup>	+	—
<b>2</b>	MF radio installation:				
	DSC encoder	+	+ <sup>1, 2</sup>	+	—
	DSC watch receiver	+	+ <sup>1, 2</sup>	+	—
	radiotelephone station	+	+ <sup>1, 2</sup>	+	—
<b>3</b>	MF/HF radio installation:				
	DSC encoder	+	+ <sup>1, 2</sup>	+	—
	DSC watch receiver	+	+ <sup>1, 2</sup>	+	—
	telephony and NBDP receiver	+	+ <sup>1, 2</sup>	+	—
	telephony DSC and NBDP transmitter	+	+ <sup>1, 2</sup>	+	—
	direct-printing apparatus of improved fidelity	+	+ <sup>1, 2</sup>	+	—
	terminal printing device;	+	+ <sup>1, 2</sup>	+	—
<b>4</b>	INMARSAT ship earth station	+	+ <sup>1, 2</sup>	+	+
<b>5</b>	Ship security alert system	+	+	+ <sup>3</sup>	—
<b>6</b>	NAVTEX service receiver	+	+	—	+
<b>7</b>	EGC receiver	+	+	—	+
<b>8</b>	HF direct-printing telegraph receiver for reception of MSI	+	+	—	+
<b>9</b>	COSPAS-SARSAT satellite EPIRB	—	—	—	+ <sup>4</sup>
<b>10</b>	VHF EPIRB	—	—	—	+ <sup>4</sup>
<b>11</b>	Public address system <sup>5</sup>	+	+	—	—
<b>12</b>	Two-way VHF radiotelephone apparatus, fixed two-way VHF radiotelephone apparatus	—	—	—	+ <sup>6</sup>
<b>13</b>	Ship's and survival craft search and rescue locating device: radar search and rescue transponder (ship's and survival craft SART) AIS search and rescue transmitter (ship's and survival craft AIS-SART)	—	—	—	+ <sup>7</sup>
<b>14</b>	Main and operational VHF radiotelephone stations	+	+ <sup>8</sup>	+ <sup>9</sup>	—
<b>15</b>	Portable VHF radiotelephone station	—	—	—	+ <sup>10</sup>
<b>16</b>	Portable two-way VHF radiotelephone apparatus intended for communication with aircraft	—	—	—	+ <sup>6</sup>
<b>17</b>	Fixed two-way VHF radiotelephone apparatus intended for communication with aircraft	+	+	—	—
<b>18</b>	Ship Security Surveillance TV System	+	+	—	—

<sup>1</sup> If an accumulator battery is used as an emergency source of electric power, feeding from the reserve power source shall be provided in accordance with 2.3.5.2, 2.3.5.3, 2.3.13.

<sup>2</sup> The emergency source of electrical power shall be capable of operating the radio equipment for a period required by Sections 9 and 19, Part XI "Electrical Equipment" of the Rules for the Classification and Construction of Sea-Going Ships.

<sup>3</sup> Required if the radio equipment supplied, according to 2.3.4, from a reserve source of power is used for transmitting an alert on the ship security threat.

<sup>4</sup> The source of electrical power shall have sufficient capacity to operate the EPIRB for a period of at least 48 h.

<sup>5</sup> The supply from the emergency transient source of electrical power shall be also provided if such source is required in Part XI "Electrical Equipment" of the Rules for the Classification and Construction of Sea-Going Ships.

<sup>6</sup> Primary power supply batteries shall have sufficient capacity to ensure 8 h operation at its highest rated power with a duty cycle of 1:9. This duty cycle is defined as 6 s — transmission, 6 s — reception above squelch opening level and 48 s — reception below squelch opening level.

<sup>7</sup> The source of electrical power integrated in SART shall have sufficient capacity to operate in the stand-by condition for 96 h and, in addition, following the stand-by period, to provide transponder transmissions for 8 h when being continuously interrogated with a pulse repetition frequency of 1 kHz. The AIS-SART shall have sufficient battery capacity to operate for 96 h within a temperature range of –20 °C to +55 °C, and to provide for testing of the functions on the equipment.

<sup>8</sup> Not required if supplied from the reserve source of electrical power.

<sup>9</sup> The source of electrical power shall have sufficient capacity to provide operation of the transmitter at full power for a period of at least 1 h and of the receiver for a period of 24 h. It is required for the main VHF radiotelephone station only. It is required for the main VHF radiotelephone station only, if provision is not made for the power supply from the reserve electrical power source.

<sup>10</sup> The source of electrical power shall have sufficient capacity to ensure 4 h operation at its highest rated power with a duty cycle of 1:9.

<sup>11</sup> Refer to 7.2.17.

.3 capacity at 1h discharge rate;

.4 capacity at 5h discharge rate.

In way of the accumulator batteries of a non-tight type that are installed, there shall be a plate warning of explosion.

**2.3.8** If, in addition to the VHF radio installation, two or more radio installations for which the reserve supplying is required, can be connected to the reserve source of electrical power, it shall be capable of simultaneously supplying for the period specified in 2.3.5.1 or 2.3.5.2, the VHF radio installations in compliance with Table 2.3.4 and:

.1 all other radio installations which can be connected to the reserve source of electrical power at the same time; or

.2 whichever of the other radio installations will consume the most power, if only one of the other radio installations can be connected to the reserve source of electrical power at the same time as the VHF radio installation.

**2.3.9** The reserve source of electrical power may be used for the electrical lighting of the controls of the VHF radio installation as well as the radio installation complying with the sea area in which the ship is navigating.

**2.3.10** If the reserve source of electrical power consists of rechargeable accumulator battery, an automatic charging device shall be provided, which shall be capable of recharging the accumulator battery within 10 h (refer to 2.3.13).

The automatic charging device shall be operational within five seconds of switching on or after interruption of power supply from the main and/or emergency shipboard source of electrical power.

The automatic charging device shall be designed and constructed so that it is protected against damage resulting from disconnecting the batteries or, with the battery disconnected, short-circuiting the battery connections. If this protection is provided by electronic means it shall reset automatically following the removal of the open or short-circuit conditions.

In the automatic charging device provision shall be made for light indication of the device operation, as well as indication of the battery charging/ discharging voltage and current intensity.

In the automatic charging device provision shall be made for audible and visual alarms, indicating when the charging voltage or current is above the limits determined by the accumulator battery manufacturer. A protection shall be provided against overcharging or discharging of accumulator batteries due to possible faults in the charging device.

Alarm shall be non-disconnectable and capable of being automatically reset after the normal charging conditions of accumulator battery has been restored. Provision shall be made for manual acknowledgement of the audible alarm.

Failure of the said alarms shall not interrupt charging or discharging of the accumulator battery.

The above-mentioned alarms shall be provided at the position, from which the ship is normally navigated.

**2.3.11** Where the automatic charging device for accumulator battery charging is used in ships in which the equipment is maintained operative by skilful maintenance and repair at sea, it shall provide at least automatic regulation of charging current. In ships where the equipment is maintained operative by means of other than skilful maintenance and repair at sea (duplication of the equipment and/or shore-based maintenance) the automatic charging device shall provide unattended charging of the accumulator batteries at sea.

**2.3.12** No failure of accumulator batteries or the battery charging device shall impair the operating capability of any radio equipment being charged from the ship's source of electrical power.

**2.3.13** If the serviceability of the equipment is ensured by its duplication on ships engaged on voyages in sea areas A1, A2 and A3, as well as A1, A2, A3 and A4, the main radio equipment fitted in accordance with Table 2.2.1 and duplicating equipment may be supplied from one reserve source of the electrical power where the automatic charging device is applied. The reserve source of electrical power shall provide power supply to the equipment during at least 1 h, and the emergency source of electrical power shall totally comply with all the relevant requirements Part XI "Electrical Equipment" of the Rules for the

Classification and Construction of Sea-Going Ships, as well as the requirements for power supply of radio installations contained in Table 2.3.4.

In case the emergency source of electrical power is not totally in line with the appropriate requirements of Part XI "Electrical Equipment" of the Rules for the Classification and Construction of Sea-Going Ships as stated above, the main radio equipment to be installed in accordance with Table 2.2.1 and the duplicating equipment shall be supplied from two independent sources of power, using their own automatic charging devices. The main radio equipment to be installed according to Table 2.2.1 shall be supplied from the reserve source of electrical power during 6 h and the duplicating equipment during 1 h.

On ships navigating in sea areas A1, as well as A1 and A2 the main radio equipment to be installed according to Table 2.2.1 and duplicating equipment, if any, may be supplied from one reserve source of electrical power, using one automatic charging device.

The reserve source of electrical power shall meet the requirements of 2.3.6 to 2.3.9.

**2.3.14** If a source of an uninterruptable power supply is used as a reserve source of electrical power the alarms required by 2.3.3 and 2.3.10 shall be activated also in case of faults in the source of the uninterruptable power supply itself.

In case of failure of the source of the uninterruptable power supply provision shall be made for connection of radio installation to the second source of the uninterruptable power supply or for the direct connection of radio installation to the main or emergency source of electrical power.

Rated current of the charging device shall be determined by the sum of four values as follows:

- .1 1/10 of the current consumed for transmission;
- .2 current consumed for reception;
- .3 current consumed for additional loads;
- .4 rated battery charging current.

**2.3.15** If an uninterruptable input of the ship's coordinates from the ship radio navigation system receivers as well as the data from the ship's navigation or other equipment to a radio installation required by this Section is needed to ensure its proper work, this equipment shall be supplied from the main, emergency and reserve sources of electrical power.

## **2.4 AERIALS**

**2.4.1** In every ship there shall be erected the following aerials to provide the operation of the radio equipment required by 2.2.1:

.1 aerial of a VHF radiotelephone station, where necessary, aerial of a fixed two-way VHF radiotelephone apparatus for communication with aircraft, as well as separate aerials of the main and operational VHF radio-telephone stations for ships of river-sea navigation;

.2 aerial of a VHF DSC watch receiver. It is allowed to use common aerial (except aerials of a two-way VHF radiotelephone apparatus for communication with aircraft, as well as aerials of the main and operational VHF radiotelephone stations for ships of river-sea navigation) provided that the independent operation of equipment specified in 2.4.1.1 and 2.4.1.2 is ensured;

.3 aerial of a MF radiotelephone station;

.4 aerial of a MF DSC watch receiver. It is allowed to use common aerial if it is capable to provide independent operation of the equipment specified in 2.4.1.3 and 2.4.1.4;

.5 aerial of a MF/HF radio transmitter for radiotelephony and NBDP (MF-band aerial and HF-band aerial);

.6 aerial of a MF/HF DSC watch receiver and MF/HF radio receiver for radiotelephony and NBDP.

It is allowed to use common aerial if it is capable to provide independent operation of the equipment specified in 2.4.1.5 and 2.4.1.6;

- .7 aerial of an INMARSAT ship earth station;
- .8 aerial of EGC receiver;

It is allowed to use common aerial if it is capable to provide independent operation of the equipment specified in 2.4.1.7 and 2.4.1.8;

.9 aerial of a NAVTEX receiver and HF direct- printing radiotelegraph receiver for reception of MSI.

2.4.2 As far as practicable, one common aerial shall be provided for all general broadcasting receivers fitted on board ship. The use of aerials assigned for radio communication and radionavigational facilities as aerials for general broadcasting receivers is not allowed.

## 2.5 SPARE PARTS AND SUPPLY

2.5.1 The necessary complement of spare parts, tools, materials and measuring instruments shall be provided on every ship, irrespective of the radio equipment maintenance and repair methods.

If the serviceability of the equipment fitted in accordance with 2.2.1 is ensured by its duplication, the list and amount of spare parts for each type of the radio equipment may be minimum (reference is made to 2.6.3) established by manufacturer.

2.5.2 For wire-type MF-band aerial the spare aerial shall be provided, completely assembled for immediate erection.

## 2.6 MAINTENANCE AND REPAIR OF RADIO EQUIPMENT

2.6.1 On ships engaged in voyages in sea area A1, as well as in sea areas A1 and A2, the serviceability shall be ensured by one of the following ways: duplication of equipment, shore-based maintenance and repair or at-sea electronic maintenance and repair capability, or a combination of these.

2.6.2 On ships engaged in voyages in sea areas A1, A2 and A3 as well as A1, A2, A3 and A4, the serviceability shall be ensured by using a combination of at least two methods such as duplication of equipment, shore-based maintenance and repair or at sea electronic maintenance and repair capability.

2.6.3 If the serviceability of the equipment fitted in accordance with 2.2.1 is ensured by its duplication, the list of duplication intended for sea area A1 shall be included: the second VHF radio installation with DSC watch receiver, for sea areas A1 and A2, in addition to the list of equipment, the second MF radio installation or INMARSAT ship earth station (subject to sea areas and under RS consideration).

Installation of INMARSAT ship earth station shall not relieve ships of having the DSC watch receivers on 2187,5 kHz among the radio equipment while navigating in sea areas A1, A2.

The scope of duplication for sea areas A1, A2 and A3, as well as A1, A2, A3 and A4 is given in Table 2.6.3.

Table 2.6.3

Nos.	Duplicating radio equipment	A1, A2 and A3 sea areas	A1, A2, A3 and A4 sea areas
1	VHF radio installation:		
	DSC encoder	1	1
2	radiotelephone station	1	1
	MF/HF radio installation <sup>1</sup> :		
	DSC encoder	1	1
	DSC watch receiver	1	1
	radio receiver for telephony and NBDP	1	1
	radio transmitter for telephony, DSC and NBDP	1	1
	direct-printing apparatus of improved fidelity	1	1
3	terminal printing device	1	1
	INMARSAT ship earth station	1 <sup>2</sup>	1 <sup>2, 3</sup>

<sup>1</sup>It is not required on ships making voyages in sea areas A1, A2 and A3 if INMARSAT ship earth station is fitted as a backup equipment.

<sup>2</sup>It is not required if MF/HF radio installation is fitted as a backup equipment.

<sup>3</sup>For ships engaged only episodically on voyages in sea area A4 and fitted with MF/HF radio installation, backup MF/HF radio installation may be replaced by INMARSAT ship earth station.

**2.6.4** All duplicating equipment shall be connected to the separate aeri-als, to the main, emergency and reserve power sources and be ready for the immediate use.

**2.6.5** If the serviceability of the equipment fitted in compliance with 2.2.1 is ensured by the shore-based maintenance and repair, there shall be on board the agreement for these services with the equipment manufacturer or with the works authorized for those by the manufacturer or a written declaration/plan showing how shore-based maintenance is to be carried out. In addition, in sea areas where ships are engaged in voyages, the opportunity for equipment maintenance and repair shall be provided.

Shore-based maintenance centres shall be recognized by the Register.

**2.6.6** In the shore-based maintenance centers and in organizations engaged in on board installation of radio equipment the radiooperators shall be properly instructed on how to use the installed radio equipment and familiarized with the maintenance and repair principles prior to putting the equipment in operation.

**2.6.7** If the serviceability of the equipment fitted in compliance with 2.2.1 is ensured by at sea electronic maintenance and repair, these services shall be provided by the radiooperator holding a relevant Certificate of Competence.

**2.6.8** All the ships engaged on voyages in sea areas A1, A2 and A3, as well as A1, A2, A3 and A4, irrespective of the radio equipment maintenance and repair methods, shall always have on board:

- .1 specifications and users manuals for all radio equipment and battery chargers in English (Russian);
- .2 specifications and battery capacity calculations for the installed batteries;
- .3 antenna arrangement drawings (plan and profile);
- .4 radio arrangement drawings (at least in two views);
- .5 wiring diagram.

Technical documentation specified in items 2.6.8.3, 2.6.8.4 and 2.6.8.5 shall be corrected for compliance with all the amendments introduced during operation of the ship and approved by the Register;

.6 tools, instruments and spare parts for all radio equipment complying with the specified maintenance method(s);

.7 international guidelines (ITU edition):

List of Coast Stations and Special Service Stations (list IV);

List of Ship Stations and Maritime Mobile Service Identity Assignments (list V);

List of Call Signs and Numerical Identities of Stations Used by the Maritime Mobile and Maritime Mobile-Satellite Services (list VII A).

The amount of technical documentation, tools, instruments and spare parts shall be approved by the Register.

**2.6.9** On ships engaged on voyages in sea areas A1, A2 and A3, as well as A1, A2, A3 and A4, if serviceability of the radio equipment is ensured by a combination of methods, including the skillful maintenance and repair at sea, then the relevant additional technical documentation, tools, instruments and spare parts shall be available on board to enable maintenance, surveys and detection and elimination of any faults. The amount of additional technical documentation, tools, instruments and spare parts to be kept on board shall comply with the installed equipment and be approved by the Register.

**2.6.10** On ships engaged on voyages in sea areas A1 or A1 and A2 the amount of technical documentation, tools, instruments and spare parts shall be approved by the Register and determined based on the requirements of 2.6.8 and 2.6.9, depending on the operating conditions of the ship, composition of radio equipment and methods of its maintenance and repair.

**2.6.11** On all the ships radio communication in distress and for safety shall be ensured by the skillful radiooperators. These operators shall hold relevant Certificates of Competence; any of them may be assigned responsible for radio communication in distress.

**2.6.12** A ship station radio license issued in accordance with established procedure shall be available on all ships.

**2.7 DOCUMENTING (RADIO LOG)**

**2.7.1** On all the ships provision shall be made for a radio log for registration of all events (with indication of date and time) relevant to radio exchange in distress, urgency or safety and are of high importance for the protection of human life at sea, as well as the records related to operation of the ship station.

### **3 SPACES FOR RADIO EQUIPMENT, ITS ARRANGEMENT, CABLING**

#### **3.1 GENERAL**

**3.1.1** Every radio installation shall:

**.1** be so located that no harmful interference of mechanical, electrical or other origin affects its proper use, and so as to ensure electromagnetic compatibility and avoidance of harmful interaction of radio installation with other equipment and systems;

**.2** be so located as to ensure the greatest possible degree of safety and operational reliability;

**.3** be protected against harmful effects of water, extremes of temperature and other adverse environmental conditions;

**.4** be provided with safe and uninterruptable illumination, independent from the main and reserve source of electrical power intended for sufficient illumination of the radio installation controls;

**.5** be placed considering the safe distance from magnetic compass;

**.6** be so located as to ensure on passenger ships compliance with the requirements of 2.2.6 — 2.2.8, Part VI "Fire Protection" of the Rules for the Classification and Construction of Sea-Going Ships where the necessity is determined to maintain operability of the radio equipment providing communication by means of GMDSS installation or VHF radio-telephone stations within marine (16 channel) and air (121,5 MHz) frequency bands in case of flooding of any watertight compartment or after fire.

**3.1.2** To comply with the requirements for radio equipment arrangement, provision shall be made for a workstation for radio communication complying with the rule requirements for the bridge design, equipment arrangement and bridge procedures set forth in Appendix to Part V "Navigational Equipment" or a special space for radio equipment (radio room) with remote controls of the equipment installed in the navigation bridge on all ships.

Wheelhouse, where radio equipment is arranged, shall comply with the requirements specified in 3.2.8 and 3.2.9.

Provision shall also be made for special spaces intended for arrangement of command broadcast centre, if public address system are required by 2.2.1, and for the accumulator batteries of the reserve source of electrical power.

In some ships where it is impossible to provide a command broadcast centre the arrangement of the equipment for public address system is allowed on the navigation bridge.

Main and emergency lighting shall be provided at command microphone posts of public address system in compliance with the requirements of Part XI "Electrical Equipment" of the Rules for the Classification and Construction of Sea-Going Ships.

In some ships where it is impossible to provide a separate accumulator battery room, it is allowed to arrange accumulator batteries in accumulator battery boxes (cabinets) provided the requirements specified in 3.3 are observed.

**3.1.3** All radio equipment shall be so located in a ship that its operational efficiency is in no way impeded by the ship being submerged to the level of the deck where it is arranged.

**3.1.4** All ship spaces intended for installation of radio receiving and transmitting apparatus shall have metal or metal-coated bulkheads. Ceilings and decks shall be electrically connected with one another and to the hull of a ship, with continuity of screening being preserved. In non-metal ships the screening metal sheathing shall be electrically connected to a keel plate or to specially made earthing arrangement.

**3.1.5** All radio equipment shall be so installed that it is readily accessible for maintenance and repair on board ship. Radio equipment shall be securely fastened and shall not shift notwithstanding the angles of heel and trim of the ship or severe bumps and shaking likely to occur under service conditions.

### **3.2 SPECIAL SPACE FOR ARRANGEMENT OF RADIO EQUIPMENT (RADIOROOM)**

**3.2.1** In ships on which radioroom is provided it shall be located on the navigation bridge deck in close proximity to the place from which the ship is normally navigated.

It is not allowed to locate the radioroom in an explosive area.

**3.2.2** The position of a radioroom aboard ship shall, as far as practicable, provide for:

- .1** direct outside lead-in of the aerials;
- .2** minimum length of cables leading to the accumulator battery room and navigation bridge;
- .3** maximum distance of aerial from large metal objects (funnels, masts, ventilators, etc.);
- .4** maximum distance of the radioroom from electrical devices and networks;
- .5** maximum distance of the radioroom from installations and compartments causing noise (winches, cranes, ventilators, exhaust pipes, coal loading trunks, shops, etc.);
- .6** maximum distance of the radioroom from compartments and objects evolving a considerable amount of heat (galleys, bakeries, steam pipes, etc.);
- .7** most favourable conditions for spacing radio equipment;
- .8** most favourable conditions for normal work and safety of operating personnel.

**3.2.3** The radioroom shall be such as to give no access into any other compartments bearing no relation to radio equipment and exclude any possibility of the radioroom being used as a permanent living compartment. The chief radio officer's cabin shall be adjacent to the radioroom. If the fulfilment of this requirement is impracticable, it is allowed to locate the cabin not more than 20 m from the radioroom and not lower than one deck below.

**3.2.4** The total floor space of the radioroom shall be not less than twice as large as the floor space occupied by the radio equipment and furniture together, and the clear height of the radioroom shall be not less than 2 m.

**3.2.5** Bulkheads, ceilings and, if required, doors of the radioroom shall be lined from the inside with sound and heat-resistant insulating materials and sheathed with electroinsulating materials. The floor of the radioroom shall be covered with insulating material.

**3.2.6** The mechanical noise level in the radioroom under service conditions shall not exceed 60 dB.

**3.2.7** There shall be two exits in the radioroom: one leading directly to the open deck and the other to the interior spaces of a ship.

If there is no direct exit to the open deck, the provision shall be made for two means of access to and exit from the radioroom, one of which can be an illuminator or a window of sufficient dimensions or another means approved by the Register.

**3.2.8** The radioroom shall be fitted with electric heating appliances in addition to the air conditioning system provided, capable of maintaining the inside temperature within the range from +18 to +23 °C during cold seasons.

**3.2.9** The radioroom shall be fitted with efficient ventilation system capable of providing reliable operation of the radio equipment under all service conditions.

**3.2.10** The radioroom shall be provided with adequate natural and artificial lighting. The main lighting shall comply with the requirements specified in Part XI "Electrical Equipment" of the Rules for the Classification and Construction of Sea-Going Ships. The emergency lighting shall be supplied from the reserve source of electrical power of the radio equipment and shall provide for an illumination intensity of not less than 50 lx on the clock dials (or supply of electronic clock) and on controls for operating the radio communication equipment providing radio exchange in distress and for safety.

**3.2.11** Two-way switches shall be fitted in two places for switching on and off the lighting from the reserve source of electrical power. One switch shall be fitted at the main exit out of the radioroom and the other switch at the operating position of the radiooperator. The switches shall operate independently of each other. Each switch shall be provided with clear marking designating its purpose. The fitting of a switch at the operating position of the radiooperator is not obligatory if the operating position is situated in close proximity to the main exit.

**3.2.12** Laying of transit electric cables and wires as well as transit pipelines through the radioroom is not allowed.

**3.2.13** The radioroom shall be provided with sufficient number of plug sockets connected to the ship's source of electrical power.

**3.2.14** The radioroom shall be provided with an efficient two-way system of calling and voice communication with the navigation bridge independent of all other communication systems of the ship and capable of providing possibility for talks only between these two points.

**3.2.15** If the ship is fitted with an automatic telephone station, the radioroom and the cabin of a radiooperator shall be provided with telephone sets.

**3.2.16** The radioroom shall be provided with the furniture and equipment as follows: operating table, working chair secured on the deck, divan, marine clock with a second-hand or electronic clock, a signal lamp of the alarm bells, cabinet for storing spare parts and supplies.

**3.2.17** The clock mounted in the radioroom shall provide the indication of hours, minutes and seconds clearly distinguished from the operating position of the radiooperator under any lighting conditions.

**3.2.18** The plate with the call sign of the ship, the ship station identity and other codes as applicable for the use in the radio installation shall be posted up in a prominent place in a radioroom.

### **3.3 ACCUMULATOR BATTERY ROOM**

**3.3.1** The accumulator battery room which is intended for installation of the accumulator batteries used for feeding the reserve source of electrical power, shall be located on or above the navigation bridge deck level in such a place that the length of cables leading to radio equipment does not exceed 15 m. The accumulator battery room shall be provided with an exit to the open deck of the ship.

**3.3.2** The construction of the accumulator battery room as well as its systems of heating and ventilation shall comply with the requirements specified in Part VIII "Systems and Piping" and in Part XI "Electrical Equipment" of the Rules for the Classification and Construction of Sea-Going Ships.

**3.3.3** The accumulator battery room shall be provided with electric lighting complying with the requirements specified in Part XI "Electrical Equipment" of the Rules for the Classification and Construction of Sea-Going Ships.

**3.3.4** The installation of the accumulator batteries, not relating to the radio equipment, in the accumulator battery room is allowed only if it causes no radio interference.

**3.3.5** The accumulator battery room shall be provided with racks for placing accumulator batteries and sectional recess for storing distilled water and electrolyte. The top surface of the first row rack shall be at least 100 mm above the deck. The arrangement of accumulator batteries shall comply with the requirements set forth in Part XI "Electrical Equipment" of the Rules for the Classification and Construction of Sea-Going Ships.

**3.3.6** Degree of protection of accumulator battery boxes (cabinets) installed on the open deck of the ship shall not be below IP56 and placed at a height of at least 100 mm above the deck.

The design, heating and ventilation systems of accumulator battery boxes shall comply with the requirements specified in Part VIII "Systems and Piping" and Part XI "Electrical Equipment" of the Rules for the Classification and Construction of Sea-Going Ships.

**3.3.7** The accumulator batteries shall be electrically insulated from the ship's hull.

**3.3.8** The accumulator batteries shall be so located and installed as to ensure:

- .1** the highest degree of service;
- .2** a reasonable lifetime;
- .3** a reasonable safety;

.4 that when charged to the rated capacity, the accumulator batteries will provide the hours of operation required by the present Part under all weather conditions.

**3.3.9** The accumulator battery temperature shall remain within the manufacturer's specifications whether under charge, discharge or idle.

### **3.4 ARRANGEMENT OF RADIO EQUIPMENT ON NAVIGATION BRIDGE**

**3.4.1** The workstation intended for installation of radio equipment in compliance with 3.1.2 shall be located in the aft of the navigation bridge so that the watch officer assistants have an over all view of the navigation while operating the radio equipment.

If the workstation and the rest of the navigation bridge are separated by a bulkhead, it shall be made of glass or fitted with windows.

There should be no lockable door between the workstation and the navigation bridge.

When the work station is being used during night-time, a curtain separating it from the rest part of the navigation bridge shall be provided in order to avoid dazzling effect from the lights to the watch-keeping personnel and the pilot.

The radio work station shall be provided with the furniture and equipment as follows: operating table, the clock complying with the requirements of 3.2.17, working chair secured on the deck as well as the main lighting and lighting from the reserve source of power.

**3.4.2** The radio equipment shall be so arranged and installed that the magnetic field produced by it will not influence the ship magnetic compass readings in compliance with 5.1.46.

**3.4.3** Radio equipment fitted on the navigation bridge as an additional equipment shall be so arranged that its functioning or technical condition could not adversely affect normal operation or cause failure of radio, navigational or other equipment required by the Rules.

**3.4.4** The VHF radio installation with the controls of the radiotelephone channels providing generation and transmission of the distress and safety alert in the DSC and radiotelephony mode shall be located forward of the navigation bridge near the radar display station so that immediate access and priority is possible at all times, if additional control units are provided, and while using them the officer of the watch shall face the ship's bow.

When there is more than one control unit, indication shall be given to the other units that the radio station is in operation.

Where necessary, facilities for radio communications from the wings of the navigation bridge shall be provided. Portable VHP radio equipment may be used to meet the latter requirement.

**3.4.5** The MF radio installation with controls providing generation and transmission of the distress alert in the DSC and radiotelephony mode, as well as communication in distress and for safety in the radiotelephony mode shall be located at workstation for radio communication.

**3.4.6** The MF/HF radio installation with controls providing generation and transmission of the distress alert in the DSC mode as well as communication in distress and for safety in the radiotelephony and NBDP modes shall be located at workstation for radio communication.

**3.4.7** The INMARSAT ship earth station with the controls providing transmission of the distress alert and communication in distress as well as providing the safety in the telephony mode or in the data transmission mode shall be located at workstation for radio communication.

**3.4.8** The VHF, MF, MF/HF-radio installations and the INMARSAT ship earth station with the controls providing generation and transmission of the distress alert as well as communication in distress and for safety (refer to 3.4.4, 3.4.5, 3.4.6, 3.4.7), fitted for duplication, shall be located at workstation for radio communication.

**3.4.9** If the radioroom is provided, then after transmission the distress alert from workstation for radio communication in compliance with 3.4.5, 3.4.6 and 3.4.7, the radio communication in distress and for safety may be performed from the radioroom.

**3.4.10** The COSPAS-SARSAT satellite EPIRB shall be located in compliance with the requirements of 3.6 and Table 2.2.1.

**3.4.11** NAVTEX service, EGC, INMARSAT receivers as well as HF NBDP receiver for reception of MSI shall be located at workstation for radio communication and shall be capable of providing light and audible signalling system in case of reception of distress or urgent messages or those having distress category.

**3.4.12** The plate with the call sign of the ship, the ship station identity and other codes as applicable for the use of the radio equipment shall be posted up in close proximity to the controls of radio installations providing transmission of the distress alert as well as communication in distress and for safety.

**3.4.13** Illuminating lamps built in the radio equipment and intended for the arrangement on the navigation bridge shall be provided with luminous intensity control facilities.

**3.4.14** The following requirements shall be complied with on passenger ships:

**.1** the distress panel shall be located at workstation for radio communication. This panel shall have either one button which activates transmission of the distress alert by all radio installations intended for that purpose on board, or one button for every separate radio installation. There shall be clear visual indication on that panel that the button or buttons were pushed.

The button or buttons shall be protected against inadvertent operation.

When the COSPAS-SARSAT satellite EPIRB is used as the second independent means of distress alert transmission and not provided with remote activation, provision shall be made for the additional COSPAS-SARSAT system EPIRB placed in close proximity to workstation for radio communication (refer to 3.6.1);

**.2** the relevant radio communication equipment shall be continuously and automatically provided with the ship's position data for inclusion in the original distress message when the button or buttons on the panel initiating a distress alert are pushed;

**.3** panel signalling a distress alert shall be installed at the position, from which the ship is normally navigated. The panel initiating a distress alert shall be provided with visual and audible warning to indicate receipt of any distress alert, as well as indication of the radio service, via which the distress alert was received.

**3.4.15** To comply with the Rule requirements for passenger ships with regard to transmitting ship-to-shore distress alerts by at least two separate and independent means, when connecting the radio equipment to the distress panel, one shall follow the requirements set out in Table 3.4.15.

Table 3.4.15

Sea areas	Radio equipment
A1	VHF radio installation, a VHF EPIRB or a COSPAS-SARSAT satellite EPIRB
A1 and A2	VHF radio installation, MF radio installation, a COSPAS-SARSAT satellite EPIRB
A1, A2 and A3 (variant 1)	VHF radio installation, MF radio installation, INMARSAT ship earth station, a COSPAS-SARSAT satellite EPIRB
A1, A2 and A3 (variant 2)	VHF radio installation, MF/HF radio installation, a COSPAS-SARSAT satellite EPIRB
A1, A2, A3 and A4	VHF radio installation, MF/HF radio installation, INMARSAT ship earth station, a COSPAS-SARSAT satellite EPIRB

**3.4.16** Radio equipment installed for duplication on ships engaged on voyages in sea areas A1, A2 and A3, as well as A1, A2, A3 and A4 does not need to be connected to the distress panel, if this equipment transmits the distress alert and is installed in close proximity to the panel.

**3.4.17** An audible and light signalling system shall be provided in order to indicate reception of distress or urgency calls, or a call having distress category, as well as those not being urgency or distress calls. The signalling system shall be non-disconnectable. Provision shall be made for manual acknowledgement of signals. Possibility of checking the audible and light signalling system shall be provided.

**3.4.18** DSC operation procedures should be posted near the DSC equipment on the navigation bridge. Emergency procedures should be posted near the relevant equipment on the bridge.

"GMDSS operating guidance for masters of ships in distress situations" and the procedure "False alerts", both drawn up by IMO, shall be posted on the navigation bridge.

### **3.5 ARRANGEMENT OF TWO-WAY VHF RADIOTELEPHONE APPARATUS AND TWO-WAY VHF RADIOTELEPHONE APPARATUS INTENDED FOR COMMUNICATION WITH AIRCRAFT**

**3.5.1** The two-way VHF radiotelephone apparatus shall be kept in the navigation bridge or in any other compartment which is kept unlocked while the ship is at sea, if such compartment provides quicker and more convenient transfer of the apparatus to any lifeboat or any liferaft.

The apparatus shall be kept at a prominent place. All fastenings, if any, intended for securing the apparatus at the place of storage shall be designed for urgent releasing without applying tools.

A clearly visible symbol complying with the requirements of Part II "Life-Saving Appliances" shall be fitted near each position where the two-way VHF radiotelephone apparatus is located.

**3.5.2** Lifeboat fixed two-way VHF radiotelephone apparatus shall be located in accordance with the requirements of Part II "Life-Saving Appliances" so that its operational capacity is not affected if the boat is flooded by water taken in up to the level of upper seat pans.

**3.5.2.1** When accumulator batteries are provided as external source of electrical power for fixed two-way VHF radiotelephone apparatus, they shall be placed in the watertight boxes (IP68) complying with the requirements of Part XI "Electrical Equipment" of the Rules for the Classification and Construction of Sea-Going Ships.

Electric lighting ensuring equipment control panel lighting not less than 50 lux shall be fed from the above stated accumulator batteries.

**3.5.2.2** Accumulator batteries charging from generator, coupled to lifeboat engine, and from ship source of electrical power shall be provided. Flexible cable connecting batteries to charger, fed from the ship source of electrical power, shall ensure its immediate release in case of lifeboat quick launching.

**3.5.3** The two-way VHF radiotelephone apparatus intended for communication with aircraft shall be kept in the navigation bridge at a prominent place.

**3.5.4** The fixed two-way VHF radiotelephone apparatus intended for communication with aircraft shall be located in the navigation bridge at a prominent place.

### **3.6 LOCATION OF EMERGENCY POSITION-INDICATING RADIO BEACONS**

**3.6.1** A COSPAS-SARSAT satellite emergency position-indicating radio beacon (EPIRB) intended as the second independent mean of distress alert transmission (refer to 2.2.1) and not provided with remote activation shall be installed in close proximity to the workstation for radio communication on the navigation bridge so that immediate access is possible at all times for initiating the distress alert as well as it shall be manually released and easily placed in any lifeboat or liferaft by a single person.

**3.6.2** A free floating COSPAS-SARSAT satellite EPIRB or a VHF EPIRB intended for installation in the ship shall be stowed on the open deck of the ship so that it does not move during ship's extreme conditions and floats free in case of sinking of the ship (refer to Section 13). Meanwhile, an immediate access shall be arranged for manual release and initiating the distress alert and possibility of fast and easy placement in any lifeboat or liferaft by a single person.

**3.6.3** At any place of EPIRB installation the highly visible symbol marked in accordance with the requirements of Part II "Life-Saving Appliances" shall be provided.

### **3.7 LOCATION OF SHIP'S AND SURVIVAL CRAFT SEARCH AND RESCUE LOCATING DEVICE**

**3.7.1** Location of ship's and survival craft search and rescue locating device (SART or AIS-SART) shall be in compliance with the requirements of Part II "Life-Saving Appliances".

**3.7.2** At any place of installation of ship's and survival craft search and rescue locating device (SART or AIS-SART) the highly visible symbol shall be marked in accordance with the requirements of Part II "Life-Saving Appliances".

### **3.8 ARRANGEMENT OF EQUIPMENT AND CABLING OF PUBLIC ADDRESS SYSTEM**

**3.8.1** Public address system shall be capable of relaying command broadcasts from the command microphone posts to all accommodation and public spaces as well as to the open decks of the ship.

Measures shall be provided in the public address system to prevent electrical and acoustic feedback or other interference.

**3.8.2** The main command broadcast microphone post and the amplifiers of the public address system, as well as general radio broadcast receivers, record players and sound-recording apparatus relating to the post shall be installed in a special room — the command broadcast centre (refer to 3.1.2).

**3.8.3** Heating, lighting and ventilation of the ship command broadcast centre shall comply with the similar requirements specified for the radioroom.

**3.8.4** Every passenger ship shall be provided with at least three main broadcasting lines each of them shall have at least two loops of flame-retarding cable, sufficiently removed along the whole length and connected to two separate and independent amplifiers:

.1 deck line intended for operating loudspeakers installed on the open decks of the ship;

.2 service line intended for operating loudspeakers fitted in service, accommodation and public spaces of the ship's crew (cabins, messrooms, dining rooms, libraries, reading rooms, etc., including corridors and platforms adjacent to these compartments);

.3 passenger line intended for operating loud- speakers fitted in passenger accommodation and public spaces (cabins, dining rooms, libraries, reading rooms, restaurants, saloons, verandahs, bars etc., including corridors and platforms adjacent to these compartments).

In enclosed spaces, cables and wires of public address system shall, as far as possible, run clear of galleys, laundries, machinery spaces of category "A" and other enclosed spaces of high fire risk, if not intended for these spaces.

Cables shall be laid so as to prevent their failure caused by bulkhead heating due to the fire in adjacent spaces.

All areas of each fire zone shall be provided with cabling of at least two loops sufficiently separated throughout their length and connected to two separate and independent amplifiers.

**3.8.5** Every cargo ship shall be provided with the broadcasting lines specified in 3.8.4.1 and 3.8.4.2.

**3.8.6** Every passenger ship shall be provided with at least two remote command broadcast microphone posts. One post shall be fitted on the navigation bridge and the other in the room intended for keeping watch while the ship is in harbour. In ships not provided with special rooms for watch keeping, the second command broadcast microphone post shall be fitted in the most convenient place close to the gangway ladder.

**3.8.7** Measures shall be taken to avoid the disfunctioning of broadcasting line in case of short-circuiting in the loudspeaker branch (refer also to Part II "Life-Saving Appliances" of the Rules and Part XI "Electrical Equipment" of the Rules the for the Classification and Construction of Sea-Going Ships).

### **3.9 CABLING**

**3.9.1** All cabling of the radio equipment and protection measures against radio interference caused by the ship's electrical installations shall comply with the requirements specified in Part XI "Electrical Equipment" of the Rules for the Classification and Construction of Sea-Going Ships as well as with additions and amendments set forth in the present Chapter.

**3.9.2** The protection measures against radio interference caused by the ship's electrical devices fitted with means of protection according to the requirements of Part XI "Electrical Equipment" of the Rules for the Classification and Construction of Sea-Going Ships shall provide for such reception conditions that switching on and operating of such devices shall not increase the output voltage of each receiver by more than 20 per cent of the voltage value caused by internal noises.

**3.9.3** Radio equipment shall be supplied from the distribution board of the radio equipment in compliance with the requirements of Part XI "Electrical Equipment" of the Rules for the Classification and Construction of Sea-Going Ships.

The distribution board of the radio equipment shall be supplied from the main distribution board and from emergency distribution board by two independent feeders.

The distribution board of the radio equipment shall be provided with the switching and protective equipment for connection and protection of the appropriate radio equipment in each outgoing feeder.

Connection of any consumers not relating to the radio equipment to the distribution board of the radio equipment is not allowed.

**3.9.4** The space intended for radio equipment shall be provided with a light indicator or measuring instrument for continuous checking of the ship's mains voltage.

**3.9.5** All cabling included into the cabling network of shipboard radio communication facilities and public address system shall be made by means of screened cables, with continuity of screening being preserved.

**3.9.6** All cabling in the compartments equipped with shipboard radio communication facilities and radionavigational facilities shall be made by means of screened cables, with continuity of screening being preserved. It is not allowed to use at such places any radio equipment and electrical devices without adequate screening.

The armour of cables shall be earthed at those places where the cables enter the ship spaces in which radio-receiving apparatus is installed.

**3.9.7** Metal cases of radio apparatus shall be electrically connected to the ship's hull as directly as possible. The screening armour of cables, where the cables enter the equipment, shall be electrically connected to the cases of the equipment.

**3.9.8** The coaxial cables shall comply with the following requirements:

- .1** coaxial cables shall be fitted in separate cable runs laid at least 10 cm away from power cables;
- .2** crossing of cables shall be done at right angles (90°);
- .3** where there is one bend in one place, bending radius shall exceed external diameter of the cable 5 times;
- .4** where there are several bends in one place, bending radius shall exceed external diameter of the cable 10 times;
- .5** where flexible cables are used, bending radius shall exceed external diameter of the cable 20 times.

Coaxial cables in cargo holds, on the open deck and on masts shall be laid in compliance with the requirements of Part XI "Electrical Equipment" of the Rules for the Classification and Construction of Sea-Going Ships.

**3.9.9** In cabling connecting panels for remote transmission of distress alert, DSC encoders, structurally made as separate units, plug connectors shall not be used.

**3.9.10** Insulation resistance of every laid cable disconnected at both ends from the radio equipment shall not be less than 20 MOhm, irrespective of the cable length.

## **4 AERIALS AND EARTHING**

### **4.1 GENERAL**

**4.1.1** It is allowed to fit a ship with an aerial of any type which provides the highest operational efficiency of the radio equipment in accordance with its purpose.

Aerials shall be capable of withstanding the effects of mechanical and climatic factors encountered under the ship's service conditions.

**4.1.2** All ship aerials shall be capable of withstanding a pressure of air flow having speed of 60 m/s in any directions, the ship's speed and other factors being not considered.

**4.1.3** Wire aerials shall be manufactured of flexible stranded aerial wire made of copper or copper-based alloy. To satisfy the requirements of 4.1.2, when calculating the minimum diameter of the aerial wire, the aerial sag shall be taken as equal to 6 % of the aerial span.

**4.1.4** Each horizontal aerial wire shall be made of one-piece stranded wire. Where the construction of the aerial does not permit to make the down-lead and the corresponding horizontal aerial of one-piece wire, the connection of the horizontal aerial wire with the down-lead shall be made by means of splicing or by means of compression couplings providing the reliable electrical contact.

**4.1.5** For the purpose of increasing durable and reliable operation of wire T-type aerial, the main mechanical load of its down-lead shall not apply directly to the place of the down-lead connection with the horizontal wire.

It is recommended to apply this requirement during the assembling of F-type aerials.

**4.1.6** The down-lead wire of an aerial shall be secured at the lead-in to a guy fitted with insulators; then the down-lead wire shall be connected to the lead-in by means of copper or brass thimble. The connection of the thimble with the down-lead wire shall be effected by soldering or cold pressing.

**4.1.7** The aerial rigging shall ensure the possibility for quick lowering and hoisting as well as tension regulation of the wire aerial without man hoisting to the mast tops.

**4.1.8** As far as is practicable, every wire of multiwire aerial shall be capable of being hoisted and lowered separately. The span between the wires shall not be less than 700 mm.

**4.1.9** Halyards used for hoisting wire aerials shall be flexible halyards made of the material approved by the Register. Hoisting halyards used in ships carrying readily flammable cargoes shall be made of non-combustible materials and their securing positions shall be outside a dangerous space. If steel halyards are used in this case, they shall be reliably electrically connected to the ship's hull.

**4.1.10** Special high frequency insulators rated for corresponding operational voltage and mechanical load shall be used for the aerial insulation.

**4.1.11** The aerial insulation resistance in relation to the ship's hull under normal climatic conditions shall not be less than 10 MOhm, and under excessive humidity, not less than 1 MOhm (for MF/HF transmitting aerials, 50 MOhm and 5 MOhm are recommended accordingly).

**4.1.12** Mast-type aerials and aerials of other types consisting of some separate conducting units shall be so constructed that the value of contact resistance of any electrical connection does not change under the influence of mechanical loads and climatic factors encountered under service conditions.

**4.1.13** The transmitting aerials shall be designed for operation of any transmitter connected to them at maximum values of its output power and impressed voltage.

The construction of the transmitting aerials shall exclude any possibility of the corona-effect.

**4.1.14** The receiving aerials shall be so constructed and arranged that their interaction with all transmitting aerials and with one another is minimum.

**4.1.15** Individual lengths of the horizontal and down-lead wires of the aerials shall be located at a distance not less than 1 m from funnels, masts and other metal objects of the ship. The aerials shall be arranged so as to prevent touching the metal structures of the ship under any service conditions.

**4.1.16** Separate elements of the mast-type aerials such as wires, pins and insulators shall be easily replaceable.

It is recommended to provide the collapsible mast-type aerials.

**4.1.17** The aerials of general radio broadcasting and television receivers shall be arranged as far apart from all service purpose aerials as possible.

**4.1.18** If the portable VHF radiotelephone station for service interior communications is stationary mounted, its aerial height shall not exceed 3,5 m above the navigation bridge deck.

**4.1.19** In oil tankers and oil recovery vessels, gas carriers and chemical carriers all steel rigging of masts (shrouds, stays, whistle/tyfon, etc.) shall be broken up with insulators. The distance between the insulators shall be not more than 6 m, and the lowest insulator shall be not less than 3 and not more than 4 m from the deck. It is recommended to break up the rigging of every ship with insulators in order to minimize power losses while operating transmitters.

**4.1.20** The lower ends of the standing steel rigging of masts and funnels shall be electrically connected to the ship's hull in compliance with the requirements specified in 4.7.8. All other rigging shall be insulated from the ship's hull or, if the fulfilment of this requirement is impracticable, shall be reliably electrically connected to the ship's hull by means of bronze or steel stranded wire of the adequate crosssection.

#### **4.2 MF AND MF/HF-AERIAL**

**4.2.1** The aerial shall provide the possibility of tuning transmitters to any frequency of the required frequency range, and the necessary radio communication. The receiving aerials may be of any type complying with the requirements of the Rules.

**4.2.2** The T- or inverted-L aerial shall be provided with means for its quick replacement by a spare aerial and shall have a device capable of preventing an aerial break caused by severe mechanical tension, for example, it may be a safety loop with a mechanical safety device fitted in the aerial halyard. The breaking force of the mechanical safety device shall be equal to not more than 0,3 of the breaking force of the aerial wire. The mechanical safety device shall be capable of ensuring sufficient slackening of the aerial tension, simultaneously preventing the aerial from touching superstructures, rigging and the ship's hull.

A device capable of preventing an aerial break need not be provided if the aerial length is not over 25 m and the aerial is suspended between the supports not subjected to the abrupt vibrations.

#### **4.3 VHF-AERIAL**

**4.3.1** The VHF-aerial shall have a vertical polarization and be placed in a position which is as elevated and free as possible, with at least 2 m horizontal separation from constructions.

**4.3.2** The VHF-aerial shall be fitted at the maximum possible height so as to ensure effective radiation and reception of signals at all operating frequencies.

#### **4.4 GENERAL REQUIREMENTS TO ANTENNA SYSTEM OF INMARSAT SHIP EARTH STATION**

**4.4.1** Antenna system shall be placed in a position which is as elevated as possible from other purpose aerials and at places of the lowest vibration.

It shall be installed at readily accessible place.

**4.4.2** The siting of the antenna system shall be so selected as to provide constant satellite tracking in all directions at positive angles up to  $-5^\circ$  relative to the horizon plane. Antenna system shall be installed at the top of the radar mast or at the mast specially installed for this purpose.

For directional antenna system measures shall be taken to avoid shadow sectors of greater than  $6^\circ$  caused by ship structures within a radius of 10 m from the antenna.

For nondirectional antenna system measures shall be taken to avoid shadow sectors of greater than  $2^\circ$  caused by ship structures within a radius of 1m from the antenna.

**4.4.3** Antenna system shall not be installed on the same level as the radar aerial.

**4.4.4** When installing the antenna system the following safe distances to other purpose aerials and magnetic compass shall be provided for:

- .1 to HF-aerial — more than 5 m;
- .2 to VHF aerial — more than 4 m;
- .3 to magnetic compass — more than 3 m.

#### **4.5 ANTENNA SYSTEM OF INMARSAT-C SHIP EARTH STATION AND EGC RECEIVER**

**4.5.1** Antenna system shall be so installed as to avoid shadow sectors impairing the performance of equipment in the bow and the stem direction of the ship up to  $-5^\circ$  and in the starboard and port directions up to  $-15^\circ$  relative to the horizontal plane.

**4.5.2** When installing two antenna systems of INMARSAT-C ship earth station the vertical distance between them shall be not less than:

- 1 m — in horizontal plane;
- 2,5 m — in vertical plane.

**4.5.3** When installing the antenna of EGC receiver considering 8.2.1 (if a separate antenna is provided), the applicable requirements of 4.4.2 and 4.5.1 shall be complied with.

#### **4.6 LEAD-IN AND INTERIOR WIRING OF AERIALS**

**4.6.1** Wiring of the transmitting aerials into interior spaces of the ship shall be effected through special lead-in fitted with insulators capable of withstanding the corresponding operational voltage, except when the interior wiring of an aerial is made by means of an coaxial cable.

**4.6.2** The construction of the lead-in of the transmitting aerial shall provide for the possibility of easy and ready connection and disconnection of the aerial, preferably, without applying any tools. The construction of the lead-in shall exclude any possibility of the corona-effect during the operation of the transmitter.

**4.6.3** The leads-in of the transmitting aerials shall be, preferably, fitted at such places where they provide for the shortest possible run of aerial wiring in interior compartments from the lead-in to transmitters. When installed at readily accessible place, the lead-in and the aerial connected thereto shall be completely guarded against the possibility of accidental touching within 1800 mm above the appropriate deck, a stairway (ladder) or any other place where people may be present. When installing the protection casings or using the hollow mast-type aerials the provision shall be made for removing the condensate from the inner cavities of the structure.

**4.6.4** To eliminate energy losses, it is recommended to use precaution guards made of insulating materials. If metal precaution guards are used, they shall be reliably earthed to the ship's hull. The precaution guard shall not cause a dead angle for visual bearing taking.

**4.6.5** Feeders of transmitting MF-aerials, laid in interior compartments, shall be, preferably, as short as possible.

**4.6.6** Feeders of transmitting aerials shall be screened; the aerial switches (commutators) shall be of a screened type.

**4.6.7** Feeders of the receiving aerials shall be made with coaxial screened cables, with continuity of screening being preserved. In this case, all commutators, change-over switches, lightning arresters and other devices connected to such cables shall be of a screen type. Feeders shall not induce signal attenuation over 3 dB.

**4.6.8** The coaxial screened cables of the feeders of receiving aerials shall be led directly to the open deck and connected to the receiving aerials at the sufficient height. This connection shall be made by means of special contact device of waterproof or hermetic design, providing for reliable electrical connection and access for control over its condition.

**4.6.9** Every aerial not intended for constant switching to operational position shall be provided with a special commutating device fitted inside the compartment and capable of switching the aerial into operational, isolated and earthed positions.

**4.6.10** Every receiving aerial shall be provided with a special device capable of protecting the receiver lead-in against atmospheric discharges.

**4.6.11** If the matching system or the devices capable of protecting against atmospheric discharges are fitted between the receiving aerial and coaxial cable, they shall be connected on the aerial side.

#### 4.7 EARTHING

**4.7.1** Operational (high-frequency) earthing intended for ensuring normal operation of shipboard transmitters installed in the radioroom shall be made with the help of a copper busbar and shall run as directly as possible from the aerial commutator to a metal bulkhead or deck reliably electrically connected to the ship's hull. The busbar shall have tappings leading to the earthing terminals of transmitters. The length of the bus-bar from the transmitter to the place where connection with the bulkhead or deck is effected shall not exceed 1000 mm. Depending upon the power of transmitters, the sectional area of busbars and tappings shall be not below values indicated in Table 4.7.1.

Table 4.7.1

Power of transmitter, W	Busbar sectional area, mm <sup>2</sup>
Below 50	25
50 — 500	50
Above 500	100

In all cases, where practicable, it is allowed to effect the operational earthing of each transmitter separately by connecting the earthing terminals of a transmitter to the nearest metal bulkhead by means of a copper busbar or a flexible conductor of adequate sectional area.

**4.7.2** In transmitters with emissive power above 50 W, the electric connection of the earthing busbar (flexible conductor) to the transmitter case shall be made in at least two places most widely apart.

**4.7.3** Operational earthings of radio receivers installed in the radioroom shall be effected by means of a copper busbar or a flexible bronze (copper) stranded wire with a sectional area of not less than 6 mm<sup>2</sup> run as directly as possible from each receiver to the main earthing busbar of transmitters or directly to the nearest metal bulkhead reliably connected to the ship's hull.

**4.7.4** Operational earthings of radio communication facilities, public address system and other radio apparatus shall be carried out in compliance with the requirements of the present Part for operating earthings of receivers or transmitters.

**4.7.5** In non-metal ships the operational earthing shall be common for the shipborne radio equipment. In this case, the electrical contact of the earthing with water shall be effected by means of a tinned copper or brass plate of at least 4 mm thick and having an area of not less than 0,5 m<sup>2</sup> secured to the outside surface of the hull below the lightest draught of the ship. It is recommended to provide two such earthings; in such a case, the contacting surface of each earthing plate may be reduced to half the above value.

Metal keel binding or anti-teredo metal plating of wooden ships may be used instead of specially provided earthing gear.

**4.7.6** On non-metal lifeboats the earthing of the radio station shall be made with two tinned copper tapes of not less than 1 mm thick and having the common area of not less than 0,1 m<sup>2</sup>, fitted to the right and to the left of the keel near the middle frame of the boat.

**4.7.7** The connecting wires of protective earthing of the apparatus cases shall be as short as possible, but not more than 150 mm long.

**4.7.8** Protective earthing of lower ends of standing rigging of masts and funnels shall be made with flexible metal conductors. Such conductors shall be provided with special soldered thimbles which shall be secured to the metal hull of the ship by means of two screws or by welding. The spots of connection with the hull shall be painted.

**4.7.9** The total resistance of all electric connections of any earthing shall not exceed 0,02 Ohm.

**4.7.10** It is not allowed to use the earthing gear of radio equipment as a lightning arrester.

## **5 PERFORMANCE STANDARDS AND FUNCTIONAL REQUIREMENTS FOR RADIO EQUIPMENT**

### **5.1 GENERAL**

**5.1.1** Radio equipment shall be so designed and arranged that easy operation in compliance with the technical documentation requirements for it, access for survey, maintenance and repair is provided.

Each type of radio equipment shall be designed for being operated by one person.

**5.1.2** Radio equipment shall be so designed that replacement of its main units can be easily made without special tuning.

**5.1.3** In case any equipment unit is connected to one or several units of other equipment, the technical and operation requirements for all equipment shall be maintained.

**5.1.4** Easy, quick and efficient operation shall be provided by the amount of controls, their design, functioning, arrangement, construction and dimensions.

**5.1.5** The controls shall be so located as to eliminate the possibility of accidental use.

**5.1.6** The controls not used in the normal operation mode shall not be easily accessible.

**5.1.7** The controls, inadvertent operation of which may cause switching off or damage to the equipment as well as nonadequate signalling, shall be specially protected against unauthorized access.

**5.1.8** The construction of all controls shall prevent spontaneous changing of their preset positions.

**5.1.9** Controls of radio apparatus shall be protected against mechanical damage likely to occur when the face panel is put on the plane surface.

**5.1.10** The diagram and construction of equipment shall exclude any possibility of damage or any harm to service personnel as a result of wrong sequence in operating the controls.

**5.1.11** The controls and measuring instruments of radio apparatus shall be provided with distinct nameplates or conventional symbols designating their purpose and operation.

**5.1.12** In all cases, the position of the controls indicating "on", "start", "increase", etc., shall correspond to the setting of control handles upwards and from or to the right of the operator, turning the control knobs clockwise and pressing the upper or right-hand buttons. The position indicating "off", "stop", "decrease", etc. shall correspond to the setting of control handles down, towards or to the left of the operator, turning the control knobs counter-clockwise and pressing the lower or left-hand buttons.

The "on" position shall have light indication.

**5.1.13** Provision shall be made for adjustable lighting of the equipment itself or a ship allowing for the distinct discerning the controls and facilitating the display unit reading at any time.

**5.1.14** Calibration of principal dials, inscriptions, marks and positions of indicators and controls fitted on the apparatus shall be distinctly visible at a distance of 700 mm under standard illumination intensity and normal eyesight.

**5.1.15** The dials of basic instruments intended for measuring the current intensity in the aerial and in output stage of the transmitter as well as for measuring the ship's mains voltage shall be so calibrated as to make any correction factor unnecessary.

**5.1.16** Radio apparatus in which a cathode-ray indicator is used shall be capable of providing possibility for image viewing in daylight.

**5.1.17** It is recommended that special turn locks, wing nuts or latches, capable of being loosened without any tools applied, be used instead of threaded fastenings for the purpose of securing drop and sliding frames, removable panels to the cases of radio apparatus.

**5.1.18** Non-secured drop and sliding frames of radio apparatus shall be fitted with safety locks capable of operating in both directions to prevent possible falling of frames out of the cases.

Opening doors shall be fixed in the open position.

**5.1.19** Securing gear of removable and drop-type panels of radio apparatus shall be of non-falling-out construction.

**5.1.20** Access to all current-carrying parts of radio apparatus, except aerial leads-in and earthing wires shall be permitted only after opening the case.

Where the opening of the case is carried out without applying any tools, then, after each opening, no unprotected conductor of radio apparatus shall remain under the voltage over 50 V relative to any other conductors or "earth". The capacitors mounted in the circuits of more than 50 V shall be automatically discharge to the voltage of 50 V and less.

**5.1.21** The circuit and construction of radio apparatus shall not exclude the possibility of carrying out the tests of it while in operation, with the case remaining open using special tools. Adequate protection of the operating personnel against electric shock in circuits of more than 50 V shall be provided. The construction of radio apparatus shall provide possibility for opening the cases only after disconnecting the voltage over 50 V.

**5.1.22** All fixed radio equipment cases shall be fitted with terminals for connecting the earthing wire. The number and arrangement of earthing terminals on the cases of radio apparatus shall ensure removal of high-frequency voltage from the cases.

Opening doors, plug-in units and folding-back panels containing measuring instruments and other components of radio equipment shall be properly grounded by at least one flexible jumper.

**5.1.23** All metal parts mounted on the outside of the radio apparatus case shall be reliably electrically connected to the case.

**5.1.24** The connection of all cables to the radio apparatus shall be carried out, with continuity of screening being preserved. The screening metal sheathings of cables shall be electrically connected to the apparatus cases. Provision shall be made for mechanical securing of cable to the apparatus case.

**5.1.25** It is recommended to provide the radio apparatus and remote controls with devices capable of signalling any failure or critical operating conditions in essential circuits of radio equipment as well as switching on the power supply and voltage over 50 V. The colours adopted for light signalling system shall comply with the requirements specified in Part XI "Electrical Equipment" of the Rules for the Classification and Construction of Sea-Going Ships.

**5.1.26** All interior wiring electric connections of radio apparatus shall be of screw, socket outlet or non-acid hot soldering kind, or of any other kind approved by the Register.

**5.1.27** All screw-type connections of the interior wiring as well as of the structural parts of radio apparatus the loosening of which is likely to disturb the apparatus parameters shall be strong and provided with special locking devices to prevent their getting loose. These locking devices shall be capable of withstanding multiple loosening of nuts and screws without any damage being sustained by screw threads or the devices themselves.

**5.1.28** Interior components of radio apparatus shall have distinct and indelible markings corresponding to those of schematic and wiring diagrams. It is allowed to label the markings of small components on the frames (chassis) and screens of corresponding units as well as on enlarged photos attached to the description. Output terminals of radio apparatus shall be clearly labelled to indicate their purpose; power supply circuits shall have voltage and polarity markings.

**5.1.29** Inscriptions characterizing technical parameters and other data fixed on the radio apparatus shall be located at prominent places.

**5.1.30** The construction of plug-and-socket connections used in radio apparatus shall exclude any possibility of their wrong connection. Measures shall be taken to prevent wrong insertion of plugs into sockets not intended for their connection. Projecting contacts of plug-and-socket connections shall be not live when being in "off" position.

**5.1.31** If a forced cooling system is used in the radio equipment, it shall be provided with the dust filters being readily changeable.

**5.1.32** Facilities shall be provided to protect all operational software incorporated in the radio equipment. Any software required in equipment to facilitate operation in accordance with technical documentation, including that for its initial activation/reactivation, shall be permanently installed within

the equipment, in such a way that it is not possible for the radiotelephone station personnel to have access to this software.

It shall not be possible for the operator to amend, augment or erase any software in the equipment required for operation in accordance with technical documentation.

Means shall be provided to monitor the operational software of the equipment automatically at appropriate regular intervals, as indicated in the equipment technical documentation, and to activate an alarm in the event of non-automatically recoverable failure.

**5.1.33** If the digital keyboard for digital input is provided, the digits shall be arranged in compliance with the recommendations of the International Radio Consultative Committee.

Where a letter-digital keyboard is provided for, the figures from "0" to "9" may alternatively be ranged in compliance with the ISO regulations.

**5.1.34** The display devices used within the radio equipment, with the screen diagonal not more than 0,5 m (with the exception of devices displaying not more than four information lines) shall not produce magnetic induction exceeding 200 nT within frequency band of 5 Hz to 2 kHz and exceeding 25 nT within frequency band of 2 to 400 kHz at a distance of 50 cm from the device. In this case the magnetic induction level at a distance of 30 cm from the face of the display screen shall not exceed 200 nT within frequency band of 5 Hz to 2 kHz. The strength of the magnetic field induced by the display device at a distance of 50 cm in all directions from the device shall not exceed 10 V/m within frequency band of 5 Hz to 2 kHz and 1 V/m within frequency band of 2 to 400 kHz. Along with that, at a distance of 30 cm from the face of the display screen the strength of the induced electromagnetic field shall not exceed 1 V/m within frequency band of 2 to 400 kHz. The electrostatic field strength at a distance of 10 cm from the face of the display screen shall not exceed  $5,0 \pm 0,5$  kV/m.

For the display devices with screen diagonal more than 0,5 m, higher field levels are accepted. In this case, the technical documentation for such devices shall state the minimum distances at which:

magnetic induction does not exceed 250 nT within frequency band of 5 Hz to 2 kHz and does not exceed 150 nT within frequency band of 2 to 400 kHz;

electromagnetic field strength does not exceed 15 V/m within frequency band of 5 Hz to 2 kHz and does not exceed 10 V/m within frequency band of 2 to 400 kHz;

electrostatic field strength does not exceed  $5,0 \pm 0,5$  kV/m.

**5.1.35** Radio equipment shall generally be designed for power supply from the ship's mains having a voltage not exceeding 250 V. If voltage over 250 V is applied, the construction of the power switchboard as well as that of basic apparatus shall comply with the requirements of 5.1.20.

Design of the radio equipment shall ensure keeping of technical parameters at continuous variation of alternating current mains voltage by  $\pm 10$  % and frequency by  $\pm 5$  % as well as when power supply varies by +30 % or  $-10$  % from the rated value if fed by accumulator battery or direct current mains.

Radio equipment shall remain operable at short voltage deviations in mains by  $\pm 20$  % within 1,5 s and frequency by  $\pm 10$  % within 5 s. Meanwhile, alarm shall not activate.

**5.1.36** Provision shall be made for protection of radio equipment against current inrushes and overvoltage as well as accidental change in polarity of the source of power and wrong sequence of phases within 5 minutes.

**5.1.37** Earthing (connection to the hull) of the ship's mains and accumulator batteries in circuits of radio equipment is not allowed.

**5.1.38** The voltage value between the contacts of microphones and headphones (between wires) as well as between them and the earth shall not exceed 50 V.

**5.1.39** Insulation resistance of feeding circuits of radio equipment measured between conductors and the case of the apparatus as well as between the windings of transformers shall not be below the rates given:

Test conditions	Insulation resistance, megohms
Normal climatic conditions	20
Temperature $(55 \pm 3)$ °C. Relative humidity below 20 %	5
Temperature $(40 \pm 2)$ °C. Relative humidity $(95 \pm 3)$ percent	1

**5.1.40** All feeding circuits of radio apparatus shall be fitted with readily replaceable fuses or circuit breakers. The construction of fuse cartridges shall exclude any possibility of accidental touching of current-carrying parts by the operating personnel while replacing fuses. The time necessary for access to fuses shall not exceed 5 s.

**5.1.41** All radio equipment shall be designed for shipboard operation under any service conditions and shall be capable of withstanding mechanical and climatic tests to at least standards given below:

**.1** at rolling, pitching and prolonged inclinations up to 45° with a rolling and pitching period of 7 to 9 s in two interperpendicular operational positions during 5 min;

**.2** under vibration conditions in the frequency range of 2 to 100 Hz with an amplitude of  $\pm 1$  mm for frequencies from 2 to 13,2 Hz and an acceleration of 0,7g (7 m/s<sup>2</sup>) for frequencies from 13,2 to 100 Hz in three interperpendicular positions;

**.3** under shock loads with an acceleration of 10g (100 m/s<sup>2</sup>), a pulse duration of 10 to 15 ms and a frequency of 40 to 80 bumps/min in three interperpendicular positions with the total number of bumps not less than 1000.

Necessity to perform the shock tests depends on the type of equipment, place of its installation and sea area;

**.4** at a temperature of  $55 \pm 3$  °C for the equipment designed to operate in the interior spaces and on the open decks of the ship during 10 to 16 h in the operating condition, and at a temperature  $70 \pm 3$  °C in the idle condition during 10 to 16 h;

**.5** at a relatively humidity of air  $95 \pm 3$  % and a temperature of  $40 \pm 2$  °C during 10 to 16 h;

**.6** at a temperature of  $-15 \pm 3$  °C and  $-40 \pm 3$  °C (for the fixed equipment designed to operate in the interior spaces of the ship and on the open decks of the ship respectively) during 10 to 16 h in the operating conditions and at a temperature of  $-60 \pm 3$  °C in the idle condition during 2 h.

Radio equipment shall be capable of resisting the brine (sea) fog.

Radio equipment shall be mould growth resistant and capable of withstanding the effect of hoarfrost, dew and icing (for the equipment designed to operate on the open decks of the ship).

Portable radio equipment shall be capable of resisting the solar radiation.

Portable radio equipment shall be capable of resisting oil.

Materials used for the manufacture of shipborne radio equipment shall ensure its long-term operation under the above conditions.

The mast-type aerials and other aerials of self-supporting type shall satisfy the tests within the limits of possible use of the test benches and chambers.

**5.1.42** The degree of protection of the radio equipment arranged in ship spaces shall be not lower than that indicated in Table 5.1.42.

Table 5.1.42

Nos.	Type of radio apparatus	Installation site	Degree of protection
<b>1</b>	Leads-in of aerials	Anywhere in ship	IP00
<b>2</b>	Communicating devices of aerials and apparatus containing no high-frequency circuits	Enclosed spaces	IP20
<b>3</b>	Radio apparatus, except apparatus specified in items 1 and 2	Enclosed spaces Navigation bridge, radioroom	IP21 IP22
<b>4</b>	Radio apparatus, except apparatus specified in item 1	Open decks	IP56
<b>5</b>	Two-way VHP radiotelephone apparatus and ship's search and rescue locating device (ship's radar search and rescue transponder or ship's AIS search and rescue transmitter)	Survival craft	IP68
<b>6</b>	Emergency radio beacon (in operational condition)	Open decks	IP68

**5.1.43** Radio apparatus shall comply with the following requirements which ensure the electromagnetic compatibility (EMC) on board ship.

**5.1.43.1** The voltage level of conducted interference from radio equipment at the electric power supply terminals shall not exceed values shown in Fig. 5.1.43.1.

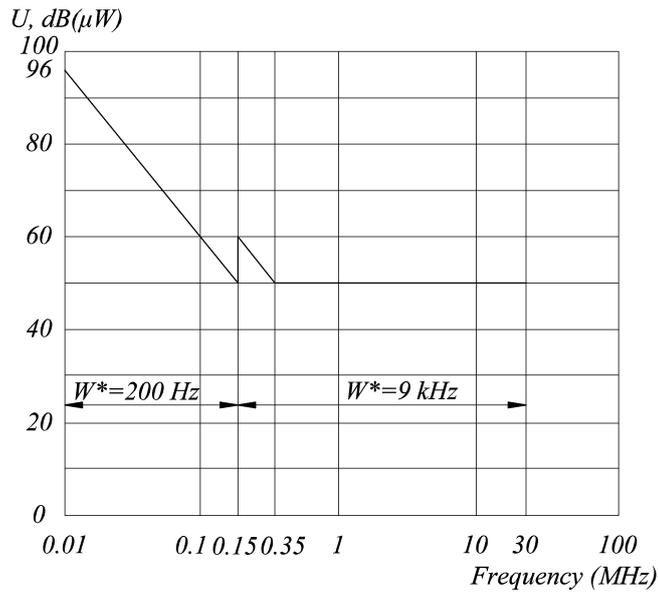


Fig. 5.1.43.1

Curve of the permissible level of conducted interference voltage  $U$ , measured at the electric power supply terminals:  
 $W^*$  is the meter bandwidth

**5.1.43.2** The intensity level of radiated interference field produced by radio equipment at a distance of 3 m from the casing shall not exceed values shown in Fig. 5.1.43.2.

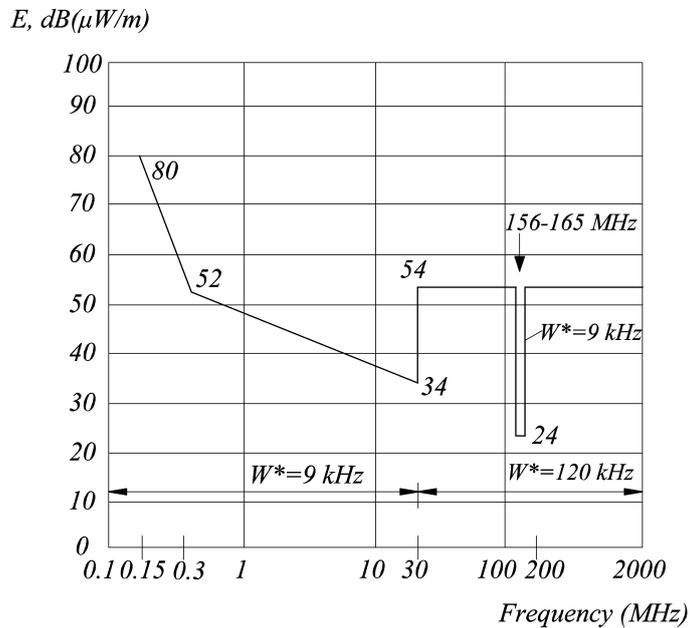


Fig. 5.1.43.2

Curve of the permissible intensity level of radiated interference field measured at a distance of 3 m from the equipment casing:  
 $W^*$  is the meter bandwidth

**5.1.43.3** Radio equipment (except for the portable equipment) shall be immune to conducted low-frequency interference when the following additional test voltages are imposed on supply voltage within the frequency range from 50 to 10 kHz:

**.1** for equipment with D.C. power supply — sine voltage the actual value of which is 10 % of the rated supply voltage;

**.2** for equipment with A.C. power supply — sine voltage the actual value of which, in relation to the rated supply voltage, varies with the frequency as shown in Fig. 5.1.43.3.2.

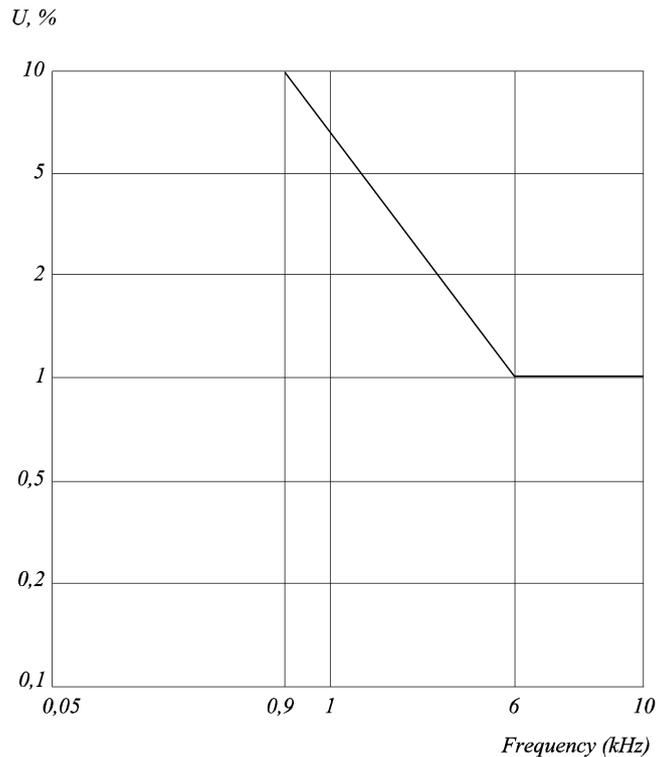


Fig. 5.1.43.3.2

Curve of the test voltage used to check the equipment for immunity to low-frequency conducted interference

**5.1.43.4** Radio equipment, except for the portable equipment shall be immune to conducted radio frequency interference when the following sine voltage are applied to input terminals of the power supply sources, signalling and control circuit of equipment:

**.1** with an actual voltage value of 3 V at the frequency which varies from 10 kHz to 80 MHz;

**.2** with actual voltage value of 10 V at the points with frequencies: 2 MHz; 3 MHz; 4 MHz; 6,2 MHz; 8,2 MHz; 12,6 MHz; 16,5 MHz; 18,8 MHz; 22 MHz and 25 MHz.

Modulation frequency of the test signal shall be  $400 \text{ Hz} \pm 10 \%$  with modulation depth of  $80 \pm 10 \%$ .

**5.1.43.5** Radio equipment shall be immune to radiated radio frequency interference, where located within a modulated electric field with an intensity of 10 V/m when the test signal frequency varies from 80 MHz to 2 GHz. Modulation frequency of the test signal in this case shall be  $400 \text{ Hz} \pm 10 \%$  with modulation depth of  $80 \pm 10 \%$ .

**5.1.43.6** Radio equipment, except for the portable equipment, shall be immune to nanosecond pulse interference induced by fast transients when the following test pulse voltages are applied to input terminals of the power supply sources, signalling and control circuits of the equipment:

**.1** with an amplitude of 2 kV and repetition frequency of 2,5 kHz — at the differential inputs of A.C. power supply sources;

.2 with an amplitude of 1kV in relation to the common earthed input and with a repetition frequency of 5 kHz — at the inputs of signalling and control circuits.

The test signal rise time in this case shall be 5 ns (at 10 to 90 % amplitude level), pulse duration shall be 50 ns (at 50 % amplitude level).

**5.1.43.7** Radio equipment, except for the portable equipment, shall be immune to microsecond pulse interference induced by slow transients when a test pulse voltage with amplitudes: 2 kV — line/earth, 1 kV — line/line is applied to its A.C. power supply circuits.

The test signal rise time in this case shall be 1,2  $\mu$ s (at 10 to 90 % amplitude level), duration — 50  $\mu$ s (at 50 % amplitude level), repetition frequency — 1 pulse/min.

**5.1.43.8** Radio equipment, except for the portable equipment, shall remain operative at power supply voltage during 60 s. In this case, the possibility of failure of the software and loss of the on-line data shall be ruled out.

**5.1.43.9** Radio equipment shall be immune to electrostatic discharges at the voltage levels of test discharge: 6 kV — for contact discharge, 8 kV — for air discharge.

**5.1.44** The ambient noise level produced by radio equipment during its operation (with the sound alarm switched off) shall not exceed 60 dB at a distance of 1 m from any part of the equipment.

The acoustic noise level produced by the sound alarm at a distance of 1 m from the noise source, except for the sound alarm for reception of distress alert, shall be within the range from 75 to 85 dB.

The sound alarm for reception of distress alert shall be audible in any location of the navigation bridge at any noise level possible in operation of the ship, and along with that, the acoustic noise level produced by this alarm at a distance of 1 m from the noise source shall be not lower than 75 dB.

**5.1.45** The X-radiation level induced by individual units of the radio equipment (cathode-ray indicators, transceiver components, etc.) shall not exceed 5 mcJ/kg (0,5 mrem/hour) at a distance of 5 cm from the surface of the devices.

**5.1.46** The radio equipment to be installed near the magnetic compass shall be provided with clear inscriptions indicating the minimum safe distance, at which it can be located away from the compass. The minimum safe distance to the magnetic compass shall be deduced by recognising that at this distance the influence of the specific radio equipment (or individual unit) in "on" position is such that the deviation of the magnetic compass does not exceed  $5,4^\circ/H$  for magnetic compasses installed on the upper bridge and not less than  $18^\circ/H$  for magnetic compasses installed inside the navigation bridge where  $H$ , in  $\mu$ T, is the horizontal component of the Earth magnetic field induction).

**5.1.47** Each radio equipment unit shall be arranged at a prominent place and have distinct markings containing the following information, at prominent places:

.1 manufacturer data;

.2 radio equipment type number or the name under which the radio equipment has passed type tests;

.3 radio equipment serial number, assigned by manufacturer;

.4 year of manufacture;

.5 safe distance between radio equipment and magnetic compass.

**5.1.48** Spare parts for radio equipment shall be kept under the conditions preventing any probability of their damage and ensuring the possibility of their convenient transfer as well as for their ready identification in respect to the type of equipment they are designed to serve.

## 5.2 GENERAL REQUIREMENTS FOR EQUIPMENT OF RADIO COMMUNICATION FACILITIES

**5.2.1** The equipment of radio communication facilities shall be capable of transmitting and receiving radio alerts for distress, urgency and safety in the shortest possible time. To fulfil the above purpose the equipment shall comply with the following requirements:

.1 switching on the power supply of the equipment providing distress alert as well as communication in distress and for safety, shall be performed by one step manipulation only;

.2 starting period of transmitters and receivers shall not exceed 1 min;

.3 frequency retiming period of radio apparatus shall be as short as possible, but it shall not exceed 15 s. Emissions shall not be produced during the frequency retuning period;

.4 switching over from transmission to reception and vice versa, while using shipboard radio communication facilities, shall be effected automatically. The level of radio interference produced by the transmitter shall not exceed the permissible rates accepted in the national standards;

.5 switching over from one class of emissions to another shall be performed by one step manipulation only;

.6 radio installations shall include means of automatic data input for correction of the ship's coordinates, the date and the time of their determination from electronic navigational aids for detection of locations which may be a constituent part of radio installations.

Radio installations, where electronic navigational aids for detection of locations are not installed, shall include the special device (interface) intended for digital interface with electronic navigational aids for detection of locations for compliance with the above requirement.

Besides, radio installations shall include means for manual input of the ship's coordinates, the date and the time of their determination.

Audible and visible signalling operating in cases when the data from the electronic navigational aids for detection of locations have not been received or in cases of manual input when these data have not been updated during 4 h shall be provided. Any information on the ship's coordinates not being updated during more than 23,5 h shall be automatically deleted.

For INMARSAT ship earth station, information on the ship coordinates not being updated during more than 24 h shall be clearly indicated;

.7 any distress alert initiation shall be carried out by two independent actions only by means of a dedicated button. This button shall be clearly identified (of red colour) and protected against inadvertent operation.

The distress alert initiation button shall be enclosed by a spring loaded lid or cover permanently attached to the equipment (e.g. by hinges).

It is not necessary for the user to remove seals or to break the lid or cover for the distress alert initiation.

The operation of the distress alert initiation button shall be accompanied by audible and visible indication.

The distress alert initiation button shall be pressed during at least 3 s. The flashing light and an intermittent signal shall start immediately. In 3 s the distress alert shall be initiated and the indication (audible and visible) shall become steady.

The equipment shall indicate the status of the distress alert transmission. It shall be possible to interrupt and initiate distress alerts at any time (refer to 1.2).

**5.2.2** Radio equipment for transmission of the distress alert shall be designed in a way preventing its inadvertent operation.

The panel for radio equipment emergency operation shall be isolated from the panel for regular operation and closed with a cover. Switches on the emergency panel shall be clearly coloured.

**5.2.3** The construction of the apparatus intended for transmitting distress alerts as well as communication in distress and for safety shall provide for rapid detection and elimination of any faults. To fulfil this purpose the opening of cases for providing access to interior parts of apparatus shall be effected in the shortest possible time and without applying any tools, considering 5.1.20.

**5.2.4** Frequency tolerance of transmitters and receivers shall not exceed the values given in Table 5.2.4.

**5.2.5** All shipboard VHF, MF/HF transmitters shall be designed for continuous operation during at least 6 h, the ratio of the total emission duration to the pause duration being 2:1.

The two-way VHF radiotelephone apparatus intended for communication with survival craft and two-way VHF radiotelephone apparatus intended for communication with aircraft shall be capable of continuous operation during 8 h, when operating cycle being 1:9 (refer to Footnote 6, Table 2.3.4).

Table 5.2.4

Nos.	Frequency range(including upper and excluding lower limit)	Radio communication facilities	Permissible frequency tolerance	Permissible relative frequency tolerance
1	1605 to 4000 kHz	MF radio installation	40 Hz <sup>1, 2, 3</sup>	—
2	4000 to 29700 kHz: for emission class A1A for other classes	HF radio installation	— 50 Hz <sup>1, 2</sup>	$10 \times 10^{-6}$ <sup>4</sup> — <sup>4</sup>
3	156 to 174 MHz	VHF radio installation	—	$10 \times 10^{-6}$
4	Beyond range 156 to 174 MHz	Two-way VHF radiotelephone apparatus Two-way VHF radiotelephone apparatus for communication with aircraft VHF radiotelephone station Radiotelephone station for internal service communication	— — — —	$50 \times 10^{-6}$ $50 \times 10^{-6}$ $5 \times 10^{-6}$
5	470 to 2450 MHz	Ship earth station	—	$20 \times 10^{-6}$

<sup>1</sup>For narrow band phase-shift keying – 5 Hz; For transmitters with frequency-shift keying – 10 Hz.

<sup>2</sup>Permissible deviation for transmitters of ship earth radio installations shall be 10 Hz.

<sup>3</sup>For emission class A1A permissible relative deviation of frequency shall be  $50 \times 10^{-6}$ .

<sup>4</sup>For transmitters of ship earth stations installed on small boat operated in coastal area and working in a frequency range of 26175 to 27500 kHz, power of carrier frequency up to 5 W and using emission class A3E or F3E and G3E, permissible relative deviation of frequency shall be  $40 \times 10^{-6}$ .

**5.2.6** The mean power of any spurious emission supplied to the aerial feeder of a transmitter operating within the frequency range below 30000 kHz shall be at least 40 dB less than the mean power on the base emission frequency and in no case shall exceed 50 mW.

For frequency-modulated maritime mobile radiotelephone equipment which operates above 30000 kHz, the mean power of any spurious emission falling in any other international maritime mobile service channel, due to products of modulation, shall not exceed a level of 10 µW and the mean power of any other spurious emission on any discrete frequency within the international maritime mobile service band shall not exceed a level of 2,5 µW.

Where, exceptionally, transmitters of mean power above 20 W are employed, these levels may be increased in proportion to the mean power of the transmitter.

Average power of any side emission of all ship transmitters in a standby mode shall not exceed 2 nW.

**5.2.7** The upper sideband shall be used for classes of emission H3E and J3E.

**5.2.8** For class of emission J3E the degree of carrier suppression shall be at least 40 dB.

For class of emission H3E the degree of carrier suppression shall be  $5 \pm 1$  dB.

**5.2.9** Unwanted frequency modulation of the carrier frequency shall be sufficiently low to prevent harmful distortion.

**5.2.10** When using classes of emission H3E and J3E the power of unwanted emissions supplied to a transmitting aerial on any discrete frequency shall, when the transmitter is driven to full peak power, be in accordance with Table 5.2.10. The difference between emitted power in pause (B) and sending (Y) shall not exceed 2 dB.

Table 5.2.10

Separation $\Delta$ , kHz, between the frequency of the unwanted emissions and the assigned frequency <sup>1</sup>	Minimum attenuation below peak power, dB
1,5 < $\Delta$ ≤ 4,5	31
4,5 < $\Delta$ ≤ 7,5	38
7,5 < $\Delta$	43, without exceeding the power of 50 mW

<sup>1</sup>Assigned frequency of a single-band channel shall be 1400 Hz higher than the carrier frequency.

**5.2.11** The audio-frequency bandwidth of transmitters operating on classes of emission H3E and J3E shall be from 350 to 2700 Hz with permissible amplitude tolerance not exceeding 6 dB.

**5.2.12** The depth of modulation of transmitters operating on classes of emission H3E shall not be less than 80 %. The depth of modulation caused by extraneous voltage sources shall not exceed 5 %.

Modulation of transmitters operating on emissions of class J3E shall be such that the components of mutual modulation are lower than relative highest level of one of two tones by 25dB.

**5.2.13** All transmitters with rated power above 20 W shall be provided with measuring instrument capable of continuously monitoring, under operating conditions, the availability of aerial current. Failure of such measuring instrument shall not cause the disconnection of the aerial circuit. Every transmitter shall be provided with a reserve tuning indicator. Transmitters with the rated power of 20 W and less shall be provided with at least one tuning indicator.

**5.2.14** If the transmitter is provided with the automatic frequency tuning device, it shall ensure:

- .1 automatic tuning of the transmitter output with the parameters of the aerial connected;
- .2 visual indication of readiness of the transmitter for operation, any fault in the automatic tuning device or the aerial parameters deviating from the predetermined values;
- .3 tuning during 5 s.

In case of short-circuiting or a break of the aerial a tuning device shall not fail or cause the transmitter damage.

**5.2.15** A break of the aerial or its earthing to the ship's hull shall not cause any damage of the equipment.

**5.2.16** The controls mounted directly on the transmitter case shall include the controls which provide possibility for emission of single-band monosignal with frequency within 450 to 1000 Hz while operating on class J3E.

**5.2.17** Intermediate frequency shall not cause interference in guard bands of international distress and safety frequencies.

**5.2.18** Unless expressly provided otherwise, the bandwidth of a low frequency channel of a receiver shall be not less than 350 to 2700 Hz provided the tolerance of the receiver output level relating to frequency 1000 Hz is  $-6$  dB.

**5.2.19** All feeding circuits of receivers shall be fitted with devices for protection against radio interference produced by the ship's electronic equipment.

**5.2.20** Input circuits of receivers shall be protected against voltage induced by operating shipboard transmitters at 30 V e.m.f. within 15 min.

**5.2.21** Back radiation intensity value of receivers shall not exceed the permissible rates accepted in the national standards.

**5.2.22** The tuning indicators of receivers shall comply with the following requirements:

- .1 indicators shall be provided with distinct contrast calibration visible under any lighting conditions of spaces;
- .2 indicators shall be calibrated in kHz or MHz depending on the portion of the frequency range;
- .3 international distress, safety and call frequencies in the radiotelephony mode shall be specially marked;
- .4 indicators shall be protected against mechanical damage.

**5.2.23** Receivers shall be provided with measuring instruments capable of checking their operating performances.

**5.2.24** The construction of shipboard receivers shall provide possibility for connecting a coaxial screened cable to the aerial terminal, with continuity of screening being preserved.

**5.2.25** Receivers shall be capable of receiving radio signals during the pause in manipulation of their own transmitter. The time necessary for restoring full sensitivity of a receiver after manipulation shall not exceed 0,1 s, with automated gain control being disconnected.

**5.2.26** Loudspeakers mounted in the receivers shall be provided with switches.

**5.2.27** All shipboard receivers shall be capable of 24-hour continuous operation.

**5.2.28** If radio equipment intended for distress alert as well as for communication in distress and for safety has additional functions, this shall not affect the main functions of the equipment.

**5.2.29** Ship's complex radio stations and remote control units of ship's radio communication facilities shall meet the requirements listed below:

- .1 when developing ship's complex radio stations incorporating radio communication facilities housed in one sectionalized cabinet combined with the radiooperator's table and combined remote

control desks of ship radio communication facilities, the relevant requirements of 5.1 and 5.2 as well as requirements given below, shall be met;

**.2** controls and indicators of the complex radio station shall generally be concentrated on the front side of the common control panel to be preferably positioned at a height of 800 to 1200 mm above the deck, provided the top surface of the radiooperator's table is at a height of 750 mm above the deck. Control panels of ship transmitters shall be incorporated in the common control panel as its sections;

**.3** in complex radio stations with a vertically arranged common control panel of a board type, a part of the table top surface against the radiooperator's position shall remain free within the semicircle the radius of which is 520 mm;

In complex radio stations with an inclined common control panel of a desk type, a part of the table top surface against the radiooperator's position shall remain free within the semicircle the radius of which is 450 mm. The angle of inclination of the common control panel from the vertical shall not exceed 30°;

**.4** clearly marked boundaries of sections intended for controls of each type of equipment shall be provided on the common control panel of the complex radio station. Controls of each equipment type shall be arranged in the sequence of their use from left to right or from up to down;

**.5** access to the interior parts of the equipment incorporated in each section shall be possible without use of any tools;

**.6** controls shall be arranged within the section of each type of equipment by separate groups at a certain distance from one another. Each group shall incorporate only such controls, which are functionally consistent with, or dependent on, one another.

In so doing, if any control is not consistent with other controls or does not functionally depend on them, it shall be considered as separate group.

All control grips shall be of the same type, size and shape within each group. However, in no group use is permitted of the grip types utilized in any other group;

**.7** there shall be no need to operate controls of the equipment using two hands simultaneously. Exception may be made only for controls intended for opening and closing housings of the equipment;

**.8** buttons of the complex radio station relating to one group shall differ in colour from those belonging to any other group;

**.9** all controls of the complex radio station shall be provided with clear inscriptions indicating their purpose. Provision shall be made for each button for inscriptions, symbols or digits specifying their application.

**5.2.30** The remote control desk of radio communication facilities shall comply with the following requirements:

**.1** all controls shall be provided allowing for the radio communication without using the controls fitted directly on a receiver, transmitter or radio station;

**.2** signalling system shall be provided to control the operation and give warning of faults of the apparatus;

**.3** it shall not cause the apparatus parameters lying outside the limits specified by the present Part and produce interference.

**5.2.31** Radio equipment in addition to the requirements specified in the present Part shall comply with the relevant requirements of ITU.

**5.2.32** In case of using the computer systems in the radio installations they shall comply with the requirements of Part XV "Automation" of the Rules for the Classification and Construction of Sea-Going Ships.

**5.2.33** Radio equipment shall be capable of interfacing to other radio and navigational equipment.

Formats used for numerical information exchange shall be in compliance with the International Standard on Interface of Marine Radio and Navigational Equipment.

## **6 RADIO COMMUNICATION FACILITIES**

### **6.1 VHF RADIO INSTALLATION**

**6.1.1** The radio installation shall provide for the following categories of calls using radiotelephony and digital selective calling for the purposes:

- .1 distress, urgency and safety;
- .2 ship operational requirements; and
- .3 public correspondence.

**6.1.2** The radio installation shall provide for the communications using radiotelephony for the purposes:

- .1 distress, urgency and safety;
- .2 ship operational requirements; and
- .3 public correspondence.

**6.1.3** The radio installation shall comprise:

- .1 a transmitter/receiver including antenna;
- .2 an integral control unit or one or more separate control unit(s);
- .3 a microphone with a press-to-transmit switch, which may be built in a handset;
- .4 an internal or external loudspeaker;
- .5 an integral or separate digital selective calling facility;
- .6 a dedicated DSC watchkeeping facility to maintain a continuous watch on channel 70.

The radio installation may also include additional receivers.

**6.1.4** DSC facility shall provide operation on channel 70 and shall comprise:

- .1 means to decode and encode DSC messages;
- .2 means necessary for composing the DSC messages;
- .3 means to verify the prepared message before it is transmitted;
- .4 means to display the information contained in a received call in plain language;
- .5 means for entry of ship's position information and the time at which the position was determined (refer to 5.2.1.6);
- .6 sufficient capacity of memory to enable at least 20 received distress messages to be stored in the DSC refer to facility (if the received messages are not printed immediately).

These messages shall be stored in memory until readout and shall be erased 48 h after they have been received;

- .7 initiation of distress alerts shall supersede any other operation of the facility;
- .8 self-identification data shall be stored in the DSC unit. It shall not be possible for the user easily to change these data;
- .9 means to enable routine testing of the DSC facilities without radiation of signals;
- .10 With a DSC modulated input signal having a level of 1  $\mu\text{V}$  e.m.f. to its associated VHF receiver — decoding the received message with a maximum permissible output character error rate of  $10^{-2}$ .

**6.1.5** Radiotelephone station belonging to VHF radio installation shall comply with the following requirements:

.1 the radio station shall be designated for maintaining radio communication on frequencies of the Maritime Mobile Service in the band 156 to 174 MHz using following classes of emission:

- .1.1 G3E – on the radiotelephone channels;
- .1.2 G2B – DSC channel 70.

Frequency range between channels shall be 25 kHz;

.2 radio station shall be capable of operating:

- .2.1 within the frequency range of 156,3 to 156,875 MHz on simplex channels;

.2.2 within the frequency range of 156,025 to 157,425 MHz for transmission and within the frequency range of 160,625 to 162,025 MHz for reception on duplex channels;

.3 the radio station shall have sufficient number of channels, but not less than five, including channel 70 (156,525 MHz); channel 6 (156,3 MHz); channel 13 (156,65 MHz); channel 16 (156,8 MHz);

.4 the maximum deviation of frequency corresponding to 100 % depth of modulation shall be as close to  $\pm 5$  kHz as practicable. Frequency instability shall vary within the limits  $\pm 1,5$  kHz;

.5 frequency modulation shall have a preemphasis of 6 dB per octave with subsequent deemphasis in the receiver;

.6 the audio frequency bandwidth shall not exceed 3000 Hz;

.7 the radio station shall be provided with a vertically polarized antenna. As far as practicable, an emission shall be omnidirectional in the horizontal plane;

.8 the rated power of a transmitter shall be not less than 6 W and not more than 25 W.

The transmitter shall be provided with a device capable of reducing power to 1 W or less except for 70 (156,525 MHz) channel;

.9 the sensitivity of the receiver shall be equal to or better than  $2 \mu\text{V e.m.f}$  for an output signal-to-noise ratio of 20 dB. Blocking shall be at least 90 dB $\mu\text{V}$ ;

.10 the bandwidth of the receiver on high (intermediate) frequency at a level of 6 dB shall be sufficient for receiving a signal with the maximum frequency deviation of  $\pm 5$  kHz;

.11 adjacent-channel selectivity of the receiver shall be not less than 75 dB;

.12 intermodulation selectivity of the receiver shall be not less than 70 dB;

.13 non-linear distortion factor of the receiver shall be not more than 7 %;

.14 radio station receiver's output shall be designed for a loudspeaker power at least 2 W and a handset power 1 mW. Provision shall be made for connecting the loudspeaker without influence on the output sound power of handset;

.15 the receiver shall be provided with a manual volume control by which the audio output may be varied;

.16 the 16th channel shall be fitted with a device capable of providing the minimum power of the loudspeaker equal to 50 mW when the manual volume control is set in zero position;

.17 a squelch control shall be provided on the face panel of the radio station;

.18 an on/off switch shall be provided for the entire VHF installation with a visual indication that the installation is switched on;

.19 the radio station shall indicate the channel number to which it is tuned. It shall allow the determination of the channel number under all conditions of lighting. Where practicable, channels 16 and 70 shall be distinctively marked;

.20 a visual indication that the carrier frequency is being transmitted shall be provided;

.21 the radio station is recommended to include devices permitting radio communication to be maintained from the navigation bridge wings;

.22 the radio station shall not be able to transmit during channel switching operation;

.23 operation of the transmit/receive control shall not cause unwanted emissions;

.24 provision shall be made for changing from transmission to reception by use of a press-to-transmit switch. Additionally, facilities for operation on duplex channels without manual control may be provided;

.25 change of channel shall be capable of being made within 5 s.

The time taken to switch from the transmit to the receive condition, and vice versa, shall not exceed 0,3 s;

.26 during duplex operation (emission) the loudspeaker shall be switched off automatically. Provision shall be made for prevention of electric and acoustic feedback in handset;

.27 switching over from simplex to duplex operation and vice versa shall be effected automatically with the transition to the corresponding channels;

.28 in the transmit condition during simplex operation, the output of the receiver shall be muted;

.29 in the absence of the scanning condition a device shall be provided capable of switching over the radio station to the 16th channel when a handset is in its regular position;

**.30** the radiotelephone station having multi- channel watch (scanning) facilities shall comply with the following requirements:

**.30.1** it shall be provided with the automatic scanning of a priority channel and an additional channel;

**.30.2** if selection of a priority channel is not provided, the priority channel shall be the 16th channel;

**.30.3** the channel numbers of both channels being scanned shall be clearly indicated simultaneously;

**.30.4** when the scanning facility is operating, transmission shall not be possible;

**.30.5** when the scanning facility is switched off, both transmitter and receiver shall be tuned automatically to the selected additional channel;

**.30.6** provision shall be made for a manual control in order to switch for operation on the priority channel by a single control unit;

**.30.7** scanning characteristics:

the priority channel shall be scanned with a sampling frequency of not less than once per two seconds;

if a signal is received on the priority channel, the receiver shall remain on this channel for a duration of that signal;

if a signal is received on the additional channel, the scanning of the priority channel shall continue, thus interrupting reception on the additional channel for periods as short as possible and not greater than 150 ms. Receiver shall be so constructed that its reliable operation was maintained during scanning the priority channel;

in the absence of a signal on the priority channel and during reception of a signal on the additional channel; the duration of each listening period on this channel shall be at least 850 ms;

means shall be provided to indicate the channel on which a signal is being received.

## **6.2 MF RADIO INSTALLATION**

**6.2.1** The radio installation shall provide for the following categories of calling using both radiotelephony and digital selective calling (DSC) for the purposes:

**.1** distress, urgency and safety;

**.2** ship operational requirements;

**.3** public correspondence.

**6.2.2** The radio installation shall provide for the following categories of communication using radio- telephony for the purposes:

**.1** distress, urgency and safety;

**.2** ship operational requirements; and

**.3** public correspondence.

**6.2.3** If the radio installation is intended for distress alerts only or also for communication in distress and for safety, the requirements of 6.2.1.2, 6.2.1.3, 6.2.2.2 and 6.2.2.3 are not obligatory.

**6.2.4** The radio installation shall comprise:

**.1** a transmitter/receiver including antenna;

**.2** an integral control unit or separate control unit (units) with a telephone handset and an internal or external loudspeaker;

**.3** an integral or separate digital selective calling facility;

**.4** a dedicated DSC watchkeeping facility to maintain a continuous watch on the frequency 2187,5 kHz.

**6.2.5** The transmitter shall be capable of transmitting within the frequency range of 1605 to 4000 kHz. Number of fixed frequencies shall be not less than two: 2182 and 2187,5 kHz.

**6.2.6** The transmitter shall be capable of transmitting using classes of emission J3E and either J2B or F1B.

**6.2.7** Means shall be provided to prevent overmodulation automatically.

**6.2.8** During normal modulation, the peak envelope power in the class of J3E emission, or the mean output power of transmitter in the classes of J2B or F1B emissions, shall be at least 60 W and not more than 400 W at any frequency within operating range of frequencies.

**6.2.9** If the mean output power of transmitter exceeds 150 W, provision shall be made to reduce it to 60 W or less except frequencies 2182 kHz and 2187,5 kHz at which the value of the mean output power of transmitter shall be at least 60 W.

**6.2.10** The transmitter shall be provided with a standard artificial aerial:  $C = 250$  pF,  $R = 10$  Ohm with series connection.

**6.2.11** The receiver shall be capable of being tuned throughout the bands between 1605 and 4000 kHz. Tuning shall be either continuous, or by incremental steps, or by their combination. It is allowed to use the receiver tuned to the fixed frequencies which shall be at least two: 2182 and 2187,5 kHz.

**6.2.12** The receiver shall be capable of receiving signals of the following classes of emission: J3E, H3E, J2B and F1B.

**6.2.13** The receiver frequency shall at all times remain within 10 Hz of the required frequency following the warming-up period.

**6.2.14** For classes of emission J3E and F1B the sensitivity of the receiver shall be equal to or better than  $6 \mu\text{V}$  e.m.f. at the receiver input for a signal-to-noise ratio of 20 dB. For DSC an output character error rate of  $10^{-2}$  or less shall be obtained for a signal-to-noise ratio of 12 dB.

**6.2.15** Adjacent-channel selectivity of the receiver shall exceed values given in Table 6.2.15.

Table 6.2.15

Class of emission	Carrier frequency of unwanted signal distant from carrier frequency of valid signal by, kHz	Adjacent-channel selectivity
J3E	-1 +4	40 dB
	-2 +5	50 dB
	-5 +8	60 dB
H3E	-10 +10	40 dB
	-20 +20	50 dB
F1B	-0,5 +0,5	40 dB (analogue output);
	-0,5 +0,5	character error ratio $\leq 10^{-2}$ (digital output)

Selectivity on spurious channels shall be not less than 60 dB.

Inter-modulation selectivity shall be not less than  $70 \text{ dB}\mu\text{V}$  for the class of emission F1B and not less than  $80 \text{ dB}\mu\text{V}$  for the class of emission J3E.

Blocking shall be not less than 65 dB when interference tuning out is  $\pm 20$  kHz.

Non-linear distortion factor of the receiver shall not exceed 7 %.

**6.2.16** The receiver shall be provided with an automatic gain control of which effectiveness ensures alteration of the output voltage no more than by 10 dB if the input voltage varies by 70 dB.

**6.2.17** Radio station receiver's output shall be designed for a loudspeaker power at least 2 W and a handset power 1 mW. Disconnection of a loudspeaker shall not affect the output sound power of a handset.

**6.2.18** An unearthed output shall be provided for DSC signals if the corresponding facility is not integrated. Output signal shall be 0 dB at a load of 600 Ohm regulated to the precision of  $\pm 10$  dB.

**6.2.19** The DSC facility shall be capable of decoding and encoding DSC formats, their composing and verifying.

**6.2.20** Indication in clear for understanding form shall be provided for the DSC formats received and being entered.

The size of the means to display information shall be such as to contain at least 160 characters in two or more lines.

**6.2.21** Means shall be provided for entry of ship's position information, the date and the time at which the position was determined (refer to 5.2.1.6).

**6.2.22** If the received messages are not printed immediately, sufficient capacity of memory shall be provided to enable at least 20 received distress messages to be stored in the DSC facility. These messages shall be stored until readout.

These messages shall be erased 48 h after they have been received.

**6.2.23** Self-identification data shall be stored in the memory of the DSC unit. It shall not be possible for the user easily to change these data.

**6.2.24** Means shall be provided for periodic checking the DSC facility without signal emission.

**6.2.25** Control of the radio installation shall be possible from an integrated control unit or separate control unit (units).

If two separate control units are available, control unit at the position from which the ship is normally navigated shall have priority.

**6.2.26** A control system for the radio installation shall provide:

.1 switching on the DSC distress alert.

Transmission of the DSC distress alert shall have priority regarding any other operations;

.2 possibility acknowledgement of DSC distress alert reception;

.3 relay of the DSC distress alert;

.4 switching on the frequency 2182 and 2187,5 kHz. Tuners and controls for these frequencies shall be clearly marked;

.5 selecting the classes of emission J3E automatically when switching to the frequency 2182 kHz;

.6 selecting the classes of emission J2B or F1B automatically when switching to the frequency 2187,5 kHz;

.7 possibility of independent selecting transmission and reception frequencies of any receiver setting.

This does not preclude the use of transceivers.

**6.2.27** Controls operation shall not cause unwanted emissions.

**6.2.28** Indication of transmission and reception frequencies shall be provided.

**6.2.29** Radio installation with manual tuning shall have a sufficient number of indicators providing fine and fast tuning.

**6.2.30** If the radio installation is required to be heated in order to operate correctly, the power supplies to the heating circuits shall be so arranged that they can remain operative when supplies to or within the installation are switched off.

A switch for the heating circuits shall be clearly indicated. It shall be protected against inadvertent switching on.

The correct operating temperature shall be reached within a period of 30 min after power supply.

**6.2.31** If it is necessary to delay power supply to any part of the transmitter after switching on, this delay shall be provided automatically.

### **6.3 MF/HF RADIO INSTALLATION**

**6.3.1** The radio installation shall provide for the following categories of calls using both radiotelephony and digital selective call (DSC) for the purposes:

.1 distress, urgency and safety;

.2 ship operational requirements; and

.3 public correspondence.

**6.3.2** The radio installation shall provide for the communication using both radiotelephony and narrow-band direct printing (NBDP) for the purposes:

.1 distress, urgency and safety;

.2 ship operational requirements;

.3 public correspondence.

**6.3.3** If the radio installation is intended for distress alerts only or also for communication in distress and for safety, the requirements of 6.3.1.2, 6.3.1.3, 6.3.2.2 and 6.3.2.3 are not obligatory.

**6.3.4** The radio installation shall comprise:

- .1 a transmitter/receiver, including antenna;
- .2 an integral control unit or one or more separate control units with a telephone handset and an internal or external loudspeaker;
- .3 an integral or separate narrow-band direct- printing facility;
- .4 an integral or separate digital selective calling facility;
- .5 special receiver providing constant DSC watching on the frequencies 2187,5, 8414,5 kHz and at least on one of the distress frequencies and providing the safety in DSC system: 4207,5, 6312, 12577 or 16804,5 kHz. In any time the receiver shall be capable to select any of these distress frequencies and to provide the safety in DSC system.

**6.3.5** The transmitter shall be capable of transmitting within the frequency range of 1605 kHz to 27,5 MHz. Number of fixed frequencies shall be not less than 18: for radiotelephony — 2182; 4125; 6215; 8291; 12290; 16420 kHz; for NBDP — 2174,5; 4177,5; 6268; 8376,5; 12520; 16695 kHz; for DSC — 2187,5; 4207,5; 6312; 8414,5; 12577; 16804,5 kHz.

**6.3.6** The transmitter shall be capable of transmitting using classes of emission J3E and either J2B or F1B.

**6.3.7** The transmitter of radio installation shall be provided with a standard artificial aerial:  $C=250$  pF,  $R=10$  Ohm with series connection for MF range;  $R=50$  Ohm for HF range.

**6.3.8** During normal modulation, the peak envelope power in the class of J3E emission, or the mean output power of transmitter at the class of emission J2B or F1B shall be:

- at least 60 W at any frequency within operating range of frequencies;
- not more than 400 W for MF range;
- not more than 1500 W for HF range.

**6.3.9** If the mean output power of transmitter exceeds 400 W, provision shall be made for an automatic reduction to 400 W or less when transmitter is switched to MF range.

**6.3.10** The receiver shall be capable of being tuned within the frequency range of 1605 kHz to 27,5 MHz. Tuning shall be either continuous, or by incremental steps or by their combination. It is allowed to use the receiver tuned to the fixed frequencies which shall be not less than 18: for radiotelephony — 2182; 4125; 6215; 8291; 12290 and 16420 kHz; for NBDP — 2174,5; 4177,5; 6268; 8376,5; 12520 and 16695 kHz; for DSC — 2187,5; 4207,5; 6312; 8414,5; 12577 and 16804,5 kHz.

**6.3.11** The receiver shall be capable of receiving signals of the following classes of emission: J3E, H3E, J2B and F1B.

**6.3.12** The receiver frequency shall remain within 10 Hz of the required frequency following the wanning-up period.

**6.3.13** For classes of emission J3E and F1B the sensitivity of the receiver shall be equal to or better than  $6 \mu\text{V}$  e.m.f at the receiver input for a signal-to- noise ratio of 20 dB. For NBDP and DSC an output character error rate of  $10^{-2}$  or less shall be obtained for a signal-to-noise ratio of 12 dB.

**6.3.14** Adjacent-channel selectivity of the receiver shall exceed values given in Table 6.3.14.

Table 6.3.14

Class of emission	Carrier frequency of unwanted signal distant from carrier frequency of valid signal by, kHz	Adjacent-channel selectivity
J3E	-1 +4	40 dB
	-2 +5	50 dB
	-5 +8	60 dB
H3E	-10 +10	40 dB
	-20 +20	50 dB
F1B	-0,5 +0,5	40 dB (analogue output);
	-0,5 +0,5	character error ratio $\leq 10^{-2}$ (digital output)

Selectivity on spurious channels shall be not less than 60 dB.

Inter-modulation selectivity shall be not less than 70 dBmV for the class of emission F1B and not less than 80 dBmV for the class of emission J3E.

Blocking shall be not less than 65 dB when interference tuning out is  $\pm 20$  kHz.

Non-linear distortion factor of the receiver shall not exceed 7 %.

**6.3.15** The receiver shall be provided with an automatic gain control which effectiveness ensures alteration of the output voltage no more than by 10 dB if the input voltage varies by 70 dB.

**6.3.16** Radio installation receiver's output shall be designed for a loudspeaker power at least 2 W and a handset power 1 mW. Disconnection of a loudspeaker shall not affect the output sound power of a handset.

**6.3.17** If DSC encoder and NBDP device are not built-in, then additional unearthed outputs shall be provided for DSC and NBDP signals.

Output signals shall be 0 dB at a load of 600 Ohm regulated to the precision of  $\pm 10$  dB.

**6.3.18** The DSC facility shall be capable of decoding and encoding DSC formats, their composing and verifying.

**6.3.19** Indication in clear for understanding form shall be provided for the DSC formats received and being entered.

The size of the means to display information shall be such as to contain at least 160 characters in two or more lines.

**6.3.20** Provision shall be made for the means of automatic input of the ship's coordinates, the date and the time of their determination (refer to 5.2.1.6).

**6.3.21** If the received messages are not printed immediately, sufficient capacity of memory shall be provided to enable at least 20 received distress messages to be stored in the DSC facility. These messages shall be stored until read-out.

These messages shall be erased 48 h after they have been received.

**6.3.22** Self-identification data shall be stored in the DSC unit. It shall not be possible for the user easily to change these data.

**6.3.23** Means shall be provided to enable routine testing of the DSC facilities without radiation of signals.

**6.3.24** If the receiver with a scanning device capable of maintaining a continuous watch on more than one DSC distress channel is used, all selected channels shall be scanned within 2 s and the time of watching on each channel shall be sufficient for detecting a sequence of dots preceding to each DSC. Scanning shall only be terminated as soon as dots transmitted at a speed of 100 Baud are detected.

**6.3.25** The NBDP device shall be capable of operating in the circular and selective call modes on the single-frequency channels allocated for distress NBDP operation.

**6.3.26** The NBDP facility shall comprise:

- .1 means to decode and encode messages;
- .2 means for composing and verifying messages to be transmitted;
- .3 means for providing a record of received messages.

**6.3.27** Self-identification data shall be stored in the NBDP unit. These data shall be protected against accidental changing.

**6.3.28** Possibility of controlling the radio installation from an integral control unit or separate control unit(s) shall be provided.

If two separate control units are available, priority shall be provided for the control unit at the position from which the ship is normally navigated.

**6.3.29** A control system for the radio installation shall provide:

- .1 switching on the DSC distress alert. Transmission of the DSC distress alert shall have priority regarding any other operations;
- .2 possibility of acknowledgement of DSC distress alert reception;
- .3 relay of the DSC distress alert;
- .4 switching on the frequency 2182 and 2187,5 kHz. Tuners and controls for these frequencies shall be clearly marked;
- .5 automatic selecting the class of emission J3E when switching to the frequency 2182 kHz;

.6 automatic selecting the classes of emission J2B or F1B when switching to the DSC and NBDP distress and safety frequencies specified in 6.3.5 and 6.3.10;

.7 possibility of selecting transmission and reception frequencies independent of any receiver setting. This does not preclude the use of transceivers.

**6.3.30** Controls operation shall not cause unwanted emissions.

**6.3.31** Indication of transmission and reception frequencies shall be provided.

**6.3.32** Radio installation with manual tuning shall have a sufficient number of instruments providing fine and fast tuning.

**6.3.33** If the radio installation is required to be heated in order to operate correctly, the power supplies to the heating circuits shall be so arranged that they can remain operative when supplies to or within the installation are switched off.

A switch for the heating circuits shall be clearly indicated. It shall be protected against inadvertent operation.

The correct operating temperature shall be reached within a period of 30 min after the application of power.

**6.3.34** If it is necessary to delay power supply to any part of the transmitter after switching on, this delay shall be provided automatically.

#### **6.4 INMARSAT SHIP EARTH STATION**

**6.4.1** The ship earth station INMARSAT shall provide radio communication in the telephony mode and/or in the data (not voice data) transmission mode for the purposes of:

- .1 distress, urgency, safety and general radiocommunications;
- .2 coordination of search and rescue operations;
- .3 transmitting navigational safety data.

**6.4.2** No controls external to the ship earth station shall be available for alteration of the ship station identity.

**6.4.3** It shall be possible to initiate and make distress alerts in the telephony mode and or in the data transmission mode from the position from which the ship is normally navigated and also from any other position designated for initiating of distress alerts. Where the space dedicated for radio communications is provided, the means for initiating a distress alert shall be installed in it.

The means for initiating a distress alert be as required in 5.2.1.7.

If no other receivers of the distress alerts, urgency and safety calls or devices for the distress alerts retry are provided, and the sound alarm level of telephone and printer during reception of these alerts is not sufficient, the ship earth station shall provide audible and visual signalling of the necessary level.

**6.4.4** If the ship earth station comprises the enhanced group calling (EGC) system its characteristics shall comply with the requirements for the EGC equipment specified in 8.2.

**6.4.5** The ship earth station shall be fitted with a self-monitoring system and capable of automatically initiating the audible and/or visual signalling in the following cases:

- .1 loss of observing the satellite by aerial;
- .2 failure of operability of the ship earth station;
- .3 loss of power supply or starting an emergency source of electrical power.

**6.4.6** The ship earth station shall provide the possibility of checking the distress alerting functions without transmitting the alerts.

**6.4.7** In addition to the requirements of the present Part of the Rules, the ship earth station shall meet the requirements and specifications of the INMARSAT and be of the type approved by the INMARSAT.

## **6.5 DIRECT-PRINTING APPARATUS OF IMPROVED FIDELITY**

**6.5.1** The direct-printing apparatus of improved fidelity (DPAIF) shall provide conversion from 5-character International Telegraph Alphabet ITU-T No. 2 to a 7-character code. DPAIF shall provide operation in the Forward-Error-Correcting (FEC) mode "B" and the Automatic error correction using an Automatic Request for Repeat or Retransmission "A" (ARQ) on the frequency channels allocated for distress and NBDP.

**6.5.2** Self-identification data shall be stored in the DPAIF unit.

**6.5.3** These data shall be protected against accidental changing.

**6.5.4** DPAIF shall comprise:

.1 means to decode and encode messages;

.2 means for composing and verifying messages intended for transmission;

.3 means for providing a record of received messages.

**6.5.5** DPAIF shall provide exchanging information between the mobile station and the subscribers of TELEX network.

## **6.6 TERMINAL PRINTING DEVICE**

**6.6.1** Terminal printing device shall use International Telegraph Alphabet No. 2 (ITU-T No. 2).

**6.6.2** Terminal printing device shall be provided with an apparatus recording all the signals transmitted or received. These signals may be not displayed if provided.

**6.6.3** Rated speed of operation of the terminal printing device shall be 50 or 100 Baud.

**6.6.4** Auto-reply code shall be transmitted by the apparatus capable to identify the signal "Who is there?" in the International Telegraph Alphabet No. 2 (ITU-T No. 2).

## **6.7 FACSIMILE TERMINAL DEVICE**

**6.7.1** Facsimile terminal device shall perform reception/transmission of the section-lined messages, graphical and text materials.

**6.7.2** Facsimile terminal device shall be able to self-copy the documents when the transmitter used.

**6.7.3** The image may be recorded both on a paper roll and on separate sheets of paper.

**6.7.4** Minimum allowable format of documents is A4.

**6.7.5** Surface of message shall be scanned in one direction both on a receiver and on a transmitter, if any.

**6.7.6** Facsimile terminal device shall be designed for round the clock operation.

**6.7.7** The device may be fitted with a memory.

## **6.8 INTEGRATED RADIO COMMUNICATION SYSTEM WHEN USED IN THE GMDSS**

**6.8.1** The Integrated Radio Communication System (IRCS) is a system where individual radio communication equipment and installations are used as sensors i.e. without the need of their own control units providing outputs to and accepting commands from spaces called workstations for radio communications.

Such workstations are called GMDSS workstations, if they include control and monitoring of all equipment and installations provided on a ship for the GMDSS which are also suitable for general radio communication.

**6.8.2** The integrated radio communication system when used in the GMDSS (GMDSS IRCS) shall meet the following requirements:

**.1** functional requirements of the GMDSS. Along with that all functional requirements for each individual type of communication equipment and installation integrated in the IRCS shall be available.

No functional requirements for individual types of the communication equipment and installation shall impede fulfillment of any other functional requirements for other communication equipment or installation integrated in the radio communication system;

**.2** all functional requirements for the equipment integrated on the IRCS shall conform to the relevant performance standards and functional requirements for this equipment;

**.3** no single fault shall impair the operation of more than one radio communication sensor or more than one workstations for radio communication.

**6.8.3** The IRCS shall:

**.1** comprise at least two workstations for radio communication each connected to each GMDSS radio communication sensor over a network or connecting system;

**.2** comprise at least two printers;

**.3** have facilities for automatic updating of the ship's position and time, in addition to manual input of these data;

**.4** have a power supply arrangement which ensures that it is not possible to switch off inadvertently any part of the IRCS;

**.5** have means providing fault detection in any part of the IRCS and alarm generation;

**.6** be provided with antivirus software protection.

**6.8.4** GMDSS workstations shall:

**.1** have an identical user interface and an identical access to each function for different radio communication sensors;

**.2** operate independently of one another;

**.3** be capable of allowing simultaneous operation of at least two radio communication sensors;

**.4** be capable of the transmission of distress alert initiated only by means of a dedicated button for each radio communication sensor and that button shall be used for no other purpose. Each button shall be clearly identified and protected against inadvertent operation. The distress alert shall be initiated by two independent actions producing an indication that the alert has been activated.

Each button of the distress alert shall be electrically separated from the IRCS network or connecting system. It shall be possible to interrupt or initiate alerts at any time (refer also to 1.2).

**6.8.5** Integration of VHF radio telephone in the GMDSS IRCS is permitted only if it does not prevent compliance with the requirement of 3.4.4.

**6.8.6** Additional workstations for radio communication intended for general radio communications only shall have no access to the distress alerting functions and shall not impair the distress alerting.

The GMDSS workstations shall have priority access over additional workstations.

**6.8.7** Additional sensors not required for the GMDSS radio communication shall neither impair nor slow down the distress alerting and alarm functions.

## **6.9 VHF RADIOTELEPHONE STATION WITHIN FREQUENCY BAND OF 300,025 TO 300,500 MHZ AND 336,025 TO 336,500 MHZ**

**6.9.1** The main VHF radiotelephone station shall ensure the radio communication within the frequency band of 300,025 to 300,500 MHz; if only one main VHF radiotelephone station is provided on board, it will operate within the frequency band of 300,025 to 300,500 MHz and 336,025 to 336,500 MHz.

The main VHF radiotelephone station shall be capable of operating on at least three frequencies including the calling and distress frequency of 300,2 MHz.

Operational VHF radiotelephone station shall ensure radio communication within the frequency band of 300,025 to 300,500 MHz and 336,025 to 336,500 MHz.

Portable VHF radiotelephone station may operate within the frequency band of 300,025 to 300,225 MHz and 336,025 to 336,225 MHz.

Interval between frequencies shall be 25 kHz.

**6.9.2** The class of emission shall be G3EE.

**6.9.3** The maximum deviation of frequency corresponding to 100 % depth of modulation shall be as close to  $\pm 5$  kHz as practicable and in no event shall exceed  $\pm 5$  kHz.

**6.9.4** The audio frequency bandwidth shall not exceed 3000 Hz.

**6.9.5** The rated power of a transmitter shall not be more than 15 W.

The transmitter shall be provided with a device capable of reducing power to 1 W.

**6.9.6** The sensitivity of the receiver shall be equal to or better than 1,5  $\mu$ V for a signal-to-noise ratio of 20 dB.

**6.9.7** The output of the receiver shall be designed for connecting a loudspeaker with power of at least 0,5 W and a telephone handset. The loudspeaker shall be integrated in the radio station case.

**6.9.8** Non-linear distortion factor of the receiver shall be not more than 7 %.

**6.9.9** The attenuation of signal reception on image frequency, intermediate frequency as well as that of other unwanted signals shall be not less than 80 dB.

**6.9.10** The bandwidth of the receiver on high (intermediate) frequency at a level of 6 dB shall be sufficient for receiving a signal with the maximum frequency deviation of 5 kHz.

**6.9.11** A device shall be provided capable of switching over the radio station on frequency 300,2 MHz (channel 5) when the microtelephone handset is placed in its regular position.

**6.9.12** The facility operating on frequency 300,2 MHz shall be provided ensuring the minimum power of 50 mW to the loudspeaker when a volume control is in zero position.

**6.9.13** The VHF radiotelephone station shall be provided with a squelch (mute) control.

**6.9.14** The VHF radiotelephone station shall be provided with a vertically polarized antenna.

**6.9.15** It is recommended to include in the VHF radiotelephone station set the devices permitting to maintain radio communications from the navigation bridge wings.

**6.9.16** Some technical requirements to the portable VHF radiotelephone station set out in the present Chapter may be changed upon agreement with the Register.

## **6.10 RADIOTELEPHONE STATION FOR INTERIOR COMMUNICATION**

**6.10.1** The radio station operating within the frequency band of 450 to 470 MHz shall ensure the radio communication on operating frequencies of 457,525 MHz; 457,550 MHz; 457,575 MHz; 467,525 MHz; 467,550 MHz; 467,575 MHz with the interval between frequencies equal to 25 kHz, using the emission of G3E class.

Where the intervals between frequencies equal to 12,5 kHz the additional operating frequencies shall be as follows: 457,5375 MHz; 457,5625 MHz; 467,5375 MHz; 467,5625 MHz.

**6.10.2** If the relay station is needed on board, the following frequencies pairs shall be used:

457,525 MHz and 467,525 MHz;

457,550 MHz and 467,550 MHz;

457,575 MHz and 467,575 MHz.

**6.10.3** The rated power of a transmitter shall not be more than 2 W.

The transmitter shall have a device for reducing the power up to 0,2 W.

**6.10.4** The deviation of frequency shall not exceed  $\pm 5$  kHz with the interval between frequencies equal to 25 kHz and  $\pm 2,5$  kHz with the interval between frequencies equal to 12,5 kHz.

**6.10.5** A permissible relative deviation of frequency shall not exceed  $5 \cdot 10^{-6}$  with the interval between frequencies equal to 25 kHz and  $2,5 \cdot 10^{-6}$  with the interval between frequencies equal to 12,5 kHz.

**6.10.6** The audio frequency bandwidth shall not exceed 3000 Hz with the interval between frequencies equal to 25 kHz and 2600 Hz with the interval between frequencies equal to 12,5 kHz.

**6.11 TWO-WAY VHF RADIOTELEPHONE APPARATUS FOR COMMUNICATION WITH AIRCRAFT**

**6.11.1** The apparatus shall be portable and capable of being used for on-scene communication between ship and aircraft.

**6.11.2** The apparatus shall comprise at least:

- .1 an internal transmitter/receiver, including antenna and source of power;
- .2 an integral control unit with a press-to-transmit switch;
- .3 a microphone and loudspeaker.

**6.11.3** The apparatus shall:

- .1 be capable of being operated by unskilled personnel;
- .2 withstand drops on to a hard surface from a height of 1 m;
- .3 be of small size and light weight;
- .4 be capable of operating in the ambient noise level likely to be encountered during search and rescue works using aircraft;

- .5 be of a colour different to colour of the two-way VHF radiotelephone apparatus (refer to 12.2.3.13);
- .6 be capable of operation on the frequency 121,5 MHz and 123,1 MHz.

Its class of emission shall be A3E;

- .7 have an on/off switch with a visual indication that the installation is switched on;
- .8 have a manual volume receiver control by which the audio output may be varied;
- .9 provide an easy channel selection switch.

Channel shall be clearly discernible;

- .10 be ready for operation not later than 5 s after activation.

**6.11.4** The carrier power of a radio transmitter shall be between 50 mW and 1,5 W.

**6.11.5** The audio output shall be sufficient to be heard in the ambient acoustic noise level likely to be encountered during search and rescue works using aircraft.

**6.11.6** In the transmit condition the receiver output sound signal shall be muted.

**6.11.7** The source of electrical power shall be a primary power supply battery integrated in the equipment, which may be replaced during operation.

In addition, it may be possible to operate the apparatus from an alternative source of electrical power.

**6.11.8** Primary power supply batteries shall have the period of storage not less than 2 years.

Date of manufacture and maximum period of storage shall be indicated on the battery.

**6.11.9** In addition to the requirements of 5.1.48 the following shall be clearly indicated on the exterior of the equipment:

- .1 brief operating instruction;
- .2 the ship's name and call signal;
- .3 "Intended only for emergency communication with aircraft".

**6.12 FIXED TWO-WAY VHF RADIOTELEPHONE APPARATUS FOR COMMUNICATION WITH AIRCRAFT**

**6.12.1** The apparatus shall be capable of being used for on-scene communication between ship and airborne rescue unit(s).

**6.12.2** The apparatus shall comprise at least:

- .1 transmitter/receiver;
- .2 antenna which may be fitted on the equipment or isolated;
- .3 a microphone with a press-to-transmit switch.

**6.12.3** The apparatus shall:

- .1 be capable of being operated by unskilled personnel;
- .2 be capable of operating in the ambient noise level likely to be encountered onboard of a ship;

- .3 have an on/off switch with a visual indication that the installation is switched on;
- .4 have a manual volume receiver control by which the audio output may be varied;
- .5 provide an easy channel selection switch. Channel shall be clearly discernible;
- .6 be ready for operation not later than 5 s after activation;
- .7 be capable of operation on the frequency 121,5 MHz and 123,1 MHz.

Its class of emission shall be A3E.

**6.12.4** The carrier power of a radio transmitter shall be between 50 mW and 1,5 W.

**6.12.5** The audio output shall be sufficient to be heard in the ambient acoustic noise level onboard a ship in a place of apparatus installation.

**6.12.6** In the transmit condition, the receiver output sound signal shall be muted.

**6.12.7** The apparatus shall be powered from the ship's main and emergency source of electrical power.

Instead of the aforesaid, the apparatus may be power supplied from the built-in primary power supply battery, which may be replaced when operating.

**6.12.8** Primary power supply batteries shall have the period of storage not less than 2 years and shall be replaced if on the date of survey of the shipboard radio equipment carried out by the Surveyor to the Register the period of their storage left is at least 12 months.

**6.12.9** In addition to the applicable requirements of 5.1.47 the following shall be clearly indicated on the exterior of the equipment:

- .1 brief operating instructions;
- .2 the ship's name and call signal;
- .3 expiry date for the primary battery stored, if applicable;
- .4 "Intended only for emergency communication with aircraft".

### **6.13 SHIP EARTH STATION FOR USE IN THE GMDSS**

**6.13.1** Ship Earth Station (SES) intended for operation on a mobile satellite communication system recognized by the International Maritime Organization on 01 January 2021 or after this date shall comply with the applicable provisions of IMO resolution A.1001(25) and the requirements specified in the Annex to IMO resolution MSC.434(98).

**6.13.2** SES intended for the operation on a mobile satellite communication system recognized by the IMO before 1 January 2021, shall comply with the applicable provisions of IMO resolution A.1001(25) and the requirements specified in the Annex to IMO resolution MSC.434(98) or:

the requirements specified in the Annex:

- .1 to IMO resolution MSC.130(75), if SES was installed after 1 February 1999;
- .2 to IMO resolution A.808(19), if SES was installed between 23 November 1996 and 1 February 1999;
- .3 to IMO resolution MSC.698(17), if SES was installed before 23 November 1996.

## **7 SHIP SECURITY EQUIPMENT**

### **7.1 SHIP SECURITY ALERT SYSTEM**

**7.1.1** The ship security alert system, when activated, shall provide generating and transmitting to the shore a security alert or a special report indicating that the security of the ship is under threat or has been compromised.

The alert transmitted by the system shall be addressed only to a designated competent organization and shall not be received by other ships.

**7.1.2** The functions of the ship security alert system may be effected using the following equipment:

**.1** GMDSS installation;

**.2** radio equipment installed in addition to that required in 2.2.1 and intended for general communications;

**.3** systems specially designed for security alert purposes.

**7.1.3** The mode of transmitting a ship security alert by the security alert system shall not cause any alarm or indication to be raised on the ship.

**7.1.4** Provision shall be made for at least two activation points, one of which shall be located on the navigation bridge. The location of another one shall be known only for the limited number of the ship crew specified in the ship security plan.

A special button, handset, keyboard, switch or other technical means located and designed so as to protect them against inadvertent operation and actuating a false signal on the ship security threat may be used as the activation device of the ship security alert system.

**7.1.5** In order to activate the ship security alert system, it shall not be necessary for the user to remove seals, to break any lid or cover, to switch on additional blocks.

**7.1.6** The radio equipment transmitting the alert on a ship security threat shall be so designed that its bringing into operation by the signal of the security alert system activation device does not require the preliminary selection of operational modes, tuning of channels or setting of menu options.

The connection of the GMDSS installation to the ship security alert system for transmitting the alert on a ship security threat shall not impair the functionality of the GMDSS installation as required in this Part of the Rules.

**7.1.7** The alert on a ship security threat generated with ship security alert system activation shall be continuously transmitted and include a unique code/identity indicating that the alert has not been generated in accordance with the GMDSS distress procedures. The ship security alert shall be continuously transmitted until the ship security alert system is deactivated and/or reset.

**7.1.8** The ship security alert shall include the ship identity and current position associated with a date and time.

**7.1.9** The design of the ship security alert system shall provide for a possibility to periodically check operability without transmitting the ship security alert.

In all cases, the check shall not lead to unpredicted effects as the result of emergency response.

### **7.2 SHIP SECURITY SURVEILLANCE TV SYSTEM**

**7.2.1** The ship security surveillance TV system shall ensure remote surveillance within the guarded areas and/or outside the guarded spaces, the transmission of visual and, where needed, voice data on condition of the surveillance areas and spaces to the navigation bridge and/or to a space intended for watch keeping during the ship's stay at port, if it is provided in the ship security plan.

**7.2.2** The ship security surveillance system may be used for visual surveillance of technological operations (loading, unloading, mooring, etc.) carried out within the guarded areas.

**7.2.3** The ship security surveillance system shall include TV cameras as well as the following means:

- .1 for displaying the visual information (visual display units);
- .2 for recording and storing visual data (video recorders);
- .3 for control and switching of visual signals;
- .4 for motion detection (where necessary).

In addition to the above, the ship security surveillance system may include the means for recording, displaying and storage of the voice data.

**7.2.4** The ship security surveillance TV system shall ensure, at least, the following:

- .1 generation and transmission of visual data;
- .2 distribution of visual signals and displaying the condition of guarded areas and spaces;
- .3 processing the signals (multiplexing, video-recording and sound-recording (where provided));
- .4 displaying the recorded data.

**7.2.5** The ship security surveillance system may have a black-and-white or color display proceeding from the required information content level of the surveillance system as well as from the location and lighting of surveillance areas, physical state of the prospective mobile objects.

**7.2.6** TV camera of the security surveillance TV system shall transmit a video signal with a signal-to-noise ratio of at least 50 dB.

**7.2.7** Horizontal resolution capability of a TV camera shall be at least 300 television lines for a color and black-and-white image with the image dimension ratio complying with the standard ones (3:4; 9:16 and etc.).

**7.2.8** The surveillance TV system camera shall be capable of transmitting a video signal with a minimum lighting of the TV surveillance area of not more than 5 lux, and with the maximum lighting not less than 50000 lux.

If the actual lighting of the surveillance area is less than the TV camera sensitivity, then this surveillance area or object shall be provided with an additional lighting, or the ship security surveillance TV system shall be provided with an infrared sensitive camera (cameras).

Where the color ship security TV surveillance system is used, infrared cameras are not recommended for use.

Object-detection sensitivity of TV cameras shall be such as to provide detection of objects of 30 × 30 cm within the surveillance area (the extreme edge of the detection area).

**7.2.9** TV cameras shall ensure surveillance of the whole surveillance area and shall be so installed as to overlap the adjacent areas.

The design of TV cameras installed on the open deck shall provide the possibility to fit a protective cover or a camera lens cleanup device.

**7.2.10** The design of the ship security surveillance TV system shall ensure full-time operation.

**7.2.11** The size of black-and-white and color display shall be of at least 360 mm (diagonally). With that, horizontal resolution capability of cathode-ray identities shall be at least 500 television lines for a black-and-white image and at least 400 television lines for color image. For LCDs the resolution capability shall be of at least 640 × 480 pixels.

**7.2.12** For the purpose of recording visual data video recorders or digital still stores shall be used. It is allowed to use audio recording, where needed, concurrently with the video recording.

**7.2.13** The ship security surveillance TV system shall ensure search, displaying (viewing), copying and transmission of the information recorded on the external data medium.

**7.2.14** Search and displaying of the recorded video data with no record interruption shall be carried out as follows:

- .1 step-by-step search/ viewing of images in a "back", "forward" or "picture stop" mode;
- .2 full-screen viewing of video data recorded by an individual TV camera on a display in the "back", "forward" or "stop image" mode; with adjustable zoom;
- .3 simultaneous "picture-in-picture" viewing of video data recorded by the two individual TV cameras on a display in the "back", "forward" or "stop image" mode;
- .4 simultaneous viewing of video data recorded by several TV cameras on a display in the "back", "forward" or "stop image" mode;

.5 full-screen sequential viewing of the video data recorded by the individual TV cameras on a display in the "back", "forward" or "stop image" mode.

**7.2.15** Means of control and switching of video signals shall ensure the priority automatic displaying of a surveilled area (areas), where the motions have been detected (if a motion sensor is provided).

**7.2.16** The ship security surveillance TV system shall ensure visual and audible signalling in cases of:

- .1 motion detection in a surveilled area or space (if motion sensors are provided);
- .2 failure of the ship's main source of electrical power or switching on the emergency source of electrical power;
- .3 failure of the ship security surveillance TV system;
- .4 failure (short circuit, breaking of circuit) of a "TV camera — display" channel;
- .5 failure of a TV camera;
- .6 failure of motion sensors;
- .7 failure of a video recorder and, where applicable, audio recorder.

**7.2.17** The ship security surveillance TV system shall be provided with a complete set of a special emergency accumulator battery to be used in case of failure of the ship's main source of electrical power.

Instead of the special emergency accumulator battery, the emergency source of uninterruptible electrical power ensuring off-line operation of the ship security surveillance TV system within at least 1 h or ship's main source of electrical power prescribed by Part XI "Electrical Equipment" of the Rules for the Classification and Construction of Sea-Going Ships may be used.

## **8 FACILITIES FOR RECEPTION OF MARITIME SAFETY INFORMATION**

### **8.1 NAVTEX RECEIVER**

**8.1.1** The equipment shall consist of two radio receivers, a signal processing device and one of the following devices:

- .1** an integrated printing device; or
- .2** a display facility with standard output port for printer and non-volatile message memory; or
- .3** a connection to an integrated navigation system and a non-volatile message memory.

**8.1.2** NAVTEX receiver shall provide the reception of information for areas covered by the service and for message categories excluded by the radiooperator from the reception and/or a display facility shall always be available.

**8.1.3** The set of equipment shall contain one NAVTEX receiver operating on the frequency 518 kHz of the International NAVTEX service, and a second receiver capable of working at the same time as the first one on at least two other frequencies recognized for the transmission NAVTEX information.

**8.1.4** The receiver operating on the frequency 518 kHz shall have priority in the display or printing of received information.

Printing or displaying of messages received by one of the two receivers shall not prevent reception by both receivers of NAVTEX equipment.

**8.1.5** Each NAVTEX receiver shall ensure recording at least 200 messages of average length 500 characters in non-volatile message memory (printed and non-printed). It shall not be possible for the user to erase messages from memory. When the memory is full, the oldest messages shall be overwritten by new messages.

**8.1.6** The user shall be able to tag individual messages for permanent retention. These messages may occupy up to 25 % of the available memory and shall not be overwritten by new messages. When no longer required, the user shall be able to remove the tag on these messages which may then be overwritten in normal course.

**8.1.7** NAVTEX receiver shall be provided with a facility to test that the radio receiver, and proceeding from what equipment is available, the display facility, printer and non-volatile message memory are functioning correctly.

**8.1.8** The equipment shall be capable of internally storing at least 200 message identifications for each receiver provided. When the time between 60 h and 72 h elapses, the message identification shall automatically be erased from the store. If the number of received message identifications exceeds the capacity of the store, the oldest message identification shall be erased.

**8.1.9** Only message identifications that are satisfactorily received shall be stored; a message is satisfactorily received if the character error rate is below 4 %.

**8.1.10** The receipt of search and rescue information shall give an alarm at the position from which the ship is normally navigated. This alarm shall be reset (acknowledged) manually only.

**8.1.11** Information for location and message designators in programmable memories shall not be erased by interruptions in the power supply of 6 h.

**8.1.12** The receiver sensitivity shall be such that for a source with an e.m.f. of  $2\mu\text{V}$  in series with a non-reactive impedance of 50 Ohm, the character error rate is below 4 %.

**8.1.13** The display facility and/or printer shall be able to display a minimum of 32 characters per line.

**8.1.14** If a display facility is used in NAVTEX receiver, the following requirements shall be met:

- .1** an indication of newly received messages shall be immediately displayed until acknowledged by the staff or until 24 h after receipt;
- .2** newly received messages shall also be displayed;
- .3** where there is no printer, the display facility shall be located in the position from which the ship is normally navigated.

**8.1.15** The display facility shall be able to display at least 16 lines of message text.

**8.1.16** The design and size of the display facility shall be such that displayed information is easily read under all conditions by observers at normal working distances and viewing angles.

**8.1.17** If automatic line feed entails division of a word, this shall be indicated in the displayed/printed text.

**8.1.18** When displaying received messages on a display facility, a clear indication of the end of a message shall be given by automatically adding line feeds after the message or including some other form of delineation.

The printer or printer output shall automatically insert line feeds after completing print of the received message.

**8.1.19** The equipment shall display/print an asterisk if the character is received corrupted.

**8.1.20** Where the printer is not integrated, it shall be possible to select the following data to be put out to the printer:

- .1 all messages as they are received;
- .2 all messages stored in non-volatile message memory;
- .3 all messages received on specified frequencies, from specified locations or having specified message designators;
- .4 all messages currently displayed; and
- .5 individual messages selected from those appearing on the display.

At the same time, NAVTEX receiver shall include a standard interface for connection with the printer.

**8.1.21** Interface for the transfer of received data to other navigational or communication equipment shall be provided.

**8.1.22** All interfaces provided in NAVTEX receiver shall ensure compliance with the formats specified in relevant International Standards on Interface of Marine Radio and Navigational Equipment.

**8.1.23** Interface for operating with the Bridge Alert Management (BAM) shall be provided.

## **8.2 ENHANCED GROUP CALLING RECEIVER**

**8.2.1** The EGC receiver may be either separate or combined with other installations. Elements of other installations, e.g., the antenna, low noise amplifier and down-converter of the ship earth station, may be shared for the reception of EGC messages.

**8.2.2** The equipment shall be capable of producing a printed copy of received information. Received EGC messages may be stored for later printing with an indication to the operator that the message has been received, except for the vital messages referred to in 8.2.4 and 8.2.7 which shall be printed out upon receipt.

In case of interfacing the equipment with the Integrated Navigation System (INS), producing of a printed copy is not required. Interfacing with the integrated system of radio communication means shall be provided.

**8.2.3** Means shall be provided to enter the ship's position and current and planned NAVAREA/METAREA codes manually so that area group calls can be received. Means shall also be provided to enter current and planned coastal warning service coverage areas and different classes of messages. Optionally, the ship's position, as determined by the navigational equipment, may be entered automatically and the NAVAREA/METAREA code automatically derived therefrom.

The equipment shall provide a visual indication that the ship's position has not been updated during the last 12 h. It shall only be possible to reset this indication by revalidating the ship's position.

**8.2.4** Provision shall be made for a specific audible alarm and visual indication at the position from which the ship is normally navigated, to indicate receipt of a distress or urgency priority EGC message. It shall not be possible to disable this alarm and it shall only be possible to reset it manually and only from the position where the message is displayed or printed.

**8.2.5** The equipment shall indicate when it is not correctly tuned or synchronized to the EGC carrier.

**8.2.6** Any message shall be printed regardless of the character error rate of its reception. The equipment shall print a low line mark if a character is received corrupted.

**8.2.7** Acceptance or rejection of service codes shall be under the operator's control except that equipment shall always receive:

    navigational warnings, meteorological warnings and forecasts;

    search and rescue information; and

    shore-to-ship distress alerts, which are directed to a fixed or absolute geographical area within which the ship is operating.

**8.2.8** Means shall be provided to prevent the re-printing of a message once it has been received without error.

**8.2.9** The printing device of the EGC receiver shall be able to print at least 40 characters per line in accordance with the standard International Alphabet Number 5 (IA5) character set as specified in ITU/CCITT Recommendation T.61. Other character sets are optionally used.

**8.2.10** The signal processor and printing device shall ensure that if a word cannot be accommodated in full on one line, it shall be transferred to the next line. The printing device shall automatically feed five lines after completing the printed messages.

A local audible alarm shall be sounded to give advanced warning of the printing device "paper low" condition. It shall not be possible to confuse the sound of the "paper low" alarm with that of the distress or urgency alarm caused by the reception of a distress or urgency priority message.

**8.2.11** In addition to the requirements of these Rules, the EGC receiver shall meet the requirements and specifications of the INMARSAT and be of the type approved by the INMARSAT.

**8.2.12** Interface for the transfer of received data to another radio or navigational equipment shall be provided.

**8.2.13** Interface for operating with the Bridge Alert Management (BAM) shall be provided.

**8.2.14** All interfaces provided for for communication with radio and navigational equipment shall comply with the relevant international standards.

### **8.3 HF DIRECT-PRINTING TELEGRAM RECEIVER FOR RECEPTION OF MARITIME SAFETY INFORMATION**

**8.3.1** The equipment of a narrow-band direct-printing telegraphy for reception of maritime safety information shall consist of a receiver, signal processing device, printer and means providing frequency retuning manually and automatically.

**8.3.2** The receiver shall operate on the frequencies 4210; 6314; 8416,5; 12579; 16806,5; 19680,5; 22376; 26100,5 kHz. Additional frequencies may be provided intended for the International and National NAVTEX services (518, 490 and 4209,5 kHz).

**8.3.3** Provision shall be made for operability check of the receiver, signal processing device, printer and means for automatic frequency retuning, if provided.

**8.3.4** The equipment shall be capable of storing at least 255 message identifications. After between 60 and 72 h a message identification shall automatically be erased from the memory of equipment. If the number of received messages exceeds the memory capacity the oldest message identification shall be erased automatically.

**8.3.5** An audible and visual signalling system shall be provided at the position from which the ship is normally navigated in order to indicate reception of search and rescue messages.

The signalling system shall be incapable of being switched off and have a possibility of manual resetting.

**8.3.6** Information for areas covered by the service and for message categories stored in the equipment memory shall not be erased in the event of supply voltage failure during a period of up to 6 h.

**8.3.7** The sensitivity of the receiver shall be so that for a source having an electromotive force of 6  $\mu$ V a character — error rate was not more than  $10^{-2}$ .

**8.3.8** The radiooperator shall control acceptance or rejection from printing service codes except for cases when the equipment shall have no possibility to reject relevant navigational and

meteorological warnings, search and rescue information and certain special warnings which are transmitted by the shore-based radio station in the area of ship location.

**8.3.9** Information for areas covered by the service and for message categories excluded by the radiooperator from reception shall be provided.

**8.3.10** Only message identifications that are satisfactorily received shall be stored.

**8.3.11** The equipment shall not print out the same message after it has been received without errors. The message is considered to be received correctly if the character to error rate is less than 4 %.

**8.3.12** The printer shall be capable of printing not less than 32 characters per line.

**8.3.13** The signal processing device and the printer shall be capable of transferring a word to the next line if it cannot be fully accommodated on one line.

Upon termination of message printing, the printer shall automatically provide sufficient multiplicity of line feed.

**8.3.14** If a character is received in a mutilated form, the equipment shall print an asterisk.

**8.3.15** Where the equipment comprises means for automatic retuning of the receiver's frequency, the universal coordinated time (UTC) clock shall be provided with an accuracy of  $\pm 1$  s, which shall be connected to a reprogrammable memory containing the frequency sequence and UTC broadcast schedules of all radio stations transmitting HF maritime safety information using NBDP.

## **9 EMERGENCY POSITION-INDICATING RADIO BEACONS**

### **9.1 GENERAL**

**9.1.1** The emergency position indicating radio beacon (EPIRB) shall be automatically activated after floating free.

The EPIRB its mounting and releasing arrangements shall be reliable under extreme ship's conditions.

**9.1.2** The EPIRB shall:

- .1** be easily activated by unskilled personnel and transferred to the survival craft by one person;
- .2** be fitted with adequate means to prevent inadvertent activation;
- .3** be so designed that the electrical portions are watertight at a depth of 10 m for at least 5 min;
- .4** be capable of withstanding temperature variation of 45 °C during its immersion.

The harmful effects of a marine environment, condensation and water leakage shall not affect the performance of the beacon;

- .5** be capable of manual activation and manual deactivation;
- .6** be provided with means to indicate that signals are being emitted;
- .7** be capable of floating upright in calm water and have positive stability and sufficient buoyancy in all sea conditions;
- .8** be capable of being dropped into the water without damage from a height of 20 m;
- .9** be of highly visible yellow/orange colour and have a paint or stripes of retroreflecting material;
- .10** be equipped with a buoyant lanyard suitable for use as a tether, which shall be so arranged and not attached to the ship's hull or EPIRB securing device as to prevent its being trapped in the ship's structure when floating free;
- .11** be provided with a light (0,75 cd) automatically activated by darkness to indicate its position;
- .12** be resistant to seawater and oil;
- .13** be resistant to deterioration in prolonged exposure to sunlight.

**9.1.3** The EPIRB shall be so designed as to operate under any of the following environmental conditions:

- .1** ambient temperatures of –20 to +55 °C (VHF EPIRB),  
ambient temperatures of –40 to +55°C (class 1) (COSPAS-SARSAT satellite EPIRB),  
ambient temperatures of –20 to +55 °C (class 2) (COSPAS-SARSAT satellite EPIRB);
- .2** icing;
- .3** relative wind speeds up to 100 knot (51 m/s);
- .4** after storage at temperatures between –30 to +70 °C.

**9.1.4** The EPIRB shall be so constructed that it can be ready for the operation during at least one year without maintenance.

**9.1.5** The installed EPIRB shall be designed to release itself and float free, when immersed to the depth of 4 m, at any angle of a list or trim.

**9.1.6** The release and activation arrangements for EPIRB shall comply with the requirements of Section 13.

**9.1.7** The installed EPIRB shall have local manual activation; remote activation may also be provided from the navigation bridge while the device is installed in the floatfree mounting.

**9.1.8** Self-floating COSPAS-SARSAT satellite EPIRB shall be so designed as to be automatically activated when immersed to the water after being manually removed from the release mechanism; when manually activated it shall require two independent actions (refer to 1.2).

**9.1.9** When the satellite EPIRB of the COSPAS-SARSAT and INMARSAT system is manually operated, a distress alert shall be initiated, as stated above, only by means of a dedicated distress alert activator and shall require two independent actions.

The dedicated activator shall be clearly identified and be protected against inadvertent operation.

The COSPAS-SARSAT satellite EPIRB shall not be automatically activated after being manually removed from the release mechanism.

**9.1.10** For periodical testing of the EPIRB in action using an artificial aerial provision shall be made for connection to it of the external source of power.

**9.1.11** The COSPAS-SARSAT satellite EPIRB shall:

**.1** undergo annual overall operational efficiency testing with due regard to emission on working frequencies, encoding and recording within the following time limits:

on passenger ships — within 3 months before the expiry of validity of the Passenger Ship Safety Certificate;

on cargo ships — within 3 months before the expiry of validity of the Cargo Ship Safety Radio Certificate or within 3 months before or after annual expiry of validity of this Certificate.

The testing may be carried out on board or at the shore-based maintenance center recognized by the Register; and

**.2** undergo maintenance and repair at the shore-based maintenance center recognized by the Register at least once every five years.

**9.1.12** Primary batteries used as a source of electrical power for the EPIRB shall have the period of storage not less than 2 years and shall be replaced if on the date of survey of the shipboard radio equipment carried out by the Surveyor to the Register the period of their storage left is at least 12 months. Date of manufacture and maximum period of storage shall be indicated on the batteries.

**9.1.13** In addition to 5.1.47, the following shall be clearly indicated on the exterior of the EPIRB:

**.1** brief operating instructions in the English and in the national languages;

**.2** expiry date for the primary battery stored;

**.3** identification code;

**.4** date of occasional shore-based maintenance;

**.5** the ship's call signal.

## **9.2 COSPAS-SARSAT SATELLITE EMERGENCY POSITION-INDICATING RADIO BEACONS**

**9.2.1** The satellite EPIRB shall be capable of transmitting a distress alert to polar orbiting satellites.

**9.2.2** Check of the EPIRB shall be provided without using the satellite system.

**9.2.3** The satellite EPIRB distress alerting signal shall be transmitted on the frequency of 406,028 MHz  $\pm$  1 kHz using G1B class of emission.

**9.2.4** The satellite EPIRB shall be provided with a frequency of 121,5 MHz for aircraft homing.

The homing signal shall:

**.1** be transmitted using A3X class of emission. Carrier frequency shall be amplitude-modulated (minimum duty cycle of 33 %) with a minimum modulation index 0,85. The emission shall consist of a characteristic audio-frequency signal obtained by amplitude modulation of the carrier frequencies with a downward/ upward audio-frequency sweep within a range of not less than 700 Hz between 1600 Hz and 300 Hz and with a sweep repetition rate of 2 to 4 times per second;

**.2** capacity of carrier frequency shall differ at least 30 % from that of sidebands and be within  $\pm$  30 Hz at any time;

**.3** have an uninterruptible duty cycle which can be interrupted for 2 s maximum for the transmission of signal on 406,028 MHz.

**9.2.5** Provisions shall be included for storing the fixed portion of the distress message in the satellite EPIRB using non-volatile memory.

**9.2.6** A unique beacon identification code shall be made part of all messages, including three digits of the code of the country of registration followed by:

**.1** a unique serial number; or

**.2** a radio call sign; or

.3 six figures of the ship identity.

Preference shall be given to 9.2.6.3.

**9.2.7** COSPAS-SARSAT satellite EPIRB, in addition to the requirements specified in the present Part of the Rules, shall comply with the COSPAS-SARSAT and be type approved by the COSPAS-SARSAT.

### **9.3 VHF EMERGENCY POSITION-INDICATING RADIO BEACONS**

**9.3.1** The EPIRB shall be capable of transmitting a VHF distress alert and of providing a homing signal by means of a 9 GHz radar transponder. These two functions may be provided in an integral unit. The radar transponder shall comply with the requirements of 10.1.

**9.3.2** The EPIRB shall be of an automatic, float-free type and shall be capable of being tested on board, without radiating an alerting signal.

**9.3.3** The EPIRB shall comply with the following requirements:

.1 DSC distress alerting signal shall be transmitted on the frequency of 156,525 MHz using G2B class of emission;

.2 the frequency tolerance shall not exceed  $10 \cdot 10^{-6}$ ;

.3 the bandwidth shall be less than 16 kHz;

.4 the output power shall be at least 100 mW;

.5 emission shall be vertically polarized;

.6 frequency modulation with a pre-emphasis characteristic of 6 dB/octave (phase modulation) with the modulating subcarrier shall be used;

.7 a subcarrier of 1700 Hz with frequency modulation between 1300 and 2100 Hz shall be used;

.8 the frequency tolerance of 1300 and 2100 Hz shall be within  $\pm 10$  Hz;

.9 the modulation rate shall be 1200 Baud;

.10 the index of modulation shall be  $2 \pm 10$  %.

**9.3.4** DSC format and sequence of DSC alerting shall comply with the following standards.

## **10 SHIP'S AND SURVIVAL CRAFT SEARCH AND RESCUE LOCATING DEVICE**

### **10.1 SHIP'S AND SURVIVAL CRAFT RADAR SEARCH AND RESCUE TRANSPONDER (SART)**

**10.1.1** SART shall be capable of indicating the location of units in distress by transmitting signals which will appear on a radar display as a series of equally spaced dots.

**10.1.2** SART shall:

- .1** be capable of being easily activated by unskilled personnel;
- .2** be fitted with means to prevent inadvertent activation;
- .3** be equipped with a means which is either visual or audible, or both visual and audible, to indicate correct operation and to alert survivors to the fact that a radar has triggered the radar transponder;
- .4** be capable of manual activation and deactivation; provision for automatic activation may be included.

If an on board test is performed using a shipborne 9 GHz radar, activation of the radar transponder shall be limited to a few seconds to avoid harmful interference to other shipborne or airborne radars and excessive consumption of source power;

- .5** be provided with an indication of the stand-by condition;
- .6** be capable of withstanding without damage drops from a height of 20 m into water;
- .7** be watertight at a depth of 10 m for at least 5 min;
- .8** maintain watertightness when subjected to a thermal shock of 45 °C under specified conditions of immersion;
- .9** be capable of floating if it is not an integral part of the survival craft;
- .10** be equipped with a buoyant lanyard, suitable for use as a tether, if it is capable of floating;
- .11** be resistant to seawater and oil;
- .12** be resistant to deterioration in prolonged exposure to sunlight;
- .13** be of a highly visible yellow/orange colour on all surfaces where this will assist detection;
- .14** have a smooth external construction to avoid damaging the survival craft.

**10.1.3** SART shall be so designed as to be able to operate under temperatures of  $-20\text{ }^{\circ}\text{C}$  to  $+55\text{ }^{\circ}\text{C}$ . It shall not be damaged in storage throughout the temperature range of  $-30\text{ }^{\circ}\text{C}$  to  $+65\text{ }^{\circ}\text{C}$ .

**10.1.4** The height of the installed transponder antenna shall be at least 1 m above sea level.

In order to fulfill this requirement provision shall be made for a pole or other arrangement compatible with the antenna pocket in a survival craft, together with illustrated instructions.

**10.1.5** Horizontal polarization shall be used for transmission and reception.

**10.1.6** SART shall operate correctly when interrogated at a distance of up to at least 5 miles by a navigational radar with an antenna height of 15 m.

It shall also operate correctly, when interrogated at a distance of not less than 30 miles by an airborne radar with at least 10 kW peak output power at a height of 1000 m.

**10.1.7** In addition to 5.1.47, the following shall be clearly indicated on the exterior of SART:

- .1** brief operating instructions;
- .2** the ship's name and call sign;
- .3** expiry date for storage of the primary battery used (refer to 9.1.12).

**10.2 SHIP'S AND SURVIVAL CRAFT AIS SEARCH AND RESCUE TRANSMITTER (AIS-SART)**

**10.2.1** The AIS-SART shall be capable of transmitting messages that indicate the position, static and safety information of a unit in distress. The transmitted messages format shall be compatible with the format of existing AIS installations be recognized and displayed on operational display equipment (minimum displays), installed aboard the ships located in the reception range of AIS-SART. The messages received from the AIS-SART and an AIS installation shall be clearly distinguishable.

**10.2.2** The AIS-SART shall:

- .1** be capable of being easily activated by unskilled personnel;
- .2** be fitted with means to prevent inadvertent activation;
- .3** be equipped with a means which is either visual or audible, or both visual and audible, to indicate correct operation;
- .4** be capable of manual activation and deactivation; provision for automatic activation may be included;
- .5** be capable of withstanding without damage drops from a height of 20 m into water;
- .6** be watertight at a depth of 10 m for at least 5 min;
- .7** maintain water tightness when subjected to a thermal shock of 45 °C under specified conditions of immersion;
- .8** be capable of floating (not necessarily in an operating position) if it is not an integral part of the survival craft;
- .9** be equipped with buoyant lanyard, suitable for use as a tether, if AIS-SART is capable of floating;
- .10** not be unduly affected by seawater or oil;
- .11** be resistant to deterioration in prolonged exposure to sunlight;
- .12** be of a highly visible yellow/orange colour on all surfaces where this will assist detection;
- .13** have a smooth external construction to avoid damaging the survival craft;
- .14** be provided with an arrangement to bring the AIS-SART antenna to a level of at least 1 m above sea level, together with illustrated instructions;
- .15** be capable of transmitting with a reporting interval of 1 min or less;
- .16** equipped with an internal position source and be capable of transmitting its current position in each message;
- .17** be capable of being tested for all functionalities using specific test information; and
- .18** have unique identifier to ensure the integrity of VHF data link.

**10.2.3** The AIS-SART shall be so designed as to be able to operate under ambient temperatures of –20 to +55 °C. It shall not be damaged in stowage throughout the temperature range of –30 to +70 °C.

**10.2.4** The AIS-SART shall be detectable at a range of not less than 5 miles.

**10.2.5** The AIS-SART shall continue transmission even if the position and time synchronization from the navigational positioning system is lost or fails.

**10.2.6** The AIS-SART shall transmit within 1 min of activation.

**10.2.7** In addition to applicable requirements of 5.1.47, the following shall be clearly indicated on the exterior of the AIS-SART:

- .1** brief operating and test instructions; and
- .2** expiry date for the primary battery used (refer to 9.1.12).

## **11 PUBLIC ADDRESS SYSTEM**

**11.1** Public address system shall be capable of providing the possibility for transmitting the service orders from the command broadcast microphone posts to all service, accommodation and public spaces as well as to the open decks of the ship.

Public address system shall be capable of providing the possibility of interrupting any broadcasting from any command broadcast microphone post or the transmission of general radio broadcasting and sound-recording programs from the navigation bridge.

It is allowed to use the ship public address system for transmitting general radio broadcasting and sound-recording programs, if the priority of loudspeaking and command broadcasting is provided.

Automatic brake of transmitting general radio broadcasting and sound-recording programs shall be provided when ship's general alarm system is in operation.

**11.2** For the transmission of the service orders all control of the public address system (switching on and off, commutation of the broadcasting relay lines, disconnection of programs and switching on a public address system) shall be carried out by remote control means directly from any of command broadcast microphone posts irrespective of the position of controls in all other command broadcast microphone posts.

**11.3** The public address system shall be capable of being connected to at least three broadcasting lines.

**11.4** The public address system shall include the main command microphone post intended for installation in the ship command broadcast centre, and at least two remote command broadcast microphone posts. The main command broadcast microphone post shall be provided with means for audio control of the quality of broadcast in each broadcasting line.

**11.5** Every command broadcast microphone post shall be fitted with light signalling system which shall be switched on simultaneously with the starting of the public address system.

The diagram of the remote control switching system shall be as simple as possible, preferably, without using relays.

**11.6** Loudspeakers installed in accommodation spaces of the ship shall be fitted with volume controls. Plugs are not allowed to be used.

## **12 SURVIVAL CRAFT RADIO EQUIPMENT**

### **12.1 SURVIVAL CRAFT SEARCH AND RESCUE LOCATING DEVICES**

**12.1.1** Survival craft SART shall comply with the performance standards and functional requirements specified in 10.1.

**12.1.2** Survival craft AIS-SART shall comply with the performance standards and functional requirements specified in 10.2.

### **12.2 TWO-WAY VHF RADIOTELEPHONE APPARATUS**

**12.2.1** The apparatus shall be capable of being used for on scene communication between survival craft, between survival craft and ship and between survival craft and rescue unit. It may also be used for on-board communications when capable of operating on appropriate frequencies.

**12.2.2** The apparatus shall constitute an integral device and comprise at least the following:

- .1 an integral transmitter/receiver including antenna and power source;
- .2 a push-button control unit for receipt/transmission;
- .3 an internal microphone and loudspeaker.

**12.2.3** The apparatus shall:

- .1 be capable of being operated by unskilled personnel;
- .2 be capable of being operated by personnel wearing gloves, as specified for immersion suits in 6.4, Part II "Life-Saving Appliances";
- .3 be capable of single-handed operation except for channel selection;
- .4 withstand drops on to a hard surface from a height of 1 m;
- .5 be watertight to a depth of 1 m for at least 5 min;
- .6 maintain watertightness when subjected to a thermal shock of 45 °C under conditions of immersion;
- .7 not be unduly affected by seawater or oil;
- .8 have no sharp projections which could damage survival craft;
- .9 be of small size and light weight;
- .10 be capable of operating in the ambient noise level likely to be encountered on board ships or in survival craft;
- .11 have provisions for its attachment to the clothing of the user and also be provided with a wrist or neck strap. For safety reasons, the strap shall include a suitable weak link;
- .12 be resistant to deterioration by prolonged exposure to sunlight;
- .13 be painted in highly visible yellow or orange colour or have an marking strip of yellow/orange colour around the apparatus.

**12.2.4** The apparatus shall be capable of operation on the frequency 156,800 MHz (VHF channel 16) and on at least one additional channel.

**12.2.5** Simplex radiotelephone channels shall be used in the apparatus.

**12.2.6** The class of emission shall be G3E.

**12.2.7** An on/off switch shall be provided with a visual indication that the radiotelephone is switched on.

**12.2.8** The receiver shall be provided with a volume control.

**12.2.9** A squelch (mute) control and a channel selection switch shall be provided.

**12.2.10** Channel selection shall be easily performed and the channels shall be clearly discernible. Channel indication shall be in accordance with Appendix 18 of the Radio Regulations.

**12.2.11** It shall be possible to determine that channel 16 has been selected in all ambient light conditions.

**12.2.12** The apparatus shall be ready for operation not later than 5 s after activation.

**12.2.13** The effective radiated power of transmitter shall be at least 0,25 W. Where the effective radiated power exceeds 1 W, a power reduction switch to reduce the power to 1 W or less is required. When this equipment provides for on-board communications, the output power of transmitter shall not exceed 1 W.

**12.2.14** The sensitivity of the receiver shall be equal to or better than 2  $\mu$ V e.m.f for a SINAD ratio of 12 dB at the output. The immunity to interference of the receiver shall be such that the unwanted signals do not effect adversely the wanted signal.

**12.2.15** The antenna shall be vertically polarized and, as far as practicable, be omnidirectional in the horizontal plane.

**12.2.16** The audio output shall be sufficient to be heard in the ambient noise level likely to be encountered on board ships or in a survival craft.

**12.2.17** In the transmit condition, the output of the receiver shall be muted.

**12.2.18** The apparatus shall be so designed as to operate over the temperature range  $-20$  to  $+55$  °C and in storage throughout the temperature range  $-30$  to  $+70$  °C.

**12.2.19** The source of electrical power shall be integrated in the apparatus. A provision shall be made to replace the source of electrical power during operation of the apparatus. In addition, provision may be made to operate the apparatus using an external source of electrical power.

**12.2.20** Two-way VHF radiotelephone apparatus, in which the source of electrical power shall be replaced during operation, shall be provided with a dedicated primary battery for use in the event of a distress situation. This battery shall be equipped with a non-replaceable seal to indicate that it has not been used.

VHF apparatus, in which a replacement of the source of power is not needed during operation, shall be provided with a primary battery. VHF apparatus shall be fitted with a non-replaceable seal to indicate that it has not been used.

Primary power supply battery shall have the period of storage at least 2 years. The battery shall be marked with the manufacture date and maximum storage period. Primary power supply battery in the event of a distress situation shall be of colour or marking in compliance with 12.2.3.13.

Battery not intended for the use in the event of a distress situation shall be of colour or marking so that they can not be confused with batteries intended for such use.

**12.2.21** In addition to 5.1.47, the following shall be clearly indicated on the exterior of the apparatus:

- .1 brief operating instructions;
- .2 the ship's name; and
- .3 expiry date for the primary batteries stored.

### **12.3 FIXED TWO-WAY VHF RADIOTELEPHONE APPARATUS**

**12.3.1** Fixed VHF apparatus shall be capable of being used for on-scene communication between survival craft, between survival craft and ship and between survival craft and rescue unit.

**12.3.2** Fixed VHF apparatus shall comprise the following:

- .1 transmitter/receiver;
- .2 antenna which may be fitted on the equipment or isolated;
- .3 a microphone with press-to-talk switch and loudspeaker.

**12.3.3** VHF apparatus shall:

- .1 be capable of being operated by unskilled personnel;
- .2 be capable of being operated by personnel wearing gloves provided for immersion suits in 6.4 of Part II "Life-Saving Appliances";

- .3 withstand shocks and vibration as might occur in survival craft;
- .4 be watertight to a depth of 1 m for at least 5 min;
- .5 maintain watertightness when subjected to a thermal shock of 45 °C under conditions of immersion;
- .6 not be unduly affected by seawater or oil;
- .7 have no sharp projections which could lead to personnel injury;
- .8 be capable of operating in the ambient noise level likely to be encountered in survival craft;
- .9 be so designed as to provide its quick installation in survival craft.

12.3.4 VHF apparatus shall be capable of operation on the frequency of 156,8 MHz (channel 16) and on at least one additional channel.

12.3.5 Simplex radiotelephone channels shall be used in VHF apparatus.

12.3.6 The class of emission of VHF apparatus shall be G3E.

12.3.7 An on/off switch shall be provided with a visual indication that the radiotelephone is switched on.

12.3.8 The receiver shall be provided with a volume control. If microphone is used, volume control shall not affect the output power of a microphone.

12.3.9 A squelch (mute) control and a channel selection switch shall be provided.

12.3.10 Channel selection shall be easily performed and the channels shall be clearly discernible. Channel indication shall be in accordance with Appendix 18 of the Radio Regulations.

12.3.11 It shall be possible to determine that channel 16 has been selected in all ambient light conditions.

12.3.12 VHF apparatus shall be ready for operation not later than 5 s after activation.

12.3.13 The effective radiated power of transmitter shall be at least 0,25 W. Where the effective radiated power exceeds 1 W, a power reduction switch to reduce the power to 1 W or less is required. When this equipment provides for on-board communications, the output power of transmitter shall not exceed 1 W.

12.3.14 The sensitivity of the receiver shall be equal to or better than 2 µV e.m.f for a SINAD ratio of 12 dB at the output. The immunity to interference of the receiver shall be such that the unwanted signals do not affect adversely the wanted signal.

12.3.15 The antenna shall be vertically polarized and, as far as practicable, be omnidirectional in the horizontal plane.

12.3.16 The audio output shall be sufficient to be heard in the ambient noise level likely to be encountered on board ships or in a survival craft.

12.3.17 In the transmit condition, the output of the receiver shall be muted.

12.3.18 VHF apparatus shall be so designed as to operate over the temperature range –20 to +55 °C and in storage throughout the temperature range –30 to +70 °C.

12.3.19 The source of electrical power shall be integrated in the apparatus. A provision shall be made to replace the source of electrical power during operation of the apparatus. In addition, provision may be made to operate the apparatus using an external source of electrical power.

12.3.20 Fixed two-way VHF radiotelephone apparatus in which the source of electrical power shall be replaced during operation, shall be provided with a dedicated primary battery for use in the event of a distress situation. This battery shall be equipped with a nonreplaceable seal to indicate that it has not been used.

VHF apparatus, in which a replacement of the source of power is not needed during operation, shall be provided with a primary battery. VHF apparatus shall be fitted with a non-replaceable seal to indicate that it has not been used.

Primary power supply batteries shall have the period of storage of at least 2 years. The batteries shall be marked with the manufacture date and maximum storage period. Primary power supply batteries intended for the use in the event of distress shall be of colour or marking in compliance with 12.2.3.13.

Battery not intended for the use in the event of a distress situation shall be of colour or marking so that they can not be confused with batteries intended for such use.

12.3.21 In addition to 5.1.47, the following shall be clearly indicated on the exterior of the apparatus:

- .1 brief operating instructions;
- .2 the ship's name; and
- .3 expiry date for the primary batteries stored.

## **13 FLOAT-FREE RELEASE AND ACTIVATION ARRANGEMENTS FOR EMERGENCY RADIO EQUIPMENT**

### **13.1 GENERAL**

**13.1.1** Float-free release and activation arrangements enable the automatic release of emergency radio equipment from a sinking ship and its automatic activation.

**13.1.2** The arrangement shall:

**.1** be designed so that the release mechanism shall operate before reaching a depth of 4 m in any orientation of the ship;

**.2** be capable of operating throughout the temperature range of  $-30$  to  $+70$  °C;

**.3** be constructed of non-corrosive compatible materials, so as to prevent any deterioration which may cause malfunction of the unit. Galvanizing or other forms of metallic coating on parts of the float-free release mechanism shall not be accepted;

**.4** be constructed to prevent release when seas wash over the unit;

**.5** not be unduly affected by seawater and oil or prolonged exposure to sunlight;

**.6** be capable of operating properly after exposure to shock, vibration and other severe environmental conditions encountered above deck on sea-going vessels;

**.7** if the ship navigates in areas where icing may be expected, be so designed as to minimize the formation of ice and prevent its effects from hindering the release of the radio equipment as far as practicable;

**.8** be mounted in such a way that the radio equipment, after being released, is not obstructed by the structure of the sinking ship;

**.9** carry a label indicating clearly the operating instructions for manual release.

**13.1.3** For radio equipment requiring external power or data connection, or both, the means of connection shall not inhibit the release or activation of the radio apparatus.

**13.1.4** It shall be possible to assess the proper functioning of the automatic release mechanism by a simple method without activation of the radio equipment.

**13.1.5** It shall be possible to release the radio equipment manually from the float-free mechanism.

**13.1.6** The float-free release and activation arrangements for emergency radio equipment shall be marked on the exterior with the manufacturer's name, date of manufacture, type and serial number, as well as the date of next checking or expiration of service life.

**INFORMATION FOR DETERMINATION OF AREAS OF NAVIGATION**

Sea area A1 is that sea area which is within a circle of radius "A", in miles, over which the radio propagation path lies substantially over the water surface. The radius "A" is equal to the transmission distance between a ship's VHF aerial at a height of 4 m and the aerial of the VHF coast station which lies at the centre of the circle.

The following formula shall be used to calculate the range "A":

$$A = 2,5(\sqrt{H} + \sqrt{h})$$

where *H* = the height of installing the coast station receiving aerial above sea level, m;

*h* = the height of installing the ship's transmitting aerial above waterline which is assumed to be 4 m.

The formula applies to line-of-sight cases only. The range of sea area A1 shall be plotted on navigational charts and verified by field strength measurements.

Sea area A2 is that sea area which is within a circle of radius "B", in miles, over which the propagation path lies substantially over the water surface and which is not part of sea area A1.

The centre of the circle is the position of the coast station receiving aerial.

The range of sea area A2 shall be plotted on navigational charts and verified by field strength measurements under the following conditions:

Frequency . . . . .	2182 kHz
Class of emission . . . . .	J3E
Bandwidth . . . . .	3 kHz
Propagation . . . . .	Groundwave
Season . . . . .	Summer
Peak power of ship's transmitter . . . . .	60 W
Ship's aerial efficiency . . . . .	25%
S/N (RF) . . . . .	9 dB
Mean transmitter power . . . . .	8 dB below peak power
Fading margin . . . . .	3 dB

Sea area A3 is the area which is not part of any sea area A1 or A2 within which the elevation angle of an INMARSAT satellite is 5 degrees or more.

Sea area A4 is the sea area which is not part of any sea area A1, A2 or A3.

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