

RUSSIAN MARITIME REGISTER OF SHIPPING

RULES FOR THE EQUIPMENT OF SEA-GOING SHIPS

PART II LIFE-SAVING APPLIANCES

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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 2020.

The present edition of the Rules is based on the 2019 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 "General";

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.

REVISION HISTORY

(Purely editorial amendments are not included in the Revision History)

Amended paras/chapters/sections	Information on amendments	Number and date of the Circular Letter	Entry-into-force date
Para 1.1.3	Russian version has been amended considering IMO resolution MSC.421(98)	—	01.01.2020
Para 1.1.6	Para has been deleted in connection with the expiration on July 1, 2019, the time allotted for the evaluation of on load release mechanisms in compliance with IMO circular MSC.1/Circ.1392 Further, all release mechanisms shall comply with the requirements of 6.13.7.6	—	01.01.2020
Para 1.3.2.1	The para has been supplemented by the reference to IMO resolution MSC.472(101) amending IMO resolution MSC.81(70)	314-17-1303c of 05.12.2019	01.01.2020
Para 1.3.8	New requirements for the documentation on the testing of welded joints of metal structures, as well as on stamping and marking have been introduced	—	01.01.2020
Para 1.3.8.1.16	Requirements have been specified for the scope of documentation on lifeboats and rescue boats to be submitted in compliance with the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships	314-17-1374c of 13.04.2020	01.06.2020
Para 1.3.8.2.4	Requirements have been specified for the scope of documentation on rigid liferafts to be submitted in compliance with the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships	314-17-1374c of 13.04.2020	01.06.2020
Para 1.3.8.4.5	Requirements have been specified for the scope of documentation on lifejackets and lifebuoys, immersion suits and thermal protective aids to be submitted in compliance with the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships	314-17-1374c of 13.04.2020	01.06.2020
Para 1.3.8.5.4	Requirements have been specified for the scope of documentation on items of equipment of life-saving appliances to be submitted in compliance with the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships	314-17-1374c of 13.04.2020	01.06.2020
Para 1.3.8.6.6	Requirements have been specified for the scope of documentation on launching appliances to be submitted in compliance with the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships	314-17-1374c of 13.04.2020	01.06.2020
Para 1.3.8.7.6	Requirements have been specified for the scope of documentation on winches and mechanical drives of launching appliances to be submitted in compliance with the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships	314-17-1374c of 13.04.2020	01.06.2020
Para 2.2.1.5	In compliance with IACS Unified Interpretation SC 293 a new para has been introduced providing the uniform interpretation of the requirements for equipment of ships with lifebuoys	314-17-1396c of 20.05.2020	01.07.2020
Para 4.1.1.1.2	Para 4.1.1.1.2 has been amended to eliminate inconsistencies with 6.8.2.2 (the Russian version only)	—	01.01.2020

Amended paras/chapters/sections	Information on amendments	Number and date of the Circular Letter	Entry-into-force date
Para 4.1.1.3.2	Para 4.1.1.3.2 has been amended to eliminate inconsistencies with 6.8.2.2 (the Russian version only)	—	01.01.2020
Para 4.1.1.3.4	Para 4.1.1.3.4 has been amended to eliminate inconsistencies with 6.8.2.2 (the Russian version only)	—	01.01.2020
Para 4.1.1.10	The para has been amended to ensure uniform interpretation of the Rules	—	01.01.2020
Para 5.1.1	Scope of requirements has been specified	—	01.01.2020
Para 5.1.3.2	Scope of requirements has been specified	—	01.01.2020
Para 5.2.6	The requirements for special purpose ships constructed before 13 May 2008 with life-saving appliances have been specified considering IMO resolution MSC.453(100)	314-17-1280c of 01.11.2019	01.01.2020
Para 6.13.1.8	Requirements have been specified for the documents issued on a series-built lifeboat	314-17-1374c of 13.04.2020	01.06.2020
Para 6.16.8	Requirements have been specified for the document of approval for a free-fall lifeboat	314-17-1374c of 13.04.2020	01.06.2020
Para 6.20.4.7	Additional clarifications for the static load testing of the launching appliances for lowering a free-fall lifeboat by falls have been introduced	314-17-1303c of 05.12.2019	01.01.2020

PART II. LIFE-SAVING APPLIANCES

1 GENERAL

1.1 APPLICATION

1.1.1 The requirements of the present Part of the Rules, unless expressly provided otherwise, apply to the ships constructed after 1 July 1998 whose equipment with life-saving appliances and arrangements is subject to survey by the Register as well as to the life-saving appliances and arrangements intended for installation aboard these ships.

1.1.2 The ships constructed before 1 July 1998 shall comply with the requirements of regulations being in force prior to 1 July 1998, as well as with the requirements of the present Part of the Rules, when it is specially provided.

1.1.3 For ships constructed before 1 July 1998, when life-saving appliances or arrangements on such ships are replaced or such ships undergo repairs, alterations or modifications of a major character which involve replacement of, or any addition to, their existing life-saving appliances or arrangements, such life-saving appliances or arrangements comply with the requirements of the present Part of the Rules. If a survival craft other than an inflatable liferaft is replaced without replacing its launching appliance, or vice versa, the survival craft or launching appliance may be of the same type as that replaced.

1.1.4 The present Part of the Rules lays down the technical requirements which life-saving appliances and arrangements shall comply with and specifies the number of these appliances and arrangements and their location on board ships.

1.1.5 Individual ships or classes of ships which, in the course of their voyage, do not proceed more than 20 miles from the nearest land, may be exempted from the requirements of the present Part, taking into account that the sheltered nature and conditions of the voyage are such that the application of such requirements rendered unreasonable or unnecessary, that shall be in each case substantiated by the procedure approved by the Register. In these cases for the ships engaged in the international voyages an Exemption Certificate shall be issued.

1.2 DEFINITIONS AND EXPLANATIONS

1.2.1 Definitions and explanations relating to the general terminology of the Rules are given in Part I "Classification" of the Rules for the Classification and Construction of Sea-Going Ships.

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

Recovery time for a rescue boat is the time required to raise the boat to a position where persons on board can disembark to the deck of the ship. Recovery time includes the time required to make preparations for recovery on board the rescue boat such as passing and securing a painter, connecting the rescue boat to the launching appliance, and the time to raise the rescue boat. Recovery time does not include the time needed to lower the launching appliance into position to recover the rescue boat.

Immersion suit is a protective suit made of waterproof material intended for reducing the body heat-loss of a person wearing it in cold water.

Rescue boat is a special life-saving appliance to be carried aboard ships in a state of continuous readiness for immediate use and intended to rescue persons fallen into the water, persons from a ship in distress, as well as to marshal and tow liferafts in emergency conditions.

Length of ship is 96 % of the total length on a waterline at 85 % of the least moulded depth measured from the top of the keel, or the length from the fore-side of the stem to the axis of the rudder stock on the same waterline, if that is greater.

In ships designed with a rake of keel the waterline on which this is measured shall be parallel to the designed waterline.

Free-fall certification height is the greatest launching height for which the lifeboat is to be approved by the Register, measured from the still water surface to the lowest point on the lifeboat when the lifeboat is in the launch configuration. Free-fall certification height shall be measured from the lightest seagoing condition without regard to the list and trim, referred to in 6.16.3 and 6.20.1.1.

Anti-exposure suit is a protective suit designed for use by rescue boat crews and marine evacuation system parties.

Survival craft is a craft capable of sustaining the lives of persons in distress from the time of abandoning the ship.

The final port of destination is the last port of call in the scheduled voyage at which the ship commences its return voyage to the country in which the voyage began.

Short international voyage is an international voyage in the course of which a ship is not more than 200 miles from a port or place in which the passengers and crew could be placed in safety. The distance between the last port of call in the country in which the voyage begins and the final port of destination as well as the return voyage shall not exceed 600 miles.

Ships constructed is definition given in 1.2, Part IV "Radio Equipment" of the Rules.

International voyage is a voyage from a country to which the International Convention for the Safety of Life at Sea, 1974, applies to a port outside this country, or conversely.

Marine evacuation system is an appliance for the rapid transfer of persons from the embarkation deck of a ship to a floating survival craft.

Lightest sea-going condition is the loading condition with the ship on even keel, without cargo, with 10 % stores and fuel remaining and in the case of a passenger ship with the full number of passengers and crew and their luggage.

Inflatable appliance is an appliance which depends upon non-rigid, gas filled chambers for buoyancy and which is normally kept uninflated until ready for use.

Inflated appliance is an appliance which depends upon non-rigid, gas filled chambers for buoyancy and which is kept inflated and ready for use at all times.

Detection is the determination of the location of survivors and life-saving appliances.

Positive stability is the ability of a craft to return to its original position after the removal of a heeling moment.

E m b a r k a t i o n l a d d e r is the ladder provided at survival craft embarkation stations to permit safe access to survival craft after their launching.

R e t r o - r e f l e c t i v e m a t e r i a l is a material which reflects in the opposite direction a beam of light directed on it.

F a s t r e s c u e b o a t is a rescue boat which is capable of manoeuvring for at least 4 h at a speed of at least 20 knots in calm water with a crew of 3 persons and at least 8 knots with a full complement of persons and equipment.

N o v e l l i f e - s a v i n g a p p l i a n c e o r a r r a n g e m e n t is an appliance or arrangement which embodies new features not fully covered by the provisions of this Chapter but which provides an equal or higher standard of safety.

F l o a t - f r e e l a u n c h i n g is that method of launching survival craft whereby the craft is automatically released from a sinking ship and is ready for use.

F r e e - f a l l l a u n c h i n g is that method of launching survival craft whereby the craft with its complement of persons and equipment on board is released from a ship and allowed to fall into the water without any restraining apparatus.

L a u n c h i n g c r e w is the personnel remaining aboard a lifeboat to handle it during launching and recovering.

L a u n c h i n g a p p l i a n c e is the davits and other arrangements aboard ship intended for launching and recovery the lifeboats, rescue boats and liferafts.

S h i p s c o n s t r u c t e d is definition given in 1.2, Part IV "Radio Equipment" of the Rules.

M o u l d e d d e p t h is the vertical distance measured from the top of the keel to the top of the freeboard deck beam at side. In wood and composite ships this distance is measured from the lower edge of the keel rabbet. Where the form at the lower part of the midship section is of a hollow character, or where thick garboards are fitted, the depth is measured from the point where the line of the flat of the bottom continued inwards cuts the side of the keel.

In ships having rounded gunwales, the moulded depth shall be measured to the point of intersection of the moulded lines of the deck and side shell plating, the lines extending as though the gunwales were of angular design.

If the freeboard deck is stepped in the longitudinal direction and the raised part of the deck extends over the point at which the moulded depth shall be determined, the moulded depth shall be measured to a line of reference extending from the lower part of the deck along a line parallel with the raised part.

T h e r m a l p r o t e c t i v e a i d is a bag or suit made of waterproof material with low thermal conductivity intended for restoring the body core temperature of the person being immersed in cold water.

W a t e r e n t r y a n g l e is the angle between the horizontal and the keel of a free-fall lifeboat when it first enters water after falling from the certificated height of installation.

L a u n c h i n g r a m p a n g l e is the angle between the horizontal and the launch rail of the lifeboat in its launching position with the ship on even keel.

F r e e - f a l l a c c e l e r a t i o n is the rate of change of velocity experienced by the occupants during launching of a free-fall lifeboat.

H i g h l y v i s i b l e c o l o u r is saturate orange or yellow colour.

E f f e c t i v e c l e a r i n g o f t h e s h i p is the ability of the free-fall lifeboat to move away from the ship after free-fall launching without using its engine.

1.3 SCOPE OF SURVEY

1.3.1 General provisions for the procedure of survey of the life-saving appliances and arrangements, their manufacturing and service, as well as the requirements for the technical documentation to be submitted to the Register for review and provisions concerning documents issued by the Register for the life-saving appliances and arrangements are given in General Regulations for the Classification and Other Activity and in Part I "Survey Regulations".

Except cases prescribed by 1.3.5 and 1.3.6 the life-saving appliances and arrangements required by the present Part shall be approved by the Register.

1.3.2 Before giving approval to life-saving appliances and arrangements the Register shall ensure that such life-saving appliances and arrangements:

.1 are tested in accordance with the provisions of IMO resolution MSC.81(70) "Revised Recommendation on Testing of Life-Saving Appliances" considering the amendments introduced by IMO resolutions MSC.200(80), MSC.226(82), MSC.274(85), MSC.295(87), MSC.321(89), MSC.323(89), MSC.378(93), MSC.427(98), MSC.472(101), IMO circular MSC.1/Circ.1347 and also IACS UI SC244 (May 2011) (Rev.1 Nov 2012) (Corr.1 Nov 2015) given in the Supplement to rules and guidelines of Russian Maritime Register of Shipping "IACS Procedural Requirements, Unified Interpretations and Recommendations" (published in electronic format as a separate edition) to confirm that they comply with the requirements of the present Part; or

.2 have successfully undergone, to the satisfaction of the Register, tests which are basically equivalent to the tests prescribed in 1.3.2.1.

1.3.3 Prior to approval of the life-saving appliances or arrangements of the new type, the Register shall provide that such appliances and arrangements:

.1 provide, at least, the equivalent level of safety to the requirements of the present Part of the Rules and shall be evaluated and tested in compliance with the provisions of the Guidelines on Alternative Design and Arrangements (refer to IMO circular MSC.1/Circ.1212);

.2 have successfully passed the engineering analysis, evaluation and approval in compliance with the requirements of 1.3.11.

1.3.4 Procedures adopted by the Register for approval shall also include the conditions whereby approval would continue to be valid or it would be withdrawn.

1.3.5 Before accepting life-saving appliances and arrangements that have not been previously approved by the Register, the Register shall be satisfied that life-saving appliances and arrangements comply with the requirements of the present Part.

1.3.6 Life-saving appliances required by the present Part for which detailed specifications are not included in this Part of the Rules shall be to the satisfaction of the Register.

1.3.7 Production tests.

The Register shall require life-saving appliances to be subjected to such production tests as are necessary to ensure that the life-saving appliances are manufactured to the same standards as the approved prototype.

1.3.8 The technical documentation on life-saving appliances and arrangements to be submitted to the Register for approval shall be as follows.

1.3.8.1 On lifeboats and rescue boats the following shall be submitted:

.1 specification (hull, machinery and electrical equipment) including calculations of strength, stability, unsinkability, carrying capacity (the number of persons), volume of buoyancy, calculations of protective means and compressed air system, heel of equipment;

.2 lines drawing;

.3 longitudinal and transverse sections with indication of arrangement of the air cases or compartments, their volume and material;

.4 drawing of the launching and recovery appliance including launching/recovery strops for lifeboat launched by free-fall, with the use of falls and for rescue boat which is not a lifeboat (arrangement, securing and strength calculations);

.5 drawing of the steering gear;

.6 general arrangement plan with indication of stowage of equipment and accommodation of persons;

.7 diagram of protective foldable cover (canopy);

.8 shell expansion for metal lifeboats;

.9 documents on welded joints testing;

.10 sailing rig, if available;

.11 drawings of the propulsion unit and the shafting including calculations drawings of driving engine, bed and protective casing, fuel tank as well as electric equipment circuit diagram and choice of accumulator batteries;

.12 test programme;

.13 drawing of survival craft towing arrangements (location, securing and strength calculation);

.14 drawing showing safety belts fitted to boat;

.15 drawings of air support and water spray systems;

.16 documents on marking.

1.3.8.2 On rigid liferafts the following shall be submitted:

.1 specification of the liferaft including the strength calculations of the liferaft, its towing and launching and recovery arrangements, volume of deck area and carrying capacity (number of persons), as well as draught; heel of equipment;

.2 general arrangement plan (construction of liferaft and main dimensions) with indication of stowage of equipment and accommodation of persons;

.3 test programme;

.4 documents on marking.

1.3.8.3 On inflatable liferafts the following shall be submitted:

.1 specification of the liferaft including the strength calculations of the towing and launching and recovery arrangements, volume of buoyancy, deck area and carrying capacity (number of persons), as well as draught; heel of equipment;

.2 general arrangement plan (construction of lifeboat and main dimensions with indication of accommodation of persons, stowage of equipment, location of fittings and valves), container drawing;

.3 arrangement diagram, drawings and calculations of pressure vessels, fittings and valves of automatic gas inflation system, electric lighting circuit;

.4 test programme;

.5 documents on marking.

1.3.8.4 On lifejackets and lifebuoys, immersion suits and thermal protective aids the following shall be submitted:

.1 specification;

.2 drawing and calculation of pressure vessels, fittings and valves of automatic gas inflation system in the case of inflatable lifejackets and immersion suits;

.3 general view drawing (construction, material and equipment);

.4 test programme;

.5 documents on marking.

1.3.8.5 On items of equipment of life-saving appliances the following shall be submitted:

.1 specification;

.2 general view drawing (construction, material and equipment);

.3 test programme;

.4 documents on marking.

1.3.8.6 On launching appliances the following shall be submitted:

- .1 specification (no stamp of approval is needed);
- .2 general view drawing (construction, material and equipment);
- .3 documents on welded joints testing;
- .4 strength calculation and diagrams of forces;
- .5 test programme;
- .6 documents on marking.

1.3.8.7 On winches and mechanical drives of launching appliances the following shall be submitted:

- .1 specification;
- .2 general view drawing (construction, material and parts with dimensions);
- .3 documents on welded joints testing;
- .4 strength calculation;
- .5 test programme;
- .6 documents on marking.

1.3.9 The following items are subject to survey by the Register during manufacture:

- .1 lifeboats and rescue boats;
- .2 liferafts (inflatable and rigid);
- .3 lifebuoys;
- .4 lifejackets;
- .5 immersion and anti-exposure suits;
- .6 thermal protective aids;
- .7 marine evacuation systems;
- .8 launching appliance winches;
- .9 engines of lifeboats and rescue boats;
- .10 line-throwing appliances;
- .11 means of rescue;
- .12 self-igniting lights of lifebuoys;
- .13 self-activating smoke signals of lifebuoys;
- .14 lifeboat searchlights;
- .15 launching appliances of lifeboats, liferafts and rescue boats;
- .16 containers for inflatable liferafts;
- .17 release mechanism of lifeboats, liferafts and rescue boats including launching/recovery strops for lifeboat launched by free-fall, with the use of falls and for rescue boat which is not a lifeboat;
- .18 hydrostatic release units;
- .19 embarkation ladders;
- .20 lights of lifeboats, liferafts and lifejackets;
- .21 buoyant rescue quoits with buoyant line;
- .22 parachute flares, hand flares and buoyant smoke signals;
- .23 manual bailing pumps of lifeboats;
- .24 food rations;
- .25 watertight receptacles with fresh water;
- .26 sea-activated power sources for lights of lifejackets, liferafts and for lifebuoy self-igniting lights;
- .27 items of equipment and parts of life-saving appliances and arrangements required in 6.8.5 and 6.13.8.

Survey by the Register consists only of review and approval of technical documentation.

1.3.10 Equipment of ships with life-saving appliances and arrangements shall be effected under survey by the Register.

1.3.11 Alternative design and arrangements.

1.3.11.1 General.

1.3.11.1.1 Life-saving appliances and arrangements may deviate from the requirements of the present Part of the Rules, provided that such alternative design and arrangements satisfy the intent of these requirements and provide the equivalent level of safety to the Rules.

1.3.11.1.2 When alternative design or arrangements deviate from the prescriptive requirements of the Rules, an engineering analysis, evaluation and approval of such design and arrangements shall be carried out in compliance with the present Chapter.

1.3.11.2 Engineering analysis.

The engineering analysis shall be prepared on the basis of the Guidelines on Alternative Design and Arrangements (refer to IMO circular MSC.1/Circ.1212) and submitted to the Register. It shall include, at least, the following elements:

- .1** determination of the ship type and appropriate life-saving appliances and arrangements;
- .2** identification of the prescriptive requirement(s), from which the life-saving appliances and arrangements will deviate;
- .3** identification of the reason of the proposed design deviation from the prescriptive requirements, taking into account its compliance with other technical standards recognized by the Register;
- .4** determination of the performance criteria for the ship and appropriate life-saving appliances and arrangements considered in the relevant prescriptive requirement(s);
- .4.1** performance criteria shall provide the level of safety not lower than the relevant prescriptive requirements contained in Sections 1 — 5 of the Rules;
- .4.2** performance criteria shall be subject to quantitative analysis and measurement;
- .5** detailed description of the alternative design and arrangements, including a list of the assumptions used in the design and any proposed operating limitations and conditions;
- .6** technical justification demonstrating that the alternative design and arrangements satisfy the safety performance criteria; and
- .7** risk assessment based on identification of possible failures and hazards associated with the proposal.

1.3.11.3 Evaluation of the alternative design and arrangements.

1.3.11.3.1 The engineering analysis required in 1.3.11.2 shall be evaluated and approved by the Register, taking into account the Guidelines on Alternative Design and Arrangements (refer to IMO circular MSC.1/Circ.1212).

1.3.11.3.2 Copies of the documents approved by the Register, indicating that the alternative design and arrangements comply with the Rules, shall be provided on board.

1.3.11.4 Re-evaluation under the changed conditions.

1.3.11.4.1 If the assumptions and operating limitations indicated in the description of the alternative design and arrangements are changed, then under the changed conditions engineering design shall be carried out and approved by the Register.

2 REQUIREMENTS FOR ALL TYPES OF SHIPS

2.1 COMMUNICATIONS

2.1.1 Radio life-saving appliances.

2.1.1.1 Two-way VHF radiotelephone apparatus.

At least three two-way VHF radiotelephone apparatus shall be provided on every passenger ship and on every cargo ship of 500 gross tonnage and upwards. At least two two-way VHF radiotelephone apparatus shall be provided on every cargo ship of 300 gross tonnage and upwards but less than 500 gross tonnage. Such apparatus shall comply with the requirements of Section 12, Part IV "Radio Equipment".

2.1.1.2 Search and rescue locating devices.

At least one search and rescue locating device shall be carried on each side of every passenger ship and of every cargo ship of 500 gross tonnage and upwards. At least one search and rescue locating device shall be carried on every cargo ship of 300 gross tonnage and upwards but less than 500 gross tonnage. Such search and rescue locating devices shall comply with the requirements of Section 10, Part IV "Radio Equipment".

Search and rescue locating devices shall be stowed in such locations that they can be rapidly placed in any survival craft other than the liferaft or liferafts required by 4.1.1.4. Alternatively one search and rescue locating device shall be stowed in each survival craft other than those required by 4.1.1.4.

On ships carrying at least two search and rescue locating devices and equipped with free-fall lifeboats one of the search and rescue locating devices shall be stowed in a free-fall lifeboat and the other located in the immediate vicinity of the navigation bridge so that it can be utilized on board and ready for transfer to any of the other survival craft.

2.1.1.3 Every cargo ship of under 300 gross tonnage, non-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 ships not engaged in international voyages shall be fitted with one search and rescue locating device and two sets of two-way VHF radiotelephone apparatus.

2.1.2 Distress flares.

Not less than 12 rocket parachute flares, complying with the requirements of 6.7.1, shall be carried and be stowed on or near the navigation bridge.

2.1.3 On-board communications and alarm systems.

2.1.3.1 Emergency means comprised of either fixed or portable equipment or both shall be provided for two-way communications between emergency control stations, muster and embarkation stations and strategic positions on board.

2.1.3.2 A general emergency alarm system complying with the requirements of 6.22.1 shall be provided and shall be used for summoning passengers and crew to muster stations and to initiate the actions included in the muster drill. The system shall be supplemented by either a public address system complying with the requirements of 6.22.2 or other suitable means of communication. Entertainment sound systems shall automatically be turned off when the general emergency alarm system is activated.

2.1.3.3 The general emergency alarm system shall be audible throughout all the accommodation and normal crew working spaces. On passenger ships, the system shall also be audible on all open decks.

2.1.3.4 On ships fitted with a marine evacuation system communication between the embarkation station and the platform or the survival craft shall be ensured.

2.1.4 Public address systems on passenger ships.

2.1.4.1 In addition to the requirements of 2.1.3.2, all passenger ships shall be fitted with a public address system. With respect to passenger ships constructed before 1 July 1997 the requirements of 2.1.4.2 and 2.1.4.4, subject to the provisions of 2.1.4.5, shall apply not later than the date of the first periodical survey after 1 July 1997.

2.1.4.2 The public address system shall be clearly audible above the ambient noise in all spaces, prescribed by 6.22.2.1, and shall be provided with an override function controlled from one location on the navigation bridge and such other places on board as deemed necessary, so that all emergency messages will be broadcast if any loudspeaker in the spaces concerned has been switched off, its volume has been turned down or the public address system is used for other purposes.

2.1.4.3 On passenger ships constructed on or after 1 July 1997:

.1 the public address system shall have at least two loops of the low surface flame spread cable which shall be sufficiently separated throughout their length and have two separate and independent amplifiers; and

.2 the public address system and its performance standards shall be approved by the Register;

.3 all rooms and spaces of each main fire zone shall comply with the requirements 2.1.4.3.1.

2.1.4.4 The public address system shall be connected to the emergency source of electrical power required by Part XI "Electrical Equipment" of the Rules for the Classification and Construction of Sea-Going Ships.

2.1.4.5 Ships constructed before 1 July 1997 which are already fitted with the public address system approved by the Register which complies substantially with those required by 2.1.4.2, 2.1.4.4 and 6.22.2.1 are not required to change their system.

2.2 PERSONAL LIFE-SAVING APPLIANCES

2.2.1 Lifebuoys.

2.2.1.1 Lifebuoys complying with the requirements of 6.2.1:

.1 so distributed as to be readily available on both sides of the ship and as far as practicable on all open decks extending to the ship's side; at least one shall be placed in the vicinity of the stern;

.2 so stowed as to be capable of being rapidly cast loose, and not permanently secured in any way.

2.2.1.2 At least one lifebuoy on each side of the ship shall be fitted with a buoyant lifeline complying with the requirements of 6.2.4 equal in length to not less than twice the height at which it is stowed above the waterline in the lightest seagoing condition, or 30 m, whichever is the greater.

2.2.1.3 Not less than one half of the total number of lifebuoys shall be provided with self-igniting lights complying with the requirements of 6.2.2; not less than two of these shall also be provided with self-activating smoke signals complying with the requirements of 6.2.3 and be capable of quick release from the navigation bridge; lifebuoys with lights and those with lights and smoke signals shall be equally distributed on both sides of the ship and shall not be the lifebuoys provided with lifelines in compliance with the requirements of 2.2.1.2.

2.2.1.4 Each lifebuoy shall be marked in block capitals of the Roman alphabet with the name and port of registry of the ship.

2.2.1.5 When considering the minimum number and distribution of lifebuoys as required by 3.2.1, 4.2.1 or 5.1.3.2 of these Rules, the lifebuoys fitted with both self-igniting lights and lifelines and provided in compliance with the requirements of 8.8.2, Part III "Equipment, Arrangements and Outfit" of the Rules for the Classification and Construction of Sea-Going Ships and IMO MSC.1/Circ.1331 shall not be taken into account.

2.2.2 Lifejackets.

2.2.2.1 For every person on board the ship a lifejacket complying with the requirements of 6.3.1 and 6.3.2 shall be provided and, in addition:

.1 for passenger ships on voyages less than 24 h, a number of infant jackets equal to at least 2,5 % of the number of passengers on board shall be provided;

.2 for passenger ships on voyages 24 h or greater, infant lifejackets shall be provided for each infant on board;

.3 a number of lifejackets suitable for children equal to at least 10 % of the number of passengers on board or more as may be required to provide one lifejacket for each child;

.4 a sufficient number of lifejackets shall be provided for persons on watch as well as for use at remotely located survival craft stations. The lifejackets carried for persons on watch shall be stowed on the bridge, in the engine control room and at any other manned watch station;

.5 if the adult lifejackets provided are not designed to fit persons weighing up to 140 kg and with a chest girth of up to 1750 mm, a sufficient number of suitable accessories shall be available on board to allow them to be secured to such persons;

.6 the requirements of 2.2.2.1.1 and 2.2.2.1.2 are applicable to all passenger ships.

2.2.2.2 Lifejackets shall be so placed as to be readily accessible and their position shall be plainly indicated. Whether, due to the particular arrangement of the ship the lifejackets provided in compliance with the requirements of 2.2.2.1 may become inaccessible, alternative provisions shall be made to the satisfaction of the Register which may include an increase in the number of lifejackets to be carried on board.

2.2.2.3 If the lifejackets are not distributed between all the persons on the ship the stowage in one place of more than 20 pieces is not permitted.

2.2.2.4 The lifejackets used in totally enclosed lifeboats, except free-fall lifeboats, shall not impede entry into the lifeboat or seating, including operation of the seat belts in the lifeboat.

2.2.2.5 Lifejackets selected for free-fall lifeboats, and the manner in which they are carried or worn, shall not interfere with entry into the lifeboat, occupant safety or operation of the lifeboat.

2.2.3 Immersion suits and anti-exposure suits.

2.2.3.1 An immersion suit, complying with the requirements of paragraph 6.4 or an anti-exposure suit complying with paragraph 6.5, of an appropriate size, shall be provided for every person assigned to crew the rescue boat or assigned to the marine evacuation system party. If the ship is constantly engaged in warm climates where thermal protection is unnecessary, this protective clothing need not be carried (region between 30°N and 30°S).

2.2.3.2 Immersion suits shall be stowed on the ship in accordance with the manufacturer's instructions. As far as practicable a special room shall be provided for drying and airing of wetted immersion suits as well as for minor repairing them in accordance with the manufacturer's instructions.

2.3 ARRANGEMENT OF SURVIVAL CRAFT

2.3.1 Lifeboats and liferafts for which approved launching appliances are required shall be stowed as close to accommodation and service spaces as possible.

2.3.2 Muster stations shall be provided close to the embarkation stations. Each muster station shall have sufficient clear deck space to accommodate all persons assigned to muster at that station, but at least 0,35 m² per person.

2.3.3 Muster and embarkation stations shall be readily accessible from accommodation and work areas.

2.3.4 Muster and embarkation stations shall be adequately illuminated by lighting supplied from the emergency source of electrical power required by Sections 9 and 19, Part XI "Electrical Equipment" of the Rules for the Classification and Construction of Sea-Going Ships.

2.3.5 Alleyways, stairways and exits giving access to the muster and embarkation stations shall be lighted. Such lighting shall be capable of being supplied by the emergency source of electrical power required by Sections 9 and 19, Part XI "Electrical Equipment" of the Rules for the Classification and Construction of Sea-Going Ships. In addition to and as part of the markings required in 8.5.5, Part III "Equipment, Arrangements and Outfit" of the Rules for the Classification and Construction of Sea-Going Ships, routes to muster stations shall be indicated with the muster station symbol, intended for that purpose, in accordance with the recommendations of IMO resolution A. 1116(30).

2.3.6 Davit-launched and free-fall launched survival craft muster and embarkation stations shall be so arranged as to enable stretcher cases to be placed in survival craft.

2.3.7 An embarkation ladder complying with the requirements of 6.20.7 extending, in a single length, from the deck to the waterline in the lightest seagoing condition under all conditions of trim of up to 10° and a heel of up to 20° either way shall be provided at each embarkation station or at every two adjacent embarkation stations for survival craft launched down the side of the ship. However, the Register may permit such ladders to be replaced by approved devices to afford access to the survival craft when waterborne, provided that there shall be at least one embarkation ladder on each side of the ship.

Embarkation ladders may not be provided for cargo and passenger ships of less than 500 gross tonnage as well as for fishing ships of less than 45 m in length where the liferafts to be boarded from the deck located at height at least 2 m (less than 1,5 m for passenger ships) above the waterline in the lightest seagoing condition and on the ships where the lifeboats are launched from the stern by the method of free-fall launching.

2.3.8 Where necessary, means shall be provided for bringing the davit-launched survival craft against the ship's side and holding them alongside so that persons can be safely embarked.

2.3.9 Launching stations shall be in such positions as to ensure safe launching of the survival craft having particular regard to clearance from the propeller and steeply overhanging portions of the hull and so that, as far as possible, survival craft, except survival craft specially designed for free-fall launching, can be launched down the straight side of the ship. If positioned forward, they shall be located abaft the collision bulkhead in a sheltered position and, in the respect it is necessary to give special consideration to the strength of the launching appliance.

2.4 STOWAGE OF SURVIVAL CRAFT

2.4.1 Each survival craft shall be stowed:

.1 so that the survival craft nor its stowage arrangements will interfere with the operation of any other survival craft or rescue boat at any other launching station;

.2 for ships of 500 gross tonnage and upwards, as near the water surface as is safe and practicable and, in the case of a survival craft other than a liferaft intended for throw-overboard launching, in such a position that the survival craft in the embarkation position is not less than 2 m above the waterline with the ship in the fully loaded condition under unfavorable conditions of trim of up to 10° and heel up to 20° either way, or to the angle at which the ship's weather deck edge becomes submerged, whichever is less;

.3 in a state of continuous readiness so that two crew members can carry out preparations for embarkation and launching in less than 5 min;

.4 fully equipped as required by this Part;

.5 as far as practicable, in a secure and sheltered position and protected from damage by fire and explosion.

In particular, survival craft on oil tankers, other than the liferafts required by 4.1.1.4, shall not be stowed on or above a cargo tank, slop tank, or other tank containing explosive or hazardous cargoes.

2.4.2 Lifeboats for lowering down the ship's side shall be stowed as far forward of the propeller as practicable. On cargo ships of 80 to 120 m in length each lifeboat shall be so stowed that the after end of the lifeboat is not less than its length forward of the propeller. On cargo ships of 120 m in length and upwards and passenger ships of 80 m in length and upwards, each lifeboat shall be so stowed that the after end of the lifeboat is not less than 1,5 times the length of the lifeboat forward of the propeller. Where necessary, the ship shall be so arranged that lifeboats, in their stowed positions, are protected from damage by heavy seas.

2.4.3 Lifeboats shall be stowed attached to launching appliances.

2.4.4 Every liferaft shall be stowed with its painter permanently attached to the ship.

2.4.5 Each liferaft or group of liferafts shall be stowed with a float-free arrangement complying with the requirements of 6.8.6 so that each floats free and, if inflatable, inflates automatically when the ship sinks.

2.4.6 Liferafts shall be so stowed as to permit manual release of one raft or container at a time from their securing arrangements.

2.4.7 Requirements of 2.4.4 and 2.4.5 do not apply to liferafts required by regulation 4.1.1.4.

2.4.8 Davit-launched liferafts shall be stowed within reach of the lifting hooks, unless some means of transfer is provided which is not rendered inoperable within the limits of trim and heel prescribed in 2.4.1.2 or by ship motion or power failure.

2.4.9 Liferafts intended for throw-overboard launching shall be so stowed as to be readily transferable for launching on either side of the ship unless liferafts, of the aggregate capacity required by 4.1.1 to be capable of being launched on either side, are stowed on each side of the ship.

2.4.10 Posters or signs shall be provided on the survival craft or in the vicinity of them and their launching controls and shall:

.1 illustrate the purpose of controls and the procedures for operating the appliance and give relevant instructions or warnings;

.2 be easily seen under emergency lighting conditions;

.3 use symbols in accordance with the recommendations of IMO resolution A.760(18) as amended by IMO resolution A.1116 (30).

2.5 STOWAGE OF RESCUE BOATS

2.5.1 Rescue boats shall be stowed:

- .1** in a state of continuous readiness for launching is not more than 5 min, and if the inflated type, in a fully inflated condition at all times;
- .2** in a position suitable for launching and recovery;
- .3** so that neither the rescue boat nor its stowage arrangements will interfere with the operation of any survival craft at any other launching station;
- .4** in compliance with the requirements of 2.4, if they are also lifeboats.

2.6 STOWAGE OF MARINE EVACUATION SYSTEMS

2.6.1 The ship's side shall not have any openings between the embarkation station of the marine evacuation station and the sea level in the lightest sea-going condition. This means no openings, be they permanent openings, recessed promenades or temporary openings such as shell doors, windows or ports. Also the means shall be provided to protect the system against any ship extensions.

On passenger ships in the said area windows and side scuttles may be allowed if complying with the requirements of 2.2.4.4, Part VI "Fire Protection" of the Rules for the Classification and Construction of Sea-Going Ships.

On cargo ships in the area of stowage of the marine evacuation system only the windows and side scuttles of non-opening type may be installed.

2.6.2 Marine evacuation systems shall be in such positions as to ensure safe launching having particular regard to clearance from the propeller and steeply overhanging positions of the hull and so that, as far as practicable, the system can be launched down the straight side of the ship.

2.6.3 Each marine evacuation system shall be stowed so that neither the passage nor platform nor its stowage or operational arrangements will interfere with the operation of any other life-saving appliance at any other launching station.

2.6.4 Where appropriate, the ship shall be so arranged that the marine evacuation systems in their stowed positions are protected from damage by heavy seas.

2.7 SURVIVAL CRAFT LAUNCHING AND RECOVERY ARRANGEMENTS

2.7.1 Unless in the present Part of the Rules expressly provided otherwise, launching and embarkation appliances complying with the requirements of 6.20 shall be provided for all survival craft except liferafts which are:

.1 boarded from a position on deck less than 4,5 m above the waterline in the lightest sea-going condition and which have a mass of not more than 185 kg;

.2 boarded from a position on deck less than 4,5 m above the waterline in the lightest seagoing condition and which are stowed for launching directly from the stowed position under unfavourable conditions of trim of up to 10° and heel of up to 20° either way;

.3 carried in excess of the survival craft for 200 per cent of the total number of persons on board the ship and which have a mass of not more than 185 kg;

.4 carried in excess of the survival craft for 200 % of the total number of persons on board the ship, are stowed for launching directly from the stowed position under unfavourable conditions of trim of up to 10° and heel of up to 20° either way;

.5 provided for use in conjunction with a marine evacuation system, complying with the requirements of 6.20.8 and stowed for launching directly from the stowed position under unfavourable conditions of trim of up to 10° and heel of up to 20° either way.

2.7.2 Each lifeboat shall be provided with an appliance which is capable of launching and recovering the lifeboat.

In addition there shall be provision for hanging-off (attaching) the lifeboat to free the release gear for maintenance.

2.7.3 Launching and recovery appliances shall be such that the appliance operator on the ship is able to observe the survival craft at all times during launching and for lifeboats during recovery.

2.7.4 Only one type of release mechanism shall be used for similar survival craft carried on board the ship.

2.7.5 Preparation and handling of survival craft at any one launching station shall not interfere with the prompt preparation and handling of any other survival craft or rescue boat at any other launching station.

2.7.6 Falls, where used, shall be long enough for the survival craft to reach the water with the ship in its high-test seagoing condition, under unfavourable conditions of trim of up to 10° and heel of up to 20° either way.

2.7.7 During preparation and launching the survival craft, its launching appliance and the area of water into which it is to be launched shall be adequately illuminated by lighting supplied from the emergency source of electrical power required by Sections 9 and 19, Part XI "Electrical Equipment" of the Rules for the Classification and Construction of Sea-Going Ships.

2.7.8 Means shall be available to prevent any discharge of water onto survival craft during abandonment.

2.7.9 If there is a danger of the survival craft being damaged by the ship's stabilizer wings, means shall be available, powered by an emergency source of power, to bring the stabilizer wings inboard. In this case indicators of the position of the stabilizer wings operated by an emergency source of power shall be available on the navigation bridge.

2.7.10 If the lifeboats complying with the requirements of 6.14 are installed on the ship, a davit span shall be provided, fitted with not less than two lifelines of sufficient length to reach the water with the ship in the lightest seagoing condition, under unfavourable conditions of trim up to 10° and heel not less than 20° either way. The breaking strength of lifelines, as a whole, shall be at least 17 kN. Their rated diameter is not less than 20 mm.

2.7.11 Launching appliances shall be installed on the open parts of the deck so that the lifeboats and rescue boats are stowed 3 ° inside from a vertical line drawn through a point of intersection of the boat deck with the side of the ship. If the launching appliances are mounted on the 'tween deck, then no parts of the launching appliance, life and rescue boats shall extend beyond the shell plating of the ship.

2.7.12 Sets of davits shall be so stowed that the distance between two davits was equal to that between the sling hooks of the lifeboat. Where this requirement cannot be complied with, a 3° deviation to either side from the vertical line in the longitudinal direction may be allowed.

2.7.13 Lifeboat tackle falls shall be evenly wound on the winch drum. Where the falls run through fixed sheaves, a maximum deviation of the rope from the sheave central plane shall not exceed 8° for grooved drums and 4° for smooth drums.

2.8 RESCUE BOAT EMBARKATION, LAUNCHING AND RECOVERY ARRANGEMENTS

2.8.1 The rescue boat embarkation and launching arrangements shall be such that rescue boat can be boarded and launched in the shortest time.

2.8.2 If the rescue boat is one of the ship's lifeboats, the embarkation arrangements and launching station shall comply with the requirements of 2.3.

2.8.3 Launching arrangements shall comply with the requirements of 2.7. All rescue boats shall be capable of being launched, where necessary utilizing painters, with the ship making headway at speeds up to 5 knots in calm water.

2.8.4 Recovery time of the rescue boat shall be not more than 5 min in moderate sea conditions when loaded with its full complement of persons and equipment. If the rescue boat is also a lifeboat, this recovery time shall be possible when loaded with its lifeboat equipment and the approved rescue boat complement of at least six persons.

2.8.5 Rescue boat embarkation and recovery arrangements shall allow for safe and efficient handling of a stretcher case. Foul weather recovery strops shall be provided for safety if heavy fall blocks constitute a danger.

2.9 LINE-THROWING APPLIANCES

2.9.1 All ships shall be equipped with line-throwing appliances having four projectiles and four lines each.

2.9.2 The ships not engaged on international voyages of 25 m in length and above shall be equipped with line-throwing appliances having not less than two projectiles and two lines each.

2.9.3 Ships of less than 25 m in length not engaged in international voyages as well as the roadstead and harbour ships may be exempted from carriage of line-throwing appliances.

3 REQUIREMENTS FOR PASSENGER SHIPS

3.1 SURVIVAL CRAFT AND RESCUE BOATS

3.1.1 Survival craft.

3.1.1.1 Passenger ships engaged in voyages which are, based on cruising range, not short international voyages shall carry:

.1 lifeboats complying with the requirements of 6.14 or 6.15 on each side of such aggregate capacity as will accommodate not less than 50 % of the total number of persons on board. On agreement with the Register it may be permitted the substitution of lifeboats by liferafts of equivalent total capacity provided that there shall never be less than sufficient lifeboats on each side of the ship to accommodate at least 37,5 % of the total number of persons on board. The liferafts shall comply with the requirements of 6.9 or 6.10 and shall be served by launching appliances equally distributed on each side of the ship; and

.2 in addition, liferafts complying with the requirements of 6.9 or 6.10 of such aggregate capacity as will accommodate at least 25 % of the total number of persons on board. These liferafts shall be served by at least one launching appliance on each side which may be those provided in compliance with the requirements of 3.1.1.1.1 or equivalent approved appliances capable of being used on both sides of the ship. However, stowage of these liferafts need not comply with the requirements of 2.4.8.

3.1.1.2 Passenger ships engaged in short international voyages shall carry:

.1 lifeboats complying with the requirements of 6.14 or 6.15 equally distributed, as far as practicable, on each side of the ship and of such aggregate capacity as will accommodate at least 30 % of the total number of persons on board and liferafts complying with requirements of 6.9 or 6.10 of such aggregate capacity that, together with the lifeboat capacity, the survival craft will accommodate the total number of persons on board. The liferafts shall be served by launching appliances equally distributed on each side of the ship; and

.2 in addition, liferafts complying with the requirements of 6.9 or 6.10 of such aggregate capacity as will accommodate at least 25 % of the total number of persons on board. These liferafts shall be served by at least one launching appliance on each side which may be those provided in compliance with the requirements of 3.1.1.2.1 or equivalent approved appliances capable of being used on both sides of the ship. However, stowage of these liferafts need not comply with the requirements of 2.4.8.

3.1.1.3 All survival craft required to provide for abandonment by the total number of persons on board shall be capable of being launched with their full complement of persons and equipment after all persons have been assembled, with lifejackets donned within a period of time not exceeding 30 min from the time the abandon ship signal is given.

3.1.1.4 In lieu of meeting the requirements of 3.1.1.1, 3.1.1.2 passenger ships of less than 500 gross tonnage where the total number of persons on board is less than 200, may comply with the following:

.1 they shall carry on each side of the ship liferafts complying with the requirements of 6.9 or 6.10 of such aggregate capacity as will accommodate the total number of persons on board;

.2 unless the liferafts required by 3.1.1.4.1 can be readily transferred for launching on either side of the ship, additional liferafts shall be provided so that the total capacity available on each side will accommodate 150 % of the total number of persons on board;

.3 if the rescue boat required by 3.1.2.2 is also a lifeboat complying with the requirements of 6.14 or 6.15 its capacity may be included in the aggregate capacity required by 3.1.1.4.1, provided that the total capacity of survival craft available on each side of the ship is at least 150 % of the total number of persons on board;

.4 in the event of any one survival craft being lost or rendered unserviceable, there shall be sufficient survival craft available for use on each side, including any which are stowed in a position providing for easy side-to-side transfer at a single open deck level, to accommodate the total number of persons on board.

3.1.1.5 A marine evacuation system or systems complying with the requirements of 6.20.8 may be substituted for the equivalent capacity of liferafts and launching appliances required by paragraphs 3.1.1.1 and 3.1.1.2.

3.1.1.6 Passenger ships of coastal navigation under 30 m in length (of 200 gross tonnage and below) engaged on voyages at a distance not more than 12 miles from the land shall carry liferafts of such aggregate capacity as will accommodate 100 % of the total number of persons on board.

3.1.2 Rescue boats.

3.1.2.1 Passenger ships of 500 gross tonnage and over shall carry at least one rescue boat complying with the requirements of 6.19 on each side of the ship.

3.1.2.2 Passenger ships of less than 500 gross tonnage shall carry at least one rescue boat complying with the requirements of 6.19.

3.1.2.3 A lifeboat may be accepted provided that it and its launching and recovery arrangements also comply with the requirements for a rescue boat.

3.1.2.4 Passenger ships under 30 m in length may be exempted from the requirement to carry a rescue boat provided their dimensions and manoeuvrability, vicinity of search and rescue services and hydrometeorological conditions in the area of navigation do not dictate necessary fulfilment of this requirement.

3.1.3 Marshalling of liferafts.

3.1.3.1 The number of lifeboats and rescue boats that are carried on passenger ships shall be sufficient to ensure that in providing for abandonment by the total number of persons on board not more than six liferafts need be marshalled by each lifeboat or rescue boat.

3.1.3.2 The number of lifeboats and rescue boats that are carried on passenger ships engaged in short international voyages shall be sufficient to ensure that in providing for abandonment by the total number of persons on board not more than nine liferafts need be marshalled by each lifeboat or rescue boat.

3.2 PERSONAL LIFE-SAVING APPLIANCES

3.2.1 Lifebuoys.

3.2.1.1 A passenger ship shall carry not less than the prescribed number of lifebuoys complying with the requirements of 2.2 and 6.2.

Length of ship, m	Minimum number of lifebuoys
Under 60	8
60 and under 120	12
120 and under 180	18
180 and under 240	24
240 and over	30

3.2.1.2 notwithstanding the requirements of 2.2.1.3, passenger ships under 60 m in length shall carry not less than six lifebuoys provided with self-igniting lights.

3.2.2 Lifejackets.

3.2.2.1 In addition to the lifejackets required by 2.2.2 every passenger ship shall carry lifejackets for not less than 5 % of the total number of persons on board. These lifejackets shall be stowed in conspicuous place on deck at muster stations.

3.2.2.2 Where lifejackets for passengers are stowed in staterooms which are located remotely from direct routes between public spaces and muster stations, the additional lifejackets for these passengers required by 2.2.2.2, shall be stowed either in the public spaces, the muster stations, or on direct routes between them. The lifejackets shall be stowed so that their distribution and donning does not impede orderly movement to muster stations and survival craft embarkation stations.

3.2.3 Lifejacket lights.

On passenger ships each lifejacket shall be fitted with a light complying with the requirements of 6.3.3.

3.2.4 Immersion suits and thermal protective aids.

3.2.4.1 Passenger ships shall carry for each lifeboat on the ship at least three immersion suits complying with the requirements of 6.4 and, in addition, one thermal protective aid complying with the requirements of 6.6 for every person to be accommodated in the lifeboat and not provided with an immersion suit. These immersion suits and thermal protective aids need not be carried:

.1 for persons to be accommodated in totally or partially enclosed lifeboats;

.2 if the ship is constantly engaged in voyages in warm climates where thermal protective aids are unnecessary (region between 30°N and 30°S).

3.2.4.2 The provisions of 3.2.4.1 also apply to totally or partially enclosed lifeboats not complying with the requirements of 6.13 or 6.14, provided they are carried on ships constructed before 1 July 1986.

3.3 SURVIVAL CRAFT AND RESCUE BOAT EMBARKATION ARRANGEMENTS

3.3.1 On passenger ships, survival craft embarkation arrangements shall be designed for:

.1 all lifeboats to be boarded and launched either directly from the stowed position or from an embarkation deck but not both;

.2 davit-launched liferafts to be boarded and launched from a position immediately adjacent to the stowed position or from a position to which, in compliance with the requirements of 2.4.8, the liferaft is transferred prior to launching.

3.3.2 Rescue boat embarkation arrangements shall be such that the rescue boat can be boarded and launched directly from the stowed position with the number of persons assigned to crew the rescue boat on board. Notwithstanding the requirements of 3.3.1 if the rescue boat is also a lifeboat and the other lifeboats are boarded and launched from an embarkation deck, the arrangements shall be such that the rescue boat can also be boarded and launched from the embarkation deck.

3.3.3 Stowage of survival craft.

The stowage height of a survival craft on a passenger ship shall take into account the requirements of regulation 2.4.1.2, the escape provisions of Part III "Equipment, Arrangements and Outfit" of the Rules for the Classification and Construction of Sea-Going Ships, the size of the ship, and the weather conditions likely to be encountered in its intended area of operation. For a davit-launched survival craft, the height of the davit head with the survival craft in embarkation position, shall, as far as practicable, not exceed 15 m above the waterline when the ship is in its lightest sea-going condition.

3.3.4 Muster stations.

Every passenger ship shall comply with the requirements of 2.3 and, in addition, have passenger muster stations which shall:

.1 be in the vicinity of, and permit ready access for the passengers to, the embarkation stations unless in the same location;

.2 have ample room for marshalling and instruction of the passengers, but at least 0,35 m² per passenger.

3.4 ADDITIONAL REQUIREMENTS FOR RO-RO PASSENGER SHIPS

3.4.1 These requirements apply to all ro-ro passenger ships.

Ro-ro passenger ships constructed:

.1 on or after 1 July 1998 shall comply with the requirements of 3.4.2.3, 3.4.2.4, 3.4.3.1 to 3.4.3.3, 3.4.4 and 3.4.5;

.2 on or after 1 July 1986 but before 1 July 1998 shall comply with the requirements of 3.4.5 not later than the first periodical survey after 1 July 1998 and with the requirements of 3.4.2.3, 3.4.2.4, 3.4.3 and 3.4.4 not later than the first periodical survey after 1 July 2000;

.3 before 1 July 1986 shall comply with the requirements of 3.4.5 not later than the first periodical survey after 1 July 1998 and with the requirements of 3.4.2.1 to 3.4.2.4, 3.4.3 and 3.4.4 not later than the first periodical survey after 1 July 2000;

.4 before 1 July 2004 shall comply with the requirements of 3.4.2.5 not later than the first survey carried out on or after 1 July 2004.

3.4.2 Liferafts.

3.4.2.1 The ro-ro passenger ships' liferafts shall be served by marine evacuation systems (MES) complying with the requirements of 6.20.8 or launching appliances equally distributed on each side of the ship complying with the requirements of 6.20.5.

3.4.2.2 Every liferaft on ro-ro passenger ships shall be provided with float-free arrangements complying with the requirements of 6.8.6.

3.4.2.3 Every liferaft on ro-ro passenger ships shall be fitted with a boarding ramp complying with the requirements of 6.9.4.1 or 6.10.4.1.

3.4.2.4 Every liferaft on ro-ro passenger ships shall be either canopied reversible liferaft or self-righting liferaft complying with the requirements of 6.11 and 6.12. Alternatively, the ship may carry self-righting or reversible liferafts, in addition to its normal complement of liferafts of such aggregate capacity as will accommodate at least 50 % of the persons not provided with seats in lifeboats. This additional liferaft capacity is determined on the basis of the difference between the total number of persons on board and the number of persons provided with seats in lifeboats.

3.4.2.5 Liferafts on ro-ro passenger ships shall be fitted with search and rescue locating devices: one search and rescue locating device for four liferafts.

Search and rescue locating device shall be attached inside a liferaft so that its antenna is located 1 m above the water surface when a liferaft is inflated except that on the canopied reversible liferafts the search and rescue locating device shall be located so that it could be easily installed and be accessible for people onboard liferaft. Each search and rescue locating device shall be fit for its manual installation when a liferaft is inflated.

Containers of liferafts fitted with the search and rescue locating device shall be clearly marked.

3.4.3 Fast rescue boats.

3.4.3.1 At least one of the rescue boats on a ro-ro passenger ship shall be a fast rescue boat complying with the requirements of 6.19.4.

3.4.3.2 Each fast rescue boat shall be served by a launching appliance complying with the requirements of 6.20.6. When approving these launching appliances, it shall be taken into account that the fast rescue boat is intended to be launched and recovered even under severe adverse weather conditions.

3.4.3.3 At least two crews of each fast rescue boat shall be trained and drilled regularly, including all aspects of rescue, handling, manoeuvring, operating these craft in various conditions and righting them after capsize.

3.4.3.4 In the case where the arrangement or size of a ro-ro passenger ship, constructed before 1 July 1997, is such as to prevent the installation of the fast rescue boat required in 3.4.3.1, the fast rescue boat may be installed in place of an existing lifeboat which is accepted as a rescue boat or, in the case of the ship constructed prior to 1 July 1986, a boat for use in an emergency, provided that all of the following conditions are met:

- .1 the fast rescue boat installed is served by a launching appliance complying with 3.4.3.2;
- .2 the capacity of the lifeboat lost by the above substitution is compensated by the installation of liferafts capable of carrying at least an equal number of persons served by the lifeboat replaced;
- .3 the above liferafts are served by the existing launching appliances or MES.

3.4.4 Means of rescue.

3.4.4.1 Each ro-ro passenger ship shall be equipped with efficient means of rescue complying with the requirements of 6.20.9.

3.4.4.2 The means of transfer of survivors to the ship may be part of a MES, or part of a system intended for rescue purposes.

3.4.4.3 If the slide of a MES is intended to provide the means of transfer of survivors to the deck of the ship, the slide shall be equipped with handlines or a ladder to aid in climbing up the slide.

3.4.5 Lifejackets.

Notwithstanding the requirements in 2.2.2 and 3.2.2, a sufficient number of lifejackets shall be stowed in the vicinity of muster stations so that passengers do not have to return to their cabins to collect their lifejackets.

3.4.6 Helicopter landing and pick-up areas.

3.4.6.1 All ro-ro passenger ships shall be provided with a helicopter pick-up area.

3.4.6.2 Ro-ro passenger ships of 130 m in length and upwards, constructed on or after 1 July 1999, shall be provided with a helicopter landing area.

4 REQUIREMENTS FOR CARGO SHIPS

4.1 SURVIVAL CRAFT AND RESCUE BOATS

4.1.1 Lifeboats and liferafts.

4.1.1.1 Cargo ships shall carry:

.1 on each side of the ship one or more lifeboats complying with the requirements of 6.15 of such aggregate capacity as will accommodate the total number of persons on board;

.2 in addition, one or more inflatable or rigid liferafts, complying with the requirements of 6.9 or 6.10, of a mass of less than 185 kg or stowed in a position providing for easy side-to-side transfer at a single open deck level, and of such aggregate capacity as will accommodate the total number of persons on board. If the liferaft or liferafts are not of a mass of less than 185 kg or stowed in a position providing for easy side-to-side transfer at a single open deck level, the total capacity available on each side shall be sufficient to accommodate the total number of persons on board.

4.1.1.2 In lieu of meeting the requirements of 4.1.1.1, cargo ships may carry:

.1 one or more lifeboats, complying with the requirements of 6.16 capable of being free-fall launched over the stern of the ship of such aggregate capacity as will accommodate the total number of persons on board;

.2 in addition, on each side of the ship one or more liferafts complying with the requirements of 6.9 or 6.10 of such aggregate capacity as will accommodate the total number of persons on board. The liferafts on at least one side of the ship shall be served by launching appliances.

4.1.1.3 In lieu of meeting the requirements of 4.1.1.1 or 4.1.1.2, cargo ships of less than 85 m in length other than oil tankers, chemical tankers and gas carriers may comply with the following:

.1 they shall carry on each side of the ship one or more liferafts complying with the requirements of 6.9 or 6.10 of such aggregate capacity as will accommodate the total number of persons on board;

.2 unless the liferafts required by 4.1.1.3.1 are of a mass of less than 185 kg and stowed in a position providing for easy side-to-side transfer at a single open deck level, additional liferafts shall be provided so that the total capacity available on each side will accommodate 150 % of the total number of persons on board;

.3 if the rescue boat required by 4.1.2 is also a lifeboat complying with the requirements of 6.15, it may be included in the aggregate capacity required by 4.1.1.3.1, provided that the total capacity of lifeboats and liferafts available on each side is sufficient to accommodate at least 150 % of the total number of persons on board;

.4 in the event of any one survival craft being lost or rendered unserviceable, there shall be sufficient survival craft available for use on each side, including any which are of a mass of less than 185 kg and stowed in a position providing for easy side-to-side transfer at a single open deck level, to accommodate the total number of persons on board.

4.1.1.4 Cargo ships where the horizontal distance from the extreme end of the stem or stern of the ship to the nearest end of the closest survival craft is more than 100 m shall carry, in addition to the liferafts required by 4.1.1.1.2 and 4.1.1.2.2 a liferaft stowed as far forward or aft, or one as far forward and another as far aft, as is reasonable and practicable. Such liferaft or liferafts may be securely fastened so as to permit manual release and need not be of the type which can be launched from an approved launching device.

4.1.1.5 All survival craft required to provide for abandonment by the total number of persons on board, with the exception of the survival craft referred to in 2.7.1.1, shall be launched with their full complement of persons and equipment within a period of 10 min. from the time the abandon ship signal is given.

4.1.1.6 Chemical tankers and gas carriers emitting toxic vapours or gases shall carry, in lieu of lifeboats complying with the requirements of 6.15, lifeboats complying with the requirements of 6.17.

4.1.1.7 Oil tankers, chemical tankers and gas carriers carrying cargoes having a flashpoint not exceeding 60 °C (closed cup test) shall carry, in lieu of lifeboats complying with the requirements of 6.15, lifeboats complying with the requirements of 6.18.

4.1.1.8 Notwithstanding the requirements of 4.1.1.1, bulk carriers as defined in paragraph 1.1.1, Part I "Classification" of the Rules for the Classification and Construction of Sea-Going Ships shall comply with the requirements of 4.1.1.2.

4.1.1.9 Ships mentioned in 4.1.1.6 and 4.1.1.7 of less than 85 m in length and not engaged in international voyages may carry only one lifeboat of such capacity as will accommodate 100 % of the persons on board, if the launching appliance is fitted providing the lifeboat launching from either side of the ship.

4.1.1.10 Harbour, roadstead and coastal ships, except for oil tankers, chemical tankers and gas carriers, shall carry one or several liferafts of sufficient aggregate capacity to accommodate 100 % of the persons on board.

In summer in these ships the liferafts may be replaced by the lifebuoys for 100 % of the persons on board; in this case the lifebuoys required in 4.2.1.1 may be included. This replacement shall be substantiated with regard to the area of navigation.

4.1.2 Rescue boats.

Cargo ships shall carry at least one rescue boat complying with the requirements of 6.19. A lifeboat may be accepted as a rescue boat, provided that it and its launching and recovery arrangements also comply with the requirement for a rescue boat.

4.1.3 Cargo ships under 500 gross tonnage:

.1 may carry rescue boats under 3,8 m but not less than 3,3 m in length. At that a rescue boat under 3,8 m in length shall be capable of carrying at least four seated persons and a person lying. Except for the length, such rescue boats shall meet the requirements of 6.19;

.2 harbour, roadstead and coastal ships (**R3**) may be exempted from the requirement of 4.1.2, provided their dimensions and manoeuvrability do not dictate necessary fulfillment of this requirement, that shall be in each case substantiated by the procedure approved by the Register.

4.1.4 In addition to their lifeboats, all cargo ships constructed before 1 July 1986 shall carry:

.1 one or more liferafts capable of being launched on either side of the ship and of such aggregate capacity as will accommodate the total number of persons on board. The liferaft or liferafts shall be equipped with a lashing or an equivalent means of securing the liferaft which will automatically release it from a sinking ship;

.2 where the horizontal distance from the extreme end of the stem or stern of the ship to the nearest end of the closest survival craft is more than 100 m, in addition to the liferafts required by 4.1.4.1 a liferaft stowed as far forward or aft, or one as far forward and another as far aft, as is reasonable and practicable. Notwithstanding the requirements of 4.1.4.1, such liferaft or liferafts may be securely fastened so as to permit manual release.

4.2 PERSONAL LIFE-SAVING APPLIANCES

4.2.1 Lifebuoys.

4.2.1.1 Cargo ships shall carry not less than the prescribed number of lifebuoys complying with the requirements of 2.2.1 and 6.2.

Length of ship, m	Minimum number of lifebuoys
Under 30	4
30 and under 100	8
100 and under 150	10
150 and under 200	12
200 and over	14

4.2.1.2 Self-igniting lights for lifebuoys on tankers required by 2.2.1.3 shall be of an electric battery type.

4.2.2 Lifejacket lights (this paragraph applies to all cargo ships).

On cargo ships each lifejacket shall be fitted with a light complying with the requirements of 6.3.3.

4.2.3 Immersion suits.

4.2.3.1 The requirements of 4.2.3.2 to 4.2.3.5 are applicable to all cargo ships including cargo ships of unrestricted and restricted area of navigation not covered by SOLAS-74.

4.2.3.2 An immersion suit of the appropriate size complying with the requirements of 6.4 shall be provided for every person on board. However, for ships other than bulk carriers, as defined in 1.1.1, Part I "Classification" of the Rules for the Classification and Construction of Sea-Going Ships, these immersion suits need not be required if the ship is constantly engaged on voyages in warm climates where the immersion suits are unnecessary (region between 30°N and 30°S).

4.2.3.3 If a ship has any watch or work stations, which are located remotely from the place or places where immersion suits are normally stowed, additional immersion suits of the appropriated size shall be provided at these locations for the number of persons normally on watch or working at those locations at any time.

4.2.3.4 Immersion suits shall be so placed as to be readily accessible and their position shall be clearly indicated.

4.2.3.5 The immersion suits required by this paragraph may be used to fulfil the requirement of 2.2.3.1.

4.2.3.6 Cargo ships of restricted area of navigation **R3** (harbour, roadsted and coastal navigation) not engaged in international voyages need not be provided with immersion suits.

4.3 SURVIVAL CRAFT EMBARKATION AND LAUNCHING ARRANGEMENTS

4.3.1 Cargo ship survival craft embarkation arrangements shall be so designed that lifeboats can be boarded and launched directly from the stowed position and davit launched liferafts can be boarded and launched from a position immediately adjacent to the stowed position or from a position to which the liferaft is transferred prior to launching in compliance with the requirements of 2.4.8.

4.3.2 On cargo ships of 20 000 gross tonnage and upwards, lifeboats shall be capable of being launched with the ship making headway at speeds up to 5 knots in calm water, utilizing painters, where necessary.

4.3.3 On cargo ships, as defined in 4.1.1.3 where no launching appliances complying with 2.7.1 are provided for liferafts, the embarkation stations of liferafts shall be provided on each side with embarkation ladders meeting the requirements of 6.20.7.

4.4 REMOTELY LOCATED LIFERAFTS

4.4.1 The present requirements shall be applied to cargo ships contracted for construction on or after 1 January 2014.

4.4.1.1 Liferafts required by 4.1.1.4 shall be regarded as "remotely located liferafts" with regard to 2.2.2.1.4.

4.4.1.2 The area where these remotely located survival liferafts are stowed shall be provided with:

.1 a minimum number of 2 lifejackets and 2 immersion suits;

.2 adequate means of illumination complying with 2.7.7, either fixed or portable, which shall be capable of illuminating the liferaft stowage position as well as the area of water into which the liferaft shall be launched. Portable lights, when used, shall have brackets to permit their positioning on both sides of the ship;

.3 self-contained battery-powered lamps (i.e. luminaires) may be accepted as means of illumination for complying with 2.7.7. Such lamps shall be capable of being recharged from the ship's main and emergency source of electrical power, and shall be stowed under charge. When disconnected from the ship's power, the lamp shall give a minimum duration of 3 h of undiminished performance. The lamps shall comply with the requirements of 6.1.2. The lamps (i.e. luminaires) shall meet the requirements of IP 55 (refer to Appendix 9 to Section 10, Part IV "Technical Supervision during Manufacture of Products" of the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships). The batteries for the subject lamps shall comply with the requirements of 13.1.5 — 13.1.7, Part XI "Electrical Equipment" of the Rules for the Classification and Construction of Sea-Going Ships irrespective of whether the expiry date is marked by the manufacturer or not;

.4 an embarkation ladder or other means of embarkation enabling descent to the water in a controlled manner as per 2.3.7. A knotted rope shall not be acceptable for this purpose.

4.4.1.3 With regard to the distance between the embarkation station and stowage location of the remotely located liferafts (refer to 4.4.1.1), the embarkation station shall be so arranged that the requirements of 2.4.1.3 can be satisfied.

4.4.1.4 Exceptionally, the embarkation station and stowage position of the liferaft (remotely located liferafts) may be located on different decks provided the liferaft can be launched from the stowage deck using the attached painter to relocate it to the embarkation ladder positioned on the other deck (traversing a stairway between different decks with the liferaft carried by crew members is not acceptable).

4.4.1.5 Notwithstanding 4.4.1.2, where the exceptional cases mentioned in 4.4.1.4 exist, the following provisions shall be applied:

.1 the lifejackets and the immersion suits required by 4.4.1.2.1 may be stowed at the embarkation station;

.2 adequate means of illumination complying with 4.4.1.2.2 shall also illuminate the area of water where the liferaft is to be embarked;

.3 the embarkation ladder or other means of embarkation as required by 4.4.1.2.3 may be stowed at the embarkation station; and

.4 notwithstanding the requirements in 6.8.3.2, the painter shall be long enough to reach the relevant embarkation station.

5 REQUIREMENTS FOR OTHER TYPES OF SHIPS

5.1 FISHING VESSELS

5.1.1 These requirements apply to fishing vessels constructed on or after 1 October 2012. Fishing vessels constructed before 1 October 2012 may be subject to the requirements of this Chapter as far as practicable.

5.1.2 Lifeboats, liferafts and rescue boats.

5.1.2.1 Each fishing vessel shall carry at least two survival craft.

5.1.2.2 Fishing vessels of 75 m in length and over shall carry:

.1 on each side, the lifeboats complying with the requirements of 6.14 or 6.15, or liferafts complying with the requirements of 6.9 or 6.10 of sufficient aggregate capacity to accommodate the total number of persons on board;

.2 the rescue boat complying with the requirements of 6.19. A lifeboat may be used as a rescue boat, provided that it and its launching and recovery arrangements also comply with the requirements for a rescue boat and its launching appliances.

5.1.2.3 In lieu of meeting the requirements of 5.1.2.2.1 fishing vessels of 75 m in length and over, if comply with additional subdivision requirements and damage stability criteria to those stipulated by 1.1.1.3 and 3.4 of Part V "Subdivision" of the Rules for the Classification and Construction of Sea-Going Ships and criteria of increased structural fire protection, additional to those stipulated in 2.5 of Part VI "Fire protection" of the Rules for the Classification and Construction of Sea-Going Ships, may carry on each side lifeboats or liferafts of sufficient aggregate capacity to accommodate at least 50 % of the persons on board, in this case, additional liferafts for at least 50 % of the total number of persons on board and the justification that such a decrease of the number of survival craft and their capacity will not compromise the safety level required by 5.1.2.2.1.

5.1.2.4 Fishing vessels of less than 75 m shall carry:

.1 on each side, the lifeboats complying with the requirements of 6.14 or 6.15 or liferafts complying with the requirements of 6.9 or 6.10 of sufficient aggregate capacity to accommodate the total number of persons on board;

.2 the rescue boat complying with the requirements of 6.19. The ship may be exempted from carriage of a rescue boat, provided it carries any other survival craft or appliances for rescuing persons from water, which can be used in rescue operations, e.g. a means of rescue that meets the requirements of 6.20.9 or a cargo handling gear that meets the requirements of 5.8 of the Rules for the Cargo Handling Gear of Sea-Going Ships equipped with a special net, basket or cradle.

5.1.2.5 In lieu of meeting the requirements of 5.1.2.4.1 fishing vessels of less than 45 m in length may carry the lifeboats complying with the requirements of 6.14 or 6.15 or liferafts complying with the requirements of 6.9 or 6.10 of sufficient aggregate capacity to accommodate at least 200 % of the total number of persons on board. In this case, the aggregate capacity of the survival craft being launched from either side of the vessel shall be sufficient to accommodate at least the total number of persons on board.

5.1.2.6 Fishing vessels of less than 45 m in length may carry rescue boats less 3,8 m in length, but not less than 3,3 m in length. In this case, a rescue boat of less than 3,8 m in length shall be capable of carrying at least four seated persons and a person laying. Such rescue boats shall meet the requirements of 6.19, except for the requirement for the length.

5.1.2.7 In lieu of meeting the requirements of 5.1.2.2.1, 5.1.2.4.1 or 5.1.2.5, fishing vessels may carry one or more lifeboats capable of being free-fall launched over the stern of the vessel and complying with the requirements of 6.16 of sufficient aggregate capacity to accommodate the total number of persons on board, in addition, they may carry liferafts of sufficient aggregate capacity to accommodate the total number of persons on board.

5.1.2.8 The number of lifeboats and rescue boats that are carried on a fishing vessel shall be sufficient to ensure that in providing for abandonment by the total number of persons on board not more than nine liferafts need be marshalled by each lifeboat or rescue boat.

5.1.2.9 Arrangement of survival craft and rescue boats shall comply with the requirements of 2.4 and 2.5.

5.1.3 Personal life-saving appliances.

5.1.3.1 Fishing vessels shall be provided with life-jackets and immersion suits as required for cargo ships.

5.1.3.2 Fishing vessels shall carry not less than the prescribed number of lifebuoys complying with the requirements of 2.2.1 and 6.2:

Length of ship, m	Minimum number of lifebuoys
75 and over	8
45 and over, but less than 75	6
less than 45	4

5.1.4 Radio life-saving appliances.

5.1.4.1 Two-way VHF radiotelephone apparatus:

.1 every fishing vessel shall be provided with at least three sets of two-way VHF radiotelephone apparatus;

.2 in fishing vessels of less than 45 m in length the number of sets of two-way VHF radiotelephone apparatus may be reduced to two provided that only one survival craft is required to provide for abandonment of the fishing vessel from one side by the total number of persons on board.

5.1.4.2 Survival craft search and rescue locating device:

.1 at least one survival craft search and rescue locating device shall be carried on each side of every fishing vessel. Survival craft search and rescue locating device shall be stowed in such location that it can be rapidly placed in any survival craft. Alternatively one survival craft search and rescue locating device shall be stowed in each survival craft;

.2 every fishing vessel of less than 45 m in length shall be provided with at least one survival craft search and rescue locating device.

5.2 SPECIAL PURPOSE SHIPS

5.2.1 Ships carrying onboard not more than 60 persons shall be provided with survival craft as required for cargo ships other than oil tankers.

5.2.2 Ships carrying onboard more than 60 persons shall be provided with survival craft as required for passenger ships engaged in the international voyages which are not short international voyages.

5.2.3 Ships mentioned in 5.2.1 may be provided with survival craft in accordance with 5.2.2, provided that they comply with the requirements of the Rules for the subdivision of ships carrying more than 60 persons onboard.

5.2.4 Despite the requirements of 5.2.2 sail training ships carrying more than 60 persons may be provided with survival craft in accordance with 3.1.1.5 instead of 3.1.1.1, if they are also provided with at least two rescue boats in accordance with 3.1.2.1.

5.2.5 The requirements of 1.1.5, 3.1.1.2, 3.1.1.3, 4.1.1.6, 4.1.1.7 are not applied to special purpose ships.

5.2.6 In lieu of meeting the requirements of 5.2.1 — 5.2.4, special purpose ships constructed before 13 May 2008 may meet the following requirements:

.1 ships carrying onboard not more than 50 special personnel shall be provided with survival craft as required for cargo ships other than tankers;

.2 ships mentioned in 5.2.6.1 and complying with the requirements of the Rules for the subdivision of ships carrying more than 50 special personnel onboard may be provided with survival craft in accordance with 5.2.6.3;

.3 ships carrying onboard more than 50 special personnel shall be provided with survival craft as required for passenger ships engaged in the international voyages which are not short international voyages;

.4 notwithstanding the requirements of 5.2.6.3, sail training ships whether mechanically self-propelled or not and irrespective of their gross tonnage, carrying more than 50 special personnel (trainees) may be provided with survival craft in accordance with 3.1.1.4 instead of 3.1.1.1, if they are provided with at least one rescue boat in accordance with 3.1.2.2 and additionally carry one immersion suit complying with requirements of 6.4 for each person on board, unless davits are provided for launching the liferafts or the ship is constantly engaged in warm climates where thermal protection is unnecessary, this protective clothing need not be carried (region between 30°N and 30°S);

.5 where the term "passenger" is used, it shall be read to mean "special personnel".

5.3 SPECIALIZED SHIPS

5.3.1 Salvage ships, icebreakers, ships equipped with means of combating fire at the other objects, pilot ships, tugs, ships of dredging fleet and other ships shall be provided with life-saving appliances as required for cargo ships, and icebreakers are assigned descriptive notation "special purpose ship" added to the character of classification shall be provided with life-saving appliances as required for special purpose ships.

5.3.2 Salvage ships and ships equipped with means of combating fire at the other objects are recommended to be supplied with additional life-saving appliances (fast rescue boats, appliances for rapid recovery of survivors on board from the water, appliances for transfer of survivors on board from the survival craft, etc.) which quantity and composition are defined by shipowner. For this additional equipment, in case it consists of the life-saving appliances specified in Section 6, the Register documents shall be issued.

5.3.3 Ships with a descriptive notation **Oil recovery ship** in the class notation are recommended to be provided with life-saving appliances as required for oil tankers.

5.4 BERTH-CONNECTED SHIPS

5.4.1 Berth-connected ships under 30 m in length shall be provided with at least two lifebuoys on each deck, and berth-connected ships of more than 30 m in length — with at least four lifebuoys on each deck.

5.4.2 Each lifebuoy shall be fitted with a buoyant lifeline in length equal to not less than twice the distance measured between the lifebuoy and the waterline or 30 m, whichever is greater.

5.4.3 The list of life-saving appliance of the berth-connected ships which are intended to be operated not in the immediate vicinity of the shore shall comply with 4.1.1.3 and 4.1.2.

6 REQUIREMENTS FOR LIFE-SAVING APPLIANCES

6.1 GENERAL REQUIREMENTS FOR LIFE-SAVING APPLIANCES

6.1.1 Unless expressly provided otherwise or unless, in the opinion of the Register having regard to the particular voyages on which the ship is constantly engaged, other requirements are appropriate, all life-saving appliances prescribed in this section shall comply with the following requirements:

- .1** be constructed of materials approved by the Register;
- .2** not be damaged in stowage throughout the air temperature range -30°C to $+65^{\circ}\text{C}$ and, in the case of personal life-saving appliances, unless otherwise specified, remain operational throughout the air temperature range -15°C to $+40^{\circ}\text{C}$;
- .3** operate throughout the seawater temperature range -1°C to $+30^{\circ}\text{C}$, if they are likely to be immersed in seawater;
- .4** where applicable, be rot-proof, corrosion-resistant and not be unduly affected by seawater, oil or fungal attack;
- .5** be resistant to prolonged exposure of sunlight, (be resistant to deterioration);
- .6** be of international or vivid reddish orange, or a comparably highly visible color on all parts where this will assist detection at sea.
Applicable to the exterior of the rigid watertight enclosure of totally enclosed lifeboats and the exterior of the canopy of partially enclosed lifeboats, "highly visible colour" only includes colours of strong chromatic content, i.e. pure achromatic colours such as white and all shades of grey shall not be accepted as "comparable" colours;
- .7** be fitted with retro-reflective material where it will assist in detection and in accordance with Appendix 1;
- .8** if they shall be used in a seaway, be capable of satisfactory operation in that environment;
- .9** be clearly marked with approval information including the Register which approved it, and any operational restrictions; and
- .10** where applicable, be provided with electrical short circuit protection to prevent damage or injury.

6.1.2 The life of life-saving appliances which are subject to deterioration with age shall be determined. Such life-saving appliances shall be marked with a means for determining their life or the date by which they must be replaced. Permanent marking with a date of expiry is the preferred method of establishing the period of acceptability. Batteries not marked with a date of expiry may be used if they are replaced annually, or in the case of a secondary battery (accumulator), if the condition of the electrolyte can be readily checked. In case of pyrotechnic lifesaving appliances, the date of expiry shall be indelibly marked on the product.

6.1.3 The materials used for manufacturing the life-saving appliances and arrangements shall comply with the requirements of Part XIII "Materials" and the welded structures shall be made in accordance with the requirements of Part XIV "Welding" of the Rules for the Classification and Construction of Sea-Going Ships.

6.1.4 Chains and ropes (wire, natural fibre and synthetic fibre) shall comply with the requirements of Part XIII "Materials" of the Rules for the Classification and Construction of Sea-Going Ships, while blocks, shackles, swivels, screw stretchers and other removable components shall comply with the requirements of the Rules for the Cargo Handling Gear of Sea-Going Ships.

6.1.5 Winches for launching appliances shall meet the applicable requirements of 6.1, Part IX "Machinery" of the Rules for the Classification and Construction of Sea-Going Ships, while their electric drives shall meet the requirements of 5.9, Part XI "Electrical Equipment" of the Rules for the Classification and Construction of Sea-Going Ships.

6.2 LIFEBOUOYS

6.2.1 Lifebuoy shall comply with the following requirements:

- .1** its outer diameter shall be not more than 800 mm and its inner diameter shall be not less than 400 mm;
- .2** be constructed of inherently buoyant material; it shall not depend upon rushes, cork shavings or granulated cork, other loose granulated material or any air compartment which depends on inflation for buoyancy;
- .3** be capable of supporting not less than 14,5 kg of iron in fresh water for a period of 24 h;
- .4** have a mass of not less than 2,5 kg;
- .5** not sustain burning or continue melting after being totally enveloped in a fire for a period of 2 s;
- .6** be constructed to withstand a drop into the water from the height equal to the distance between the place of stowage and the waterline in the lightest sea-going condition or 30 m, whichever is the greater, without impairing either its operating capability or that of its attached components;
- .7** if the lifebuoy is intended to operate the quick-release arrangement provided for the self-activated smoke signals and self-igniting lights, have a mass of not less than 4 kg;
- .8** be fitted with a grabline not less than 9,5 mm in diameter and not less than 4 times the outside diameter of the buoy body in length. The grabline shall be secured at four equidistant points around the circumference of the buoy to form four equal loops.

6.2.2 Self-igniting lights shall comply with the following requirements:

- .1** be of such construction that cannot be extinguished by water;
- .2** be of white colour and capable of either burning continuously with a luminous intensity of not less than 2 cd in all directions of the upper hemisphere or flashing (discharge flashing) at a rate of not less than 50 flashes and not more than 70 flashes per min with at least the corresponding effective luminous intensity;
- .3** be provided with a source of power capable of meeting the requirement of 6.2.2.2 for a period of at least 2 h;
- .4** be capable of withstanding the drop test required by 6.2.1.6.

6.2.3 Self-activating smoke signal shall comply with the following requirements:

- .1** emit smoke of a highly visible colour at a uniform rate for a period of at least 15 min when floating in calm water;
- .2** not ignite explosively or emit any flame during the entire smoke emission time;
- .3** not be swamped in a seaway;
- .4** continue to emit smoke when submerged in water for a period of at least 10 s;
- .5** be capable of withstanding the drop test required by 6.2.1.6;
- .6** be provided with a quick-release arrangement that will automatically release and activate the signal and associated self-igniting light connected to a lifebuoy having a mass of not less than 4 kg.

6.2.4 Buoyant lifelines for lifebuoys shall comply with the following requirements:

- .1** be non-kinking;
- .2** have a diameter of not less than 8 mm;
- .3** have a breaking strength of not less than 5 kN.

6.3 LIFEJACKETS

6.3.1 General requirements for lifejackets.

6.3.1.1 A lifejacket shall not sustain burning or continue melting after being totally enveloped in a fire for a period of 2 s.

6.3.1.2 Lifejackets shall be provided in three sizes in accordance with table 6.3.1.2. If a lifejacket fully complies with the requirements of two adjacent size ranges (weight and height), it may be marked with both size ranges, but the specified ranges (weight and height) shall not be divided. Lifejackets shall be marked by either weight or height, or by both weight and height, according to Table 6.3.1.2.

Table 6.3.1.2

Lifejacket sizing criteria			
Lifejacket marking	Infant	Child	Adult
User's size:			
Weight (kg)	less than 15	15 or more but less than 43	43 or more
Height (cm)	less than 100	100 or more but less than 155	155 or more

6.3.1.3 If an adult lifejacket is not designed to fit persons weighing up to 140 kg and with a chest girth up to 1750 mm, suitable accessories shall be available to allow it to be secured to such persons.

6.3.1.4 The in-water performance of a lifejacket shall be evaluated by comparison to the performance of a suitable size standard reference lifejacket, i.e. reference test device (RTD) complying with the Revised Recommendation on Testing of Life-Saving Appliances (IMO resolution MSC.81(70)), as amended.

6.3.1.5 An adult lifejacket shall be so constructed that:

- .1** at least 75 % of persons who are completely unfamiliar with the lifejacket can correctly don it within a period of 1 min without assistance, guidance or prior demonstration;
- .2** after demonstration, all persons can correctly don it within a period of 1 min without assistance;
- .3** it is clearly capable of being worn only one way or inside-out and, if donned incorrectly, it is not injurious to the wearer;
- .4** the method of securing the lifejacket to the wearer has quick and positive means of closure that do not require tying of knots;
- .5** it is comfortable to wear; and
- .6** it allows the wearer to jump into the water from a height of at least 4,5 m while holding on to the lifejacket, and from a height of at least 1 m with arms held overhead, without injury and without dislodging or damaging the lifejacket or its attachments.

6.3.1.6 When tested according to the Revised Recommendation on Testing of Life-Saving Appliances (IMO resolution MSC.81(70)), as amended, on at least 12 persons, adult lifejackets shall have sufficient buoyancy and stability in calm fresh water to:

- .1** lift the mouth of exhausted or unconscious persons by an average height of not less than the average provided by the adult RTD minus 10 mm;
- .2** turn the body of unconscious, face-down persons in the water to a position where the mouth is clear of the water in an average time not exceeding that of the RTD plus 1 s, with the number of persons not turned by the lifejacket no greater than that of the RTD;
- .3** incline the body backwards from the vertical position for an average torso angle of not less than that of the RTD minus 10°;
- .4** lift the head above horizontal for an average faceplane angle of not less than that of the RTD minus 10°; and
- .5** return at least as many wearers to a stable face-up position after being destabilized when floating in the flexed foetal position as with the RTD when tested on the wearers in the same manner.

6.3.1.7 An adult lifejacket shall allow the person wearing it to swim a short distance and to board a survival craft.

6.3.1.8 An infant or child lifejacket shall perform the same as an adult lifejacket except as follows:

- .1 donning assistance is permitted for small children and infants;
- .2 the appropriate child or infant RTD shall be used in place of the adult RTD;
- .3 assistance may be given to board a survival craft, but wearer mobility shall not be reduced to any greater extent than by the appropriate size RTD;
- .4 for infants the jump and drop tests shall be exempted;
- .5 for children, five of the nine subjects shall perform the jump and drop tests; and
- .6 for tests required in 6.3.1.8.5, manikins may be substituted for human test subjects.

6.3.1.9 With the exception of freeboard and self-righting performance, the requirements for infant lifejackets may be relaxed, if necessary, in order to:

- .1 facilitate the rescue of the infant by a caretaker;
- .2 allow the infant to be fastened to a caretaker and contribute to keeping the infant close to the caretaker;
- .3 keep the infant dry, with free respiratory passages;
- .4 protect the infant against bumps and jolts during evacuation; and
- .5 allow a caretaker to monitor and control heat loss by the infant.

6.3.1.10 In addition to the markings required by 6.1.1.9, an infant or child lifejacket shall be marked with:

- .1 the size range in accordance with 6.3.1.2; and
- .2 an "infant" or "child" symbol as shown in the "infant's lifejacket" or "child's lifejacket" symbol as given in IMO resolution A.760 (18) as amended by IMO resolution A. 1116 (30).

6.3.1.11 A lifejacket shall have buoyancy which is not reduced by more than 5 % after 24 h submersion in fresh water.

6.3.1.12 The buoyancy of a lifejacket shall not depend on the use of loose granulated materials.

6.3.1.13 Each lifejacket shall be provided with means of securing a lifejacket light as specified in 6.3.3 such that it shall be capable of complying with the requirements of 6.3.1.5.6 and 6.3.3.1.3.

6.3.1.14 Each lifejacket shall be fitted with a whistle firmly secured by a lanyard.

6.3.1.15 Lifejacket lights and whistles shall be selected and secured to the lifejacket in such a way that their performance in combination is not degraded.

6.3.1.16 A lifejacket shall be provided with a releasable buoyant line or other means to secure it to a lifejacket worn by another person in the water.

6.3.1.17 A lifejacket shall be provided with a suitable means to allow a rescuer to lift the wearer from the water into a survival raft or rescue boat.

6.3.2 Inflatable lifejackets.

6.3.2.1 A lifejacket which depends on inflation for buoyancy shall have not less than two separate compartments, shall comply with the requirements of 6.3.1 and shall:

- .1 inflate automatically upon immersion, be provided with a device to permit inflation by a single manual motion and be capable of having each chamber inflated by mouth;
- .2 in the event of loss of buoyancy in any one compartment be capable of complying with the requirements of 6.3.1.5 — 6.3.1.7; and
- .3 comply with the requirements of 6.3.1.11 after inflation by means of the automatic mechanism.

6.3.3 Lifejacket lights.

6.3.3.1 Each lifejacket light shall:

- .1 have a luminous intensity of not less than 0,75 cd in all directions of the upper hemisphere;
- .2 have a source of energy capable of providing a luminous intensity of 0,75 cd for a period of at least 8 h;
- .3 be visible over as a great segment of the upper hemisphere as is practicable when attached to a lifejacket; and
- .4 be of white colour.

6.3.3.2 If the light referred to in 6.3.3.1 is a flashing light, it shall, in addition:

- .1** be provided with a manually operated switch; and
- .2** flash at a rate of not less than 50 and not more than 70 flashes per minute with an effective luminous intensity of at least 0,75 cd.

6.4 IMMERSION SUITS

6.4.1 General requirements for immersion suits.

6.4.1.1 The immersion suit shall be constructed with waterproof materials such that:

.1 it can be unpacked and donned without assistance within 2 min, taking into account donning of any associated clothing (according to 3.1.3 of the Revised Recommendation on Testing of Life-Saving Appliances, (IMO resolution MSC.81(70)), as amended), donning of a lifejacket if the immersion suit must be worn in conjunction with a lifejacket to meet the requirements of 6.4.1.2, and inflation of orally inflatable chambers if fitted;

.2 it will not sustain burning or continue melting after being totally enveloped in a fire for a period of 2 s;

.3 it will cover the whole body with the exception of the face, except that covering for the hands may be provided by separate gloves which shall be permanently attached to the suit;

.4 it is provided with arrangements to minimize or reduce free air in the legs of the suit;

.5 following a jump from a height of not less than 4,5 m into the water there is no undue ingress of water into the suit.

6.4.1.2 An immersion suit on its own, or worn in conjunction with a lifejacket if necessary, shall have sufficient buoyancy and stability in calm fresh water to:

.1 lift the mouth of an exhausted or unconscious person clear of the water by not less than 120 mm; and

.2 allow the wearer to turn from a face-down to a face-up position in not more than 5 s.

6.4.1.3 An immersion suit shall permit the person wearing it, and also wearing a lifejacket if the immersion suit shall be worn in conjunction with a lifejacket, to:

.1 climb up and down a vertical ladder of at least 5 m in length;

.2 perform normal duties during abandonment;

.3 jump from a height of not less than 4,5 m into the water without damaging or dislodging the immersion suit or its attachments, or being injured;

.4 swim a short distance through the water and board a survival craft.

6.4.1.4 An immersion suit which has buoyancy and is designed to be worn without a lifejacket shall be fitted with a light complying with the requirements of 6.3.3 and the whistle prescribed by 6.3.1.14.

6.4.1.5 An immersion suit which has buoyancy and is designed to be worn without a lifejacket shall be provided with a releasable buoyant line or other means to secure it to a suit worn by another person in the water.

6.4.1.6 An immersion suit which has buoyancy and is designed to be worn without a lifejacket shall be provided with a suitable means to allow a rescuer to lift the wearer from the water into a survival craft or rescue boat.

6.4.1.7 If an immersion suit shall be worn in conjunction with a lifejacket, the lifejacket shall be worn over the immersion suit. Persons wearing such an immersion suit shall be able to don a lifejacket without assistance. The immersion suit shall be marked to indicate that it must be worn in conjunction with a compatible lifejacket.

6.4.1.8 An immersion suit shall have buoyancy which is not reduced by more than 5 % after 24 h submersion in fresh water and does not depend on the use of loose granulated materials.

6.4.2 Thermal performance requirements for immersion suits.

6.4.2.1 An immersion suit made of material which has no inherent insulation shall be:

.1 marked with instructions that it shall be worn in conjunction with warm clothing;

.2 so constructed that, when worn in conjunction with warm clothing, and with a lifejacket if the immersion suit shall be worn with a lifejacket, the immersion suit continues to provide sufficient thermal protection, following one jump by the wearer into the water from a height of 4,5 m, to ensure that when it is worn for a period of 1 h in calm circulating water at a temperature of 5 °C, the wearer's body core temperature does not fall more than 2 °C.

6.4.2.2 An immersion suit made of material with inherent insulation, when worn either on its own or with a lifejacket, if the immersion suit is to be worn with a lifejacket shall provide the wearer with sufficient thermal insulation, following one jump by the wearer into the water from a height of 4,5 m, to ensure that when it is worn for a period of 6 h in calm circulating water at a temperature of range 0 to 2 °C, the wearer's body core temperature does not fall more than 2 °C.

6.4.2.3 The immersion suit shall permit the person wearing it with hands covered to pick up a pencil and write after being immersed in water at 5 °C for a period of 1 h.

6.5 ANTI-EXPOSURE SUITS

6.5.1 General requirements for anti-exposure suits.

6.5.1.1 The anti-exposure suit shall be constructed with waterproof materials such that it:

- .1 provides inherent buoyancy of at least 70 N;
- .2 is made of material which reduces the risk of heat stress during rescue and evacuation operations;
- .3 covers the whole body except the feet; covering for the hands and head may be provided by separate gloves and a hood, both of which shall be permanently attached to the suit;
- .4 can be unpacked and donned without assistance within 2 min;
- .5 does not sustain burning or continue melting after being totally enveloped in a fire for a period of 2 s;
- .6 is equipped with a pocket for a portable VHF telephone;
- .7 has a lateral field of vision of at least 120°.

6.5.1.2 An anti-exposure suit shall permit the person wearing it, to:

- .1 climb up and down a vertical ladder of at least 5 m in length;
- .2 jump from a height of not less than 4,5 m into the water with feet first, without damaging or dislodging the suit or its attachments, or being injured;
- .3 swim through the water at least 25 m and board a survival craft;
- .4 don a lifejacket without assistance;
- .5 perform all duties associated with abandonment, assist others and operate a rescue boat.

6.5.1.3 An anti-exposure suit shall be fitted with a light complying with the requirements of 6.3.3 such that it shall be capable of complying with 6.3.3.1.3 and 6.5.1.2.2, and the whistle prescribed by 6.3.1.14.

6.5.2 Thermal performance requirements for anti-exposure suits.

6.5.2.1 An anti-exposure suit shall:

- .1 if made of material which has no inherent insulation, be marked with instructions that it shall be worn in conjunction with warm clothing; and
- .2 be so constructed that, when worn as marked and following one jump into water which totally submerges the wearer, the suit continues to provide sufficient thermal protection to ensure that when it is worn in calm circulating water at a temperature of 5 °C, the wearer's body core temperature does not fall at the rate of more than 1,5 °C per h, after the first 0,5 h.

6.5.3 Stability requirements.

A person in fresh water wearing an anti-exposure suit complying with the requirements of this section shall be able to turn from a face-down to a face-up position in not more than 5 s and shall be stable face-up. The suit shall have no tendency to turn the wearer face-down in moderate sea condition.

6.6 THERMAL PROTECTIVE AIDS

6.6.1 A thermal protective aid shall be made of waterproof material having a thermal conductance of not more than $7800 \text{ W}/(\text{m}^2 \cdot \text{K})$ and shall be so constructed that, when used to enclose a person, it shall reduce both the convective and evaporative heat loss from the wearer's body.

6.6.2 The thermal protective aid shall:

.1 cover the whole body of persons of all sizes wearing a lifejacket with the exception of the face. Hands shall also be covered unless permanently attached gloves are provided;

.2 be capable of being unpacked and easily donned without assistance in a survival craft;

.3 permit the wearer to remove it in the water in not more than 2 min, if it impairs ability to swim.

6.6.3 The thermal protective aid shall function properly throughout an air temperature range -30°C to $+20^\circ \text{C}$.

6.7 PYROTECHNIC SIGNAL MEANS

6.7.1 Rocket parachute flares.

6.7.1.1 The rocket parachute flare shall:

- .1 be contained in a water-resistant casing;
- .2 have brief instructions or diagrams clearly illustrating the use of the rocket parachute flare printed on its casing;
- .3 be so designed as not to cause discomfort to the person holding the casing when used in accordance with the manufacturer's operating instructions;
- .4 have integral means of ignition.

6.7.1.2 The rocket shall, when fired vertically, reach an altitude of not less than 300 m. At or near the top of its trajectory, the rocket shall eject a parachute flare, which shall:

- .1 burn with a bright red colour;
- .2 burn uniformly with an average luminous intensity of not less than 30 000 cd;
- .3 have a burning period of not less than 40 s;
- .4 have a rate of descent of not more than 5 m/s;
- .5 not damage its parachute or attachments while burning.

6.7.2 Hand flares.

6.7.2.1 The hand flare shall:

- .1 have brief instructions or diagrams printed on its casing clearly illustrating the use of the hand flare;
- .2 be contained in a water-resistant casing;
- .3 have integral means of ignition;
- .4 be so designed as not to cause discomfort to the person holding the casing and not endanger the survival craft by burning or glowing residues when used it in accordance with the manufacturer's operating instructions.

6.7.2.2 The hand flare shall:

- .1 burn with a bright red colour;
- .2 burn uniformly with an average luminous intensity of not less than 15 000 cd;
- .3 have a burning period of not less than 1 min;
- .4 continue to burn after having been immersed for 10 s under 100 mm of water.

6.7.3 Buoyant smoke signals.

6.7.3.1 The buoyant smoke signal shall:

- .1 be contained in a water-resistant casing;
- .2 not ignite explosively when used it in accordance with the manufacturer's operating instructions;
- .3 have brief instructions or diagrams printed on its casing clearly illustrating the use of the buoyant smoke signal.

6.7.3.2 The buoyant smoke signal shall:

- .1 emit highly visible smoke at a uniform rate for a period of not less than 3 min when floating in calm water;
- .2 not emit any flame during the entire smoke emission time;
- .3 not be swamped in a seaway;
- .4 continue to emit smoke when submerged in water for 10 s under 100 mm of water.

6.8 LIFERAFTS

6.8.1 General.

6.8.1.1 Construction of a liferaft shall provide its using in all sea conditions for not less than 30 days afloat.

6.8.1.2 The liferaft shall be so constructed that when it is dropped into the water from a height of 18 m, the liferaft and its equipments will operate satisfactorily.

If the liferaft is stowed at a height of more than 18 m above the waterline in the lightest sea-going condition, it shall be of a type which has been satisfactorily drop-tested from at least that height.

6.8.1.3 The floating liferaft shall be capable of withstanding repeated jumps onto it from a height of at least 4,5 m above its floor both with and without the canopy erected.

6.8.1.4 The liferaft and its fitting shall be so constructed as to enable it to be towed at a speed of 3 knots in calm water with its full complement of persons and equipment and with one of its sea anchors streamed.

6.8.1.5 The liferaft shall have a canopy to protect the occupant from exposure which shall automatically set in place when the liferaft is being put into operating condition. The canopy shall comply with the following:

.1 provide protection of the under-canopy space against heat and cold by means of either two layers of material separated by an air gap or other equally efficient means. Measures shall be taken to prevent accumulation of water in the air gap;

.2 its interior surface shall be of a colour that does not irritate the occupants;

.3 each entrance shall be clearly indicated and be provided with efficient adjustable closing arrangements which can be easily and quickly opened by persons clothed in immersion suits from inside and outside, and closed from inside, the liferaft so as to permit ventilation but exclude seawater, wind and cold.

Liferafts accommodating more than eight persons shall have at least two diametrically opposite entrances;

.4 admit sufficient air for the occupants at all times, even with the entrances closed;

.5 have at least one viewing port;

.6 have the means for collecting rain water;

.7 it shall be provided with means to mount a survival craft radar transponder at a height of at least 1 m above the sea;

.8 have sufficient headroom for sitting occupants under all parts of the canopy.

6.8.2 Minimum carrying capacity and mass of liferafts.

6.8.2.1 No liferaft shall be approved which has a carrying capacity of less than six persons calculated in accordance with the requirements of 6.9.3 or 6.10.3 as appropriate.

6.8.2.2 Unless the liferaft shall be launched by an approved launching appliance complying with the requirements of 6.20.5 or is not intended for easy side-to-side transfer, the total mass of the liferaft, its container and its equipment shall not be more than 185 kg.

6.8.3 Liferaft fittings.

6.8.3.1 The liferaft shall be fitted with lifelines securely becketed around the inside and outside of the liferaft.

6.8.3.2 The liferaft shall be fitted with an efficient painter of length equal to not less than 10 m plus the distance from the stowed position to the waterline in the lightest seagoing condition or 15 m whichever is the greater. The breaking strength of the painter system, including its means of attachment to the liferaft, except the weak link required by 6.8.6, shall be not less than 15,0 kN for liferafts permitted to accommodate more than 25 persons, not less than 10,0 kN for liferafts permitted to accommodate 9 to 25 persons and not less than 7,5 kN for any other liferaft.

6.8.3.3 A manually controlled exterior light shall be fitted to the uppermost position of the liferaft canopy or structure. The light shall be white and be capable of operating continuously for at least 12 h with a luminous intensity of not less than 4,3 cd in all directions of the upper hemisphere. However, if the light is a flashing light it shall flash at a rate of not less than 50 flashes and not more than 70 flashes per min for the 12 h operating period with an equivalent effective luminous intensity. The lamp shall light automatically when the canopy is erected. Batteries shall be of a type that does not deteriorate due to dampness or humidity in the stowed liferaft.

6.8.3.4 A manually controlled interior light shall be fitted inside the liferaft capable of continuous operation for a period of at least 12 h. It shall light automatically when the canopy is erected and shall produce an arithmetic mean luminous intensity of not less than 0,5 cd when measured over the entire hemisphere to permit reading of survival and equipment instructions. Batteries shall be of a type that does not deteriorate due to dampness or humidity in the stowed liferaft.

6.8.4 Davit-launched liferafts.

6.8.4.1 Davit-launched liferaft shall comply with the following provisions:

.1 be capable of withstanding, when loaded with its full complement of persons and equipment, a lateral impact against the ship's side at an impact velocity of not less than 3,5 m/s and also a drop into the water from a height of not less than 3 m without damage that will affect its function;

.2 be provided with means for bringing it alongside the embarkation deck and holding the liferaft securely during embarkation of persons.

6.8.4.2 Every passenger ship davit-launched liferaft shall be so constructed that it can be rapidly boarded by its full complement of persons.

6.8.4.3 Every cargo ship davit-launched liferaft shall be so constructed that it can be boarded by its full complement of persons in not more than 3 min from the time the instruction to board is given.

6.8.5 Equipment.

6.8.5.1 The normal equipment of every liferaft shall consist of:

.1 one buoyant rescue quoit, attached to not less than 30 m of buoyant line;

.2 one knife of the non-folding type having a buoyant handle attached by a lanyard and stowed in a pocket on the exterior of the canopy near the point at which the painter is attached to the liferaft.

The liferafts which are permitted to accommodate 13 persons or more shall be provided with a second knife which may be of folding type;

.3 one buoyant bailer for a liferaft which is permitted to accommodate not more than 12 persons and two buoyant bailers for a liferaft which is permitted to accommodate 13 persons and more;

.4 two sponges;

.5 two sea-anchors each with a shock resistant hawser and tripping line if fitted, one being spare and the other permanently attached to the liferaft in such a way that when the liferaft inflates or is waterborne it will cause the liferaft to lie oriented to the wind in the most stable manner. The strength of each sea-anchor and its hawser and tripping line if fitted shall be adequate in all sea conditions. The sea-anchors shall have means to prevent twisting of the line and shall be of a type which is unlikely to turn inside out between its shroud lines. The sea-anchor permanently attached to davit-launched liferafts and liferafts fitted on passenger ships shall be arranged for manual deployment only. All other liferafts shall have the sea-anchor deployed automatically when the liferaft inflates;

.6 two buoyant oars (paddles);

.7 three tin-openers and a pair of scissors. Safety knives containing special tin-opener blades are satisfactory for this requirement;

.8 one first-aid outfit in a waterproof case capable of being closed tightly after use;

.9 one signal whistle or other equivalent sound signal providing a sound pressure level of about 100 dB at a distance of 1 m;

.10 four red rocket parachute flares complying with the requirements of 6.7.1;

.11 six hand flares complying with the requirements of 6.7.2;

.12 two buoyant smoke signals complying with the requirements of 6.7.3;

.13 one waterproof electric torch suitable for Morse signalling together with one spare set of batteries and one spare bulb in a waterproof container;

.14 one efficient radar reflector, unless search and rescue locating device is stowed in the liferaft;

.15 one daylight signalling mirror (heliograph) with instructions on its use for signalling to ships and aircraft;

.16 a table of the life-saving signals in a waterproof container or on a watertight material (one copy);

.17 one set of fishing tackle;

.18 a food ration consisting of not less than 10000 kJ (2400 kCal) for each person the liferaft is permitted to accommodate. These rations shall be palatable, edible throughout the marked life, and packed in a manner which can be readily divided and easily opened, taking into account immersion suit gloved hands.

The rations shall be packed in permanently sealed metal containers or vacuum packed in a flexible packaging material with a negligible vapour transmission rate ($< 0,1 \text{ g/m}^2$ per 24 h at 23 °C/85 % relative humidity when tested according to the standard, which application is agreed with the Register). Flexible packaging material shall be further protected by outer packing if needed to prevent physical damage to the food ration or other items as result of sharp edges. The packaging shall be clearly marked with date of packing and date of expiry, the production lot number, the content in the package and instructions for use. The content of the food ration and its portions shall be acceptable to the Register;

.19 1,5 l of fresh water for each person the liferaft is permitted to accommodate, of which either 0,5 l per person may be replaced by a de-sailing apparatus capable of producing an equal amount of fresh water in 2 days or 1 l per person may be replaced by a manually powered reverse osmosis desalinator, as described in 6.13.7.7, capable of producing an equal amount of fresh water in 2 days. The water shall satisfy suitable international requirements for chemical and microbiological content, and shall be packed in sealed watertight containers that are of corrosion resistant material or are treated to be corrosion resistant. Flexible packaging materials, if used, shall have a negligible vapour transmission rate ($< 0,1 \text{ g/m}^2$ per 24 h at 23 °C/85 % relative humidity when tested to a standard accepted to the Register), except that individually packaged portions within a larger container need not meet this vapour transmission requirement. Each water container shall have a method of spill proof reclosure, except for individually packaged portions of less than 125 ml. Each container shall be clearly marked with date of packing and date of expiry, the production lot number, the quantity of water in the container, and instructions for consumption. The containers shall be easy to open, taking into account immersion suit gloved hands. Water for emergency drinking complying with the international standard acceptable to the Register is acceptable in compliance with these requirements;

.20 one rustproof graduated vessel for drinking water;

.21 anti-seasickness medicine sufficient for at least 48 h and one seasickness bag for each person the liferaft is permitted to accommodate;

.22 instructions on how to survive in the liferaft;

.23 instructions for immediate action;

.24 personal thermal protective aids complying with the requirements of 6.6 sufficient for at least 10 % of the number of persons the liferaft is permitted to accommodate but not less than two.

6.8.5.2 The marking required in 6.9.6.3.5, 6.10.6.7 on liferafts equipped in accordance with 6.8.5.1 shall be "SOLAS A PACK" in block capitals of the Roman alphabet.

6.8.5.3 For the passenger ships engaged on short international voyages or on such voyages which by cruising range may be rendered as the short international voyages of such duration that not all the items specified in 6.8.5.1 are necessary, it may be allowed, when substantiated with regard to the area of navigation, that the liferafts carried on such ships be provided with the equipment specified in 6.8.5.1.1 to 6.8.5.1.6 inclusive, 6.8.5.1.8, 6.8.5.1.9, 6.8.5.1.13 to 6.8.5.1.16 inclusive, 6.8.5.1.21 to 6.8.5.1.24 inclusive as well as one half of the equipment specified in 6.8.5.1.10 to 6.8.5.1.12 inclusive. The marking required in 6.9.6.3.5 and 6.10.6.7 on such liferafts shall be "SOLAS B PACK" in block capitals of the Roman alphabet.

6.8.5.4 The liferafts for coastal ships not engaged on international voyages shall at least be fitted with the following equipment:

.1 the items of equipment specified in 6.8.5.1.1, 6.8.5.1.4, 6.8.5.1.6, 6.8.5.1.8, 6.8.5.1.9, 6.8.5.1.11, 6.8.5.1.13 and 6.8.5.1.22;

.2 one buoyant bailer and one sea anchor.

The marking required in 6.9.6.3.5 and 6.10.6.7 on such liferafts shall be "C PACK" in block capitals of the Roman alphabet.

6.8.5.5 In general the items of equipment of the liferaft shall be stowed in a container which shall be secured inside the liferaft, if the container is not an integral part of the liferaft or permanently attached to it, and be capable of floating in water for at least 30 min. without damage to its contents.

6.8.6 Float-free arrangements for liferafts.

6.8.6.1 The liferaft painter system shall provide a connection between the ship and the liferaft and shall be so arranged as to ensure that the liferaft when released and inflated (if the liferaft is inflatable) is not dragged under by the sinking ship.

6.8.6.2 If the float-free arrangements use a weak link, it shall:

.1 not be broken by the force required to pull the painter from the liferaft container;

.2 be of sufficient strength to permit the inflation of the liferaft;

.3 break under a strain of $2,2 \pm 0,4$ kN.

6.8.6.3 Hydrostatic release unit.

If the float-free arrangements use a hydrostatic release unit, it shall:

.1 be constructed of compatible materials so as to prevent malfunction of the unit. Galvanizing or other forms of metallic coating on parts of the hydrostatic release unit not permitted;

.2 automatically release the liferaft from a ship at a depth of not more than 4 m;

.3 have drains to prevent the accumulation of water in the hydrostatic chamber when the unit is in its normal position;

.4 be so constructed as to prevent release the liferaft from a ship when seas wash over the unit;

.5 be permanently marked on its exterior with its type and serial number;

.6 be permanently marked on the unit or identification plate securely attached to the unit, with the date of manufacture, type and serial number and whether the unit is suitable for use with a liferaft with a capacity of more than 25 persons;

.7 be such that each part connected to the painter system has a strength of not less than that required for the painter;

.8 if disposable, in lieu of the requirement in 6.8.6.3.6 be marked with a means of determining its date of expiry.

6.9 INFLATABLE LIFERAFTS

6.9.1 Inflatable liferafts shall comply with the requirements of 6.8 and, in addition, shall comply with the requirements of the present Chapter.

6.9.2 Construction of inflatable liferafts.

6.9.2.1 The main buoyancy chambers shall be divided into not less than two separate compartments, each inflated through a non-return inflation valve on each compartment. The buoyancy chambers shall be so arranged that in the event of any one of the compartments being damaged or failing to inflate, the intact compartments shall be able to support afloat the number of persons, each having a mass of 82,5 kg, which the liferaft is permitted to accommodate, seated in their normal positions with positive freeboard over the liferaft's entire periphery.

6.9.2.2 The floor of the liferaft shall be water-proof and shall be capable to provide sufficient insulation against cold either:

.1 by means of one or more compartments which can be inflated automatically or by the occupants and then can be deflated and reinflated by the occupants;

.2 by other equally efficient means not dependent on inflation.

6.9.2.3 The liferaft shall be capable of being inflated by one person. The liferaft shall be inflated with a nontoxic gas. The inflation system, including any relief valves installed in compliance with 6.9.2.4 shall be approved by the Register. Inflation shall be completed within a period of 1 min at an ambient temperature of between 18 °C and 20 °C and within a period of 3 min at an ambient temperature of – 30 °C. After inflation the liferaft shall maintain its form when loaded with its full complement of persons and equipment.

The pressure vessels used in an automatic gas inflation system shall be approved by the Register or other competent body.

6.9.2.4 Each inflatable compartment shall withstand a pressure equal to 3 times the working pressure and shall be prevented from reaching a pressure exceeding twice the working pressure either by means of relief valves or by a limited gas supply. Means shall be provided for fitting the topping-up pump or bellows required by 6.9.9.1 so that the working pressure can be maintained.

6.9.3 Carrying capacity of inflatable liferafts.

The number of persons which a liferaft shall be permitted to accommodate shall be equal to the lesser of:

.1 the greatest whole number obtained by dividing by 0,096 the volume in cubic metres of the inflated main buoyancy chambers (which for this purpose shall include neither the arches nor the thwarts if fitted);

.2 the greatest whole number obtained by dividing by 0,372 the inner horizontal cross-sectional area of the liferaft in square metres (which for this purpose may include the thwart or thwarts, if fitted, measured to the innermost edge of the buoyancy tubes);

.3 the number of persons having an average mass of 82,5 kg, all wearing either immersion suits and lifejackets or, in the case of davit-launched liferafts, lifejackets, that can be seated with sufficient comfort and headroom without interfering with the operation of any of the liferaft's equipment.

6.9.4 Access into inflatable liferafts.

6.9.4.1 At least one entrance shall be fitted with a boarding ramp, capable of supporting a person weighing 100 kg sitting or kneeling or not holding onto any other part of the liferaft, to enable persons to board the liferaft from the sea. The boarding ramp shall be so arranged as to prevent significant deflation of the liferaft if the raft is damaged. The rest remains as it stands. The boarding ramp shall be so arranged as to prevent significant deflation of the liferaft if the ramp is damaged. In the case of a davit-launched liferaft having more than one entrance, the boarding ramp shall be fitted at the entrance opposite the bowing lines and embarkation facilities.

6.9.4.2 Entrances not provided with boarding ramps shall have boarding ladders, the lowest step of which shall be situated not less than 0,4 m below the liferaft's light waterline.

6.9.4.3 There shall be means inside the liferaft to assist persons to pull themselves into the liferaft from the ladder.

6.9.5 Stability of inflatable liferafts.

6.9.5.1 Every inflatable liferaft shall be so constructed that, when fully inflated and floating with the canopy uppermost, it is stable in a seaway.

6.9.5.2 The stability of the liferaft when in the inverted position shall be such that it can be righted in a seaway and in calm water by one person.

6.9.5.3 The stability of the liferaft when loaded with its full complement of persons and equipment shall be such that it can be towed at speeds of up to 3 knots in calm water.

6.9.5.4 The liferaft shall be fitted with water pockets complying with the following requirements:

- .1 the water pockets shall be of a highly visible colour;
- .2 the design shall be such that the pockets fill to at least 60 % of their capacity within 25 s of deployment;
- .3 the pockets shall have an aggregate capacity of at least 220 l for liferafts up to 10 persons;
- .4 the pockets for liferafts certified to carry more than 10 persons shall have an aggregate capacity of not less than $20 N$ l, where N = number of persons carried;
- .5 the pockets shall be positioned symmetrically round the circumference of the liferaft. Means shall be provided to enable air to readily escape from underneath the liferaft.

6.9.6 Containers for inflatable liferafts.

6.9.6.1 The liferaft shall be packed in a container complied with the following requirements:

- .1 be so constructed as to withstand hard wear under any conditions of service encountered at sea;
- .2 when packed with the liferaft and its equipment, be of sufficient inherent buoyancy to pull the painter and to operate the gas inflation mechanism shall the ship sink;
- .3 be watertight as far as practicable, except for drain holes in the container bottom.

6.9.6.2 The liferaft shall be packed in its container in such a way as to ensure that the waterborne liferaft inflates in an upright position on breaking free from its container.

6.9.6.3 The container shall be marked with the following data:

- .1 manufacturer's name or trade mark;
- .2 serial number;
- .3 name of approving authority and the number of persons it is permitted to carry;
- .4 SOLAS (excluding the containers containing the liferafts equipped in accordance with 6.8.5.4);
- .5 type of emergency pack enclosed;
- .6 date when last serviced;
- .7 length of painter;
- .8 mass of the packed liferaft, if greater than 185 kg;
- .9 maximum permitted height of stowage above waterline (depending on drop-test height and length of painter);
- .10 launching instructions;
- .11 type of the weak link system if any inside the liferaft container or indication of its absence.

6.9.7 Marking on inflatable liferafts.

6.9.7.1 The liferaft shall be marked with the following:

- .1 manufacturer's name or trade mark;
- .2 serial number;
- .3 date of manufacture (month and year);
- .4 name of authority approved the liferaft;
- .5 name and place of servicing station where it was last serviced;
- .6 number of persons it is permitted to accommodate over each entrance in characters not less than 100 mm in height of a colour contrasting with that of the liferaft.

6.9.7.2 Provision shall be made for marking each liferaft with the name and port of registry of the ship to which shall to be fitted, in such a form that the ship identification can be changed at any time without opening the container.

6.9.8 Davit-launched inflatable liferafts.

6.9.8.1 In addition to complying with the above requirements, a liferaft intended for use with a launching appliance, when suspended from its lifting hook or bridle, shall withstand a load of:

.1 4 times the mass of its full complement of persons and equipment, at an ambient temperature and a stabilized liferaft temperature of 20 ± 3 °C with all relief valves inoperative;

.2 1,1 times the mass of its full complement of persons and equipment at an ambient temperature and a stabilized liferaft temperature of -30 °C with all relief valves operative.

6.9.8.2 Rigid containers of the liferafts to be launched by a launching appliance shall be so secured that the container or parts of it are prevented from falling into the sea during and after inflation and launching of the contained liferaft.

6.9.9 Additional equipment for inflatable liferafts.

6.9.9.1 In addition to the equipment required by 6.8.5, every inflatable liferaft shall be provided with:

.1 one repair outfit for repairing punctures in buoyancy compartments;

.2 one topping-up pump or bellows.

6.9.9.2 The knives, the tin openers and scissors required by paragraph 6.8.5 shall be of safe type.

6.10 RIGID LIFERAFTS

6.10.1 Rigid liferafts shall comply with the requirements of 6.8 and in addition shall comply with the requirements of the present Part.

6.10.2 Construction of rigid liferafts.

6.10.2.1 The buoyancy of the liferaft shall be provided by approved inherently buoyant material placed as near as possible to the periphery of the liferaft. The buoyant material shall be low flame spread or be protected by a relevant coating.

6.10.2.2 The floor of the liferaft shall prevent the ingress of water and shall effectively support the occupants out of the water and insulate them from cold.

6.10.3 Carrying capacity of rigid liferafts.

The number of persons which a liferaft shall be permitted to accommodate shall be equal to the lesser of:

.1 the greatest whole number obtained by dividing by 0,096 the volume, measured in cubic metres, of the buoyancy material multiplied by a factor of 1 minus the specific gravity of that material;

.2 the greatest whole number obtained by dividing by 0,372 the horizontal cross-sectional area of the floor of the liferaft measured in square metres;

.3 the number of persons having an average mass of 82,5 kg, all wearing immersion suits and lifejackets, that can be seated with sufficient comfort and headroom without interfering with the operation of any of the liferaft's equipment.

6.10.4 Access into rigid liferafts.

6.10.4.1 At least one entrance shall be fitted with a boarding ramp, capable of supporting a person weighing 100 kg sitting or kneeling and not holding onto other part of the liferaft, to enable persons to board the liferaft from the sea. In the case of a davit-launched liferaft having more than one entrance, the boarding ramp shall be fitted at the entrance opposite to the bowing and embarkation facilities.

6.10.4.2 Entrances not provided with a boarding ramp shall have a boarding ladder, the lowest step of which shall be situated not less than 0,4 m below the liferaft's light waterline.

6.10.4.3 There shall be means inside the liferaft to assist persons to pull themselves into the liferaft from the ladder.

6.10.5 Stability of rigid liferafts.

6.10.5.1 Unless the liferaft is capable of operating safely whichever way up it is floating, its strength and stability shall be such that it is either self-righting or can readily be righted to the operating condition in a seaway and in calm water by one person.

6.10.5.2 The stability of a liferaft when loaded with its full complement of persons and equipment shall be such that it can be towed at speeds of up to 3 knots in calm water.

6.10.6 Marking on rigid liferafts.

The liferaft shall be marked with:

- .1** name and port of registry of the ship to which it belongs;
- .2** manufacturer's name or trade mark;
- .3** serial number;
- .4** name of approving authority;
- .5** number of persons it is permitted to accommodate over each entrance in characters not less than 100 mm in height of a colour contrasting with that of the liferaft;
- .6** "SOLAS" (excepting the liferaft equipped in accordance with 6.8.5.4);
- .7** type of emergency pack enclosed;
- .8** length of painter;
- .9** maximum permitted height of stowage above waterline depending on drop-test height;
- .10** launching instructions.

6.10.7 Davit-launched rigid liferafts.

In addition to the above requirements, a rigid liferaft intended for use with an approved launching appliance, when suspended from its lifting hook or bridle, shall withstand a load of 4 times the mass of its full complement of persons and equipment.

6.11 CANOPIED REVERSIBLE LIFERAFTS

6.11.1 All canopied reversible liferafts shall comply with the requirements of 6.8.1, inflatable canopied reversible liferafts — requirements of 6.9, except 6.9.5.2 and 6.9.6.2, rigid canopied reversible liferafts shall comply with the requirements of 6.10, except 6.10.5.1 and the requirements of the present Chapter.

6.11.2 The canopied reversible liferafts shall be fitted with self-draining arrangements. Liferafts shall be capable of being safely used at all times by untrained persons.

6.11.3 The canopied reversible liferaft shall be capable of operating safely whichever way up it is floating. The liferaft shall have a canopy on both sides of the main body, if applicable, of the liferaft, which shall be set in place when the liferaft is launched and waterborne. Both canopies shall comply with the requirements of 6.8.1.5.5, 6.8.3.3 and 6.8.3.4.

6.11.4 The equipment required under 6.8.5 shall be readily accessible whichever way up the canopied reversible liferaft is floating, either by use of an equipment container which is accessible from either side, or by duplication of equipment on each side of the liferaft.

6.11.5 The fully equipped canopied reversible liferaft shall float in a stable upright position at all times, regardless of the conditions of loading.

6.11.6 The canopied reversible liferaft do not need to be arranged for easy side-to-side transfer, and are therefore, not subject to the 185 kg mass limitation of 6.8.2.2.

6.11.7 On ro-ro passenger ships operating on fixed routes in shallow water, the requirements that liferafts be arranged as to ensure that the liferafts are not dragged under the sinking ship, can be achieved by using a liferaft painter with a length of at least the maximum depth of water plus an additional 20 %.

6.12 SELF-RIGHTING LIFERAFTS

6.12.1 All self-righting liferafts shall comply with the requirements of 6.8.1, inflatable self-righting liferafts — requirements of 6.9, except 6.9.5.2 and 6.9.6.2, rigid self-righting liferafts shall comply with the requirements of 6.10 except 6.10.5.1 and the requirements of the present Chapter.

6.12.2 The fully equipped liferaft shall automatically turn from a capsized position to an upright position on the surface of the water, regardless of whether it inflates in the inverted position underwater or capsizes for any reason following inflation.

6.12.3 The self-righting liferafts shall be fitted with self-draining arrangements. Liferafts shall be capable of being safely used at all times by untrained persons.

6.12.4 The self-righting liferafts do not need to be arranged for easy side-to-side transfer, and are therefore, not subject to the 185 kg mass limitation of 6.8.2.2.

6.12.5 On ro-ro passenger ships operating on fixed routes in shallow water, the requirement that liferafts be arranged as to ensure that the liferafts are not dragged under the sinking ship, can be achieved by using a liferaft painter with a length of at least the maximum depth of water plus an additional 20 %.

6.13 LIFEBOATS

6.13.1 Construction of lifeboats.

6.13.1.1 All lifeboats shall be properly constructed and shall be of such form and proportion that they have ample stability in a seaway and sufficient freeboard when loaded with their full complement of persons and equipment, and are capable of being safely launched under all conditions of trim up to 10° and list up to 20° either way. All lifeboats shall have rigid hulls and shall be capable of maintaining positive stability when in an upright position in calm water and loaded with their full complement of persons and equipment and holed in any location below the waterline, provided no loss of buoyancy material or other damages.

6.13.1.2 All lifeboats shall be of sufficient strength to:

.1 enable them to be safely lowered into the water when loaded with their full complement of persons and equipment;

.2 be capable of being launched and towed when the ship is making headway at a speed of 5 knots in calm water.

6.13.1.3 Hulls and rigid covers of the lifeboats shall be manufactured of fire-retardant or low flame-spread materials.

6.13.1.4 Seating shall be provided on thwarts, benches or fixed chairs which are constructed so as to be capable of supporting:

.1 a static load equivalent to the number of persons each weighing 100 kg for which spaces are provided in compliance with the requirements of 6.13.2;

.2 a load of 100 kg in any single seat location when a lifeboat to be launched by falls is dropped into the water from a height of at least 3 m;

.3 a load of 100 kg in any single seat location when a free-fall lifeboat is launched from a height of at least 1,3 times its free-fall certification height.

6.13.1.5 Except for free-fall lifeboats, each lifeboat to be launched by falls shall be of sufficient strength to withstand a load, without residual deflection on removal of that load:

.1 in the case of boats with metal hulls, 1,25 times the total mass of the lifeboat when loaded with its full complement of persons and equipment;

.2 in the case of other boats, twice the total mass of the lifeboat when loaded with its full complement of persons and equipment.

6.13.1.6 Except for free-fall lifeboats, each lifeboat to be launched by falls shall be of sufficient strength to withstand, when loaded with its full complement of persons and equipment and with, where applicable, skates or fenders in position, a lateral impact against the ship's side at an impact velocity of at least 3,5 m/s and also a drop into the water from a height of at least 3 m.

6.13.1.7 The vertical distance between the floor surface and the interior of the enclosure or canopy extending over 50 % of the floor area shall be:

.1 not less than 1,3 m for lifeboats permitted to accommodate 9 persons or less;

.2 not less than 1,7 m for lifeboats permitted to accommodate 24 persons or more;

.3 not less than the distance as determined by linear interpolation between 1,3 m and 1,7 m for lifeboats permitted to accommodate from 9 to 24 persons.

6.13.1.8 Each lifeboat shall be fitted with a Type Approval Certificate issued by the Register, containing the following items:

number of the Type Approval Certificate;

manufacturer's name and address;

lifeboat model;

material of hull construction, in such detail as to ensure that compatibility problems in repair shall not occur;

total mass of fully equipped and fully manned boats;

the measured towing force of the lifeboat; and

statement of approval as to 6.14, 6.15, 6.16, 6.17 or 6.18.

Moreover, in compliance with Section 5, 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, the Register shall draw up and issue for a series-built lifeboat a document confirming its compliance with the Register requirements.

The document, in addition to the above items, shall specify:

- lifeboat serial number;
- month and year of manufacture;
- number of persons the lifeboat is approved to carry;
- information required under 6.1.1.9.

Each lifeboat shall be fitted with a permanently affixed approval plate with the Register brand containing at least the following items:

- manufacturer's name and address;
- lifeboat model or type and serial number;
- month and year of manufacture;
- number of persons the lifeboat is approved to carry;
- the approval information required under paragraph 6.1.1.9.

6.13.2 Carrying capacity of lifeboats.

6.13.2.1 No lifeboat shall be approved to accommodate more than 150 persons.

6.13.2.2 The number of persons which a lifeboat is permitted to accommodate shall be equal to the lesser of:

.1 the number of persons having an average mass of 75 kg (for a lifeboat intended for a passenger ship) or 82,5 kg (for a lifeboat intended for a cargo ship) all wearing lifejackets, that can be seated in a normal position without interfering with the means of propulsion or the operation of any of the lifeboat's equipment;

.2 the number of spaces that can be provided on the seating arrangements in accordance with Fig. 6.13.2.2.2. The shapes may be overlapped as shown in the figure, provided footrests are fitted and there is sufficient room for legs and the vertical separation between the upper and lower seat is not less than 350 mm.

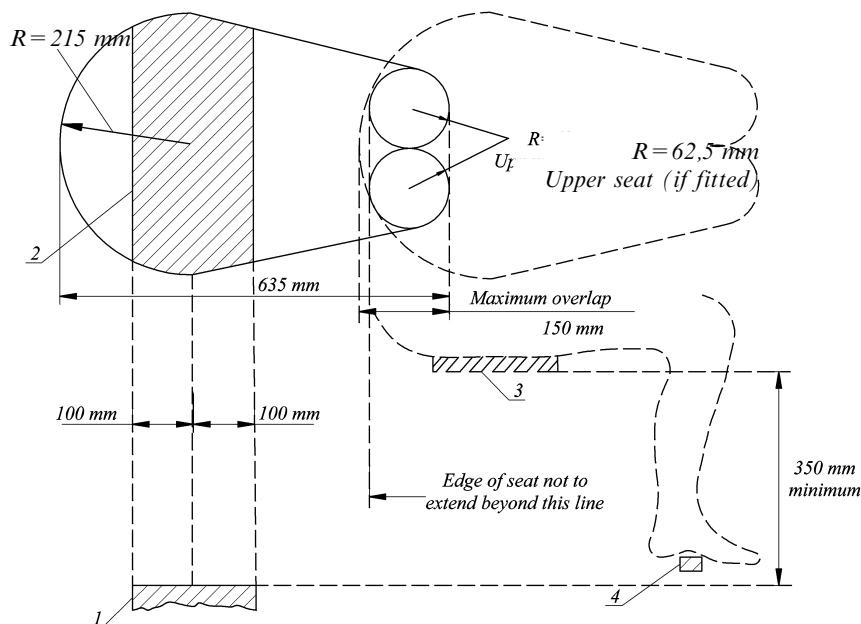


Fig. 6.13.2.2.2:

1 — lower seat; 2 — minimum seat area extends 100 mm to both sides of half-circle base line and to full width of Figure;
3 — upper seat; 4 — footrest

6.13.2.3 Each seating position shall be clearly indicated in the lifeboat.

6.13.3 Access into lifeboats.

6.13.3.1 Every passenger ship lifeboat shall be so arranged that it can be boarded by its full complement of persons in not more than 10 min from the time the instruction to board is given. Rapid disembarkation shall also be possible.

6.13.3.2 Every cargo ship lifeboat shall be so arranged that it can be boarded by its full complement of persons in not more than 3 min from the time the instruction to board is given. Rapid disembarkation shall also be possible.

6.13.3.3 Lifeboats shall have a boarding ladder that can be used on either side of the lifeboat to enable persons in the water to board the lifeboat. The lowest step of the ladder shall be not less than 0,4 m below the lifeboat's light waterline.

6.13.3.4 The lifeboat shall be so arranged that helpless people can be brought on board either from the sea or on stretchers.

6.13.3.5 All surfaces of the lifeboat on which persons might walk shall have a non-skid finish.

6.13.4 Lifeboat buoyancy.

All lifeboats shall have inherent buoyancy or shall be fitted with inherently buoyant material which shall not be adversely affected by seawater, oil or oil products, sufficient to float the lifeboat with all its equipment on board when flooded and open to the sea. Additional inherently buoyant material, equal to 280 N of buoyant force per person shall be provided for the number of persons the lifeboat is permitted to accommodate. Buoyant material, unless in addition to that required above, shall not be installed external to the hull of the lifeboat.

6.13.5 Lifeboat freeboard and stability.

6.13.5.1 All lifeboats shall be stable and have a positive GM value when loaded with 50 % of the number of persons the lifeboat is permitted to accommodate in their normal positions to one side of the centreline.

6.13.5.2 Under the condition of loading in 6.13.5.1:

.1 each lifeboat with side openings near the gunwale shall have a freeboard, measured from the waterline to the lowest opening through which the lifeboat may become flooded, of at least 1,5 % of the lifeboat's length or 100 mm, whichever is the greater;

.2 each lifeboat without side openings near the gunwale shall not exceed an angle of heel of 20° and shall have a freeboard, measured from the waterline to the lowest opening through which the lifeboat may become flooded, of at least 1,5 % of the lifeboat's length or 100 mm, whichever is greater.

6.13.6 Lifeboat propulsion.

6.13.6.1 Every lifeboat shall be powered by a compression ignition engine. No engine shall be used for any lifeboat if its fuel has a flashpoint of 43 °C or less (closed cup test).

6.13.6.2 The engine shall be provided with either a manual starting system, or a power starting system with two independent sources of power. Any necessary starting aids shall also be provided. The engine starting systems and aids shall start the engine at an ambient temperature of – 15 °C within 2 min. of commencing the start procedure. The temperature for the lifeboat provided for the ship constantly engaged in particular voyages may be different when substantiated by the procedure approved by the Register with regard to the area of navigation. The starting systems shall not be impeded by the engine casing, thwarts or other obstructions.

6.13.6.3 The force on the handle when actuating the propelling gear at the moment of starting shall not be more than 160 N per one person.

6.13.6.4 The engine shall be capable of operating for not less than 5 min. after starting from cold condition when the lifeboat is out of water in "ready-to-lower" condition.

6.13.6.5 The engine shall be capable of operating when the lifeboat is flooded up to the centreline of the crank shaft.

6.13.6.6 The engine shall be provided with a reverse-reduction gear or other arrangement disengaging the propeller shafting and the propeller from the engine. Provision shall be made for ahead and astern propulsion of the lifeboat.

6.13.6.7 The exhaust pipe shall be so arranged as to prevent water from entering the engine in normal operation.

6.13.6.8 The propeller shall be so arranged and guarded as to ensure safety of persons in the water and prevent damage to the propeller by floating debris.

6.13.6.9 The speed of a lifeboat when proceeding ahead in calm water loaded with its full complement of persons and equipment and with all engine-powered auxiliary equipment shall be at least 6 knots and at least 2 knots when towing a liferaft of maximum carrying capacity available on board loaded with its full complement of persons and equipment or its equivalent. Sufficient fuel shall be provided to run the fully loaded lifeboat at 6 knots for a period of not less than 24 h at a temperature range expected in the area in which the ship operates.

6.13.6.10 The lifeboat engine, reverse-reduction gear and engine-suspended accessories shall be protected with a casing made of low spread flame materials or non-combustible materials in accordance with 1.6, Part VI "Fire Protection" of the Rules for the Classification and Construction of Sea-Going Ships. or by other suitable means providing similar protection.

Such means shall also protect persons from coming into accidental contact with hot or moving parts and protect engine from exposure to weather and sea. Adequate means shall be provided to reduce the engine noise so that a shouted order can be heard.

Starter batteries shall be placed into the watertight casings providing gas venting.

6.13.6.11 The lifeboat engine and accessories shall be so constructed as to limit electromagnetic emission so that engine operation does not interfere with the operation of radio life-saving appliances used in the lifeboat.

6.13.6.12 Means shall be provided for recharging all engine-starting, radio and searchlight batteries. Radio batteries shall not be used to provide power for engine starting and for searchlight operation. Means shall be provided for recharging lifeboat batteries from the ship's power supply at a supply voltage not exceeding 50 V which can be disconnected at the lifeboat embarkation station.

6.13.6.13 Water-resistant instructions for starting and operating the engine shall be provided and mounted in conspicuous places near the engine starting controls.

6.13.6.14 The beds for the engine and reverse-reduction gear shall be sufficiently strong and resistant to vibration, and the scantlings of their members shall be assigned with due regard to the power of the engine.

6.13.6.15 The fuel and lubrication piping shall be effectively protected from mechanical damage and fitted with a readily accessible stop valve provided directly at the tank. The system of air supply and discharging the exhaust gases shall be so designed as to prevent water from penetrating into the engine and the exhaust pipe shall be efficiently insulated.

6.13.7 Lifeboat fittings.

6.13.7.1 All lifeboats except free-fall lifeboats shall be provided with at least one drain valve fitted near the lowest point in the hull, which shall automatically open to drain water from the hull when the lifeboat is not waterborne and shall automatically close to prevent entry of water when the lifeboat is waterborne. Each drain valve shall be provided with a cap or plug to close the valve, which shall be attached to the lifeboat by a lanyard, a chain, or other suitable means.

6.13.7.2 A lifeboat shall be provided with a rudder and tiller.

When a wheel or other remote steering mechanism is also provided the tiller shall be capable of controlling the ship in case of failure of the steering mechanism.

The tiller shall be permanently installed on, or linked to, the rudder stock; however, if the lifeboat is provided with a remote steering mechanism, the tiller may be removable and securely stowed near the rudder stock. The rudder and tiller shall be arranged in order not to be damaged by operation of the launching and recovering appliance or by the propeller.

6.13.7.3 Except in the vicinity of the rudder and propeller, suitable handholds shall be provided or a buoyant lifeline shall be becketed around the outside of the lifeboat above the waterline and within reach of a person in the water.

6.13.7.4 A lifeboat which is not self-righting shall have such means as bilge keels or keel handholds to enable persons to cling to the capsized lifeboat. They shall be fastened to the lifeboat in such a way that, when subjected to heavy impact, they break away without damaging the hull of the lifeboat.

6.13.7.5 All lifeboats shall be fitted with sufficient watertight lockers or compartments to provide for the storage of the small items of equipment, water and provisions required by 6.13.8. The lifeboat shall be equipped with a means for storing the collected rain water.

All lifeboats shall be equipped with a means for collecting rain water or for producing drinking water from seawater with a manually powered desalinator. The desalinator shall not be dependent upon solar heat, nor on chemicals other than seawater.

6.13.7.6 Every lifeboat to be launched by a fall or falls, except a free-fall lifeboat, shall be fitted with a release mechanism complying with the following requirements subject to 6.13.7.6.17:

.1 the mechanism shall be so arranged that all hooks are released simultaneously;

.2 notwithstanding the requirements of 6.13.7.6.7.2 the mechanism shall only open when the release mechanism is operated with the boat fully waterborne or, if the boat is not waterborne, by multiple, deliberate and sustained action which shall include the removal or bypassing of safety interlocks designed to prevent premature or inadvertent release;

.2.1 the mechanism shall not be able to open due to wear, misalignment and unintended force within the hook assembly or operating mechanism, control rods or cables as may be connected to, or form part of the hook assembly and with trim up to 10° and a list of up to 20° either way; and

.2.2 the functional criteria of 6.13.7.6.2 and 13.7.6.2.1 apply for the range of loads, representing 0 to 100 % of the safe working load of the lifeboat release and retrieval system for which it may be approved;

.3 unless a release mechanism is of the load over centre type, which is held fully closed by the weight of the lifeboat, the hook assembly shall be designed so that the movable hook component is kept fully closed by the hook locking parts capable of holding its safe working load under any operational conditions until the hook locking part is deliberately caused to open by means of operating mechanism. For designs utilizing the tail of the movable hook component and cam directly or indirectly securing the tail of the movable hook component, the hook assembly shall continue to be closed and hold its safe working load through rotation of the cam of up to 45° in either direction, or 45° in one direction if restricted by design, from its locked position;

.4 to provide hook stability, the release mechanism shall be designed so that, when it is fully reset in the closed position, the weight of the lifeboat does not cause any force to be transmitted to the operating mechanism;

.5 locking devices shall be designed so that they can not turn to open due to forces from the hook load; and

.6 if a hydrostatic interlock is provided, it shall automatically reset upon lifting the boat from the water;

.7 the mechanism shall have two release capabilities: normal (off-load) and on-load release capability:

.7.1 normal (off-load) release capability shall release the lifeboat when it is waterborne or when there is no load on the hooks, and not require manual separation of the lifting ring or shackle from the jaw of the hook; and

.7.2 on-load release capability shall release the lifeboat with a load on the hooks. This release mechanism shall be provided with a hydrostatic interlock unless "other means" are provided to ensure that the boat is waterborne before the release mechanism can be activated. In case of failure or when the boat is not waterborne, there shall be a means to override the hydrostatic interlock or "similar device" to allow emergency release. This interlock override capability shall be adequately protected against accidental or premature use. Adequate protection shall include special mechanical protection not normally required for off-load release, in addition to a danger sign. The protection shall be deliberately destroyed by applying a suitable minimum force, for instance by breaking a protection glass or translucent cover. A label or thin wire seal is not considered sufficiently robust. To prevent a premature on-load release, on-load operation of the release mechanism shall require multiple, deliberate and sustained action or actions by the operator. The reset function, as required in 6.13.7.6.6, shall also apply to the above mentioned "other means" or "similar device";

.8 to prevent an accidental release during recovery of the boat, unless the hook is completely reset, either the hook shall not be able to support any load, or the handle or safety pins shall not be able to be returned to the reset (closed) position and any indicators shall not indicate the release mechanism is reset. Additional danger signs shall be posted at each hook station to alert crew members to the proper method of resetting;

.9 all components of the hook unit, release handle unit, control cables or mechanical operating links and the fixed structural connections in a lifeboat shall be of material corrosion resistant in the marine environment without the need for coatings or galvanizing. All interlocks ("mechanical protection" of on load release), which include hydrostatic components in the operating mechanism, shall also be of material corrosion resistant in the marine environment. Design and manufacturing tolerances shall be such that anticipated wear throughout the service life of the mechanism shall not adversely affect the proper functioning. Mechanical operating links such as control cables shall be waterproof and shall have no exposed or unprotected areas.

Where stainless steel having a pitting resistance equivalent number ($PREN = 1 \times \%Cr + 3,3 (\%Mo + 0,5 \times \%W) + 16 \times \%N$) of 22 or more is chosen, such stainless steel do not need to be subjected to ISO 9227:2012 or other equivalent national standard, which application is agreed with the Register.

Where stainless steel having a $PREN < 22$, or another corrosion-resistant material/alloy is chosen, the material shall be qualified by corrosion test according to ISO 9227:2012 or other equivalent national standard, which application is agreed with the Register. When the test is carried out in accordance with ISO 9227:2012, neutral salt spray (NSS) shall be used, with 1000 h test duration for components outside the lifeboat, and 160 h for those inside the lifeboat. The salt spray tests may be conducted by using round specimens (diameter is 14 mm) according to IACS UR W2.4.2 (2.2.2.3, Part XIII "Materials" of the Rules for the Classification and Construction of Sea-Going Ships).

After the salt spray test, the release mechanism shall be subjected to load and release test as described in IMO resolution MSC.81(70), as amended by IMO resolution MSC.321(89), part 1, paragraph 6.9.4.1 to demonstrate satisfactory operation. The load and release shall be repeated 10 times. Where specimens are used for the salt spray tests, tensile tests shall be conducted in lieu of the load and release test. The results from the tests shall in order to verify that the reduction in the ultimate tensile strength and reduction in cross sectional area ratio is less than 5 % between corrosion tested and non-corrosion tested specimens.

Where austenitic stainless steels (e.g. 316L or 316) are used for welded structures, the risk of sensitisation to intergranular corrosion shall be addressed by the component manufacturer's quality control system.

Austenitic stainless steels 201, 304, 321, 347 are susceptible to pitting and crevice corrosion, and therefore unsuitable for these applications.

For operating cables covered with sheath and installed inside the lifeboat, inner cables made of austenitic stainless steels 304 are acceptable without the corrosion test above;

.10 the release mechanism shall be so designed and installed that crew members from inside the lifeboat can unambiguously determine when the system is ready for lifting by:

.10.1 directly observing that the movable hook portion or the hook portion that locks the movable hook portion in place is properly and completely reset at each hook; or

.10.2 observing a non-adjustable indicator that confirms that the mechanism that locks the movable hook portion in place is properly and completely reset at each hook; or

.10.3 easily operating a mechanical indicator that confirms that the mechanism that locks the movable hook portion in place is properly and completely reset at each hook;

.11 clear operating instructions shall be provided with a suitably worded warning notice using colour coding, pictograms and/or symbols as necessary for clarity. If colour coding is used, green shall indicate a properly reset hook and red shall indicate danger or improper or incorrect setting;

.12 the release control shall be clearly marked in a colour that contrasts with its surroundings;

.13 means shall be provided for hanging-off the lifeboat to free the release mechanism for maintenance;

.14 the load-bearing components of the release mechanism and the fixed structural connections in the lifeboat shall be designed with a calculated factor of safety of 6 based on the ultimate strength of the materials used, and the mass of the lifeboat when loaded with its full complement of persons, fuel, and equipment, assuming the mass of the lifeboat is equally distributed between the falls, except that the factor of safety for hanging-off arrangement may be based upon the mass of the lifeboat when loaded with its full complement of fuel and equipment plus 1000 kg.

(The hanging-off arrangement (including the connections to the lifeboat release and retrieval system and davit) shall be designed with a calculated factor of safety of 6 based on the ultimate strength of the materials used, and mass of the lifeboat when loaded with its full complement of fuel and equipment plus 1 000 kg equally distributed between the falls);

.15 a hydrostatic interlock shall be designed for a factor of safety of not less than 6 times maximum operating force based on the ultimate strength of the materials used;

.16 the operating cables shall be designed for a factor of safety of not less than 2,5 times maximum operating force based on the ultimate strength of the materials used; and

.17 where a single fall and hook system is used for launching a lifeboat or rescue boat in combination with a suitable painter, the requirements of 6.13.7.6.7, 6.13.7.6.8 and 5.13.7.6.15 need not be applicable; in such an arrangement a single capability to release the lifeboat or rescue boat, only when it is fully waterborne, will be adequate.

6.13.7.7 Every lifeboat shall be fitted with a device to secure a painter near its bow. The device shall be such that the lifeboat does not exhibit unsafe or unstable characteristics when being towed by the ship making headway at speeds up to 5 knots in calm water. Except for free-fall lifeboats, the painter securing device shall include a release device to enable the painter to be released from inside the lifeboat, with the ship making headway at speeds up to 5 knots in calm water.

6.13.7.8 Every lifeboat which is fitted with a fixed two-way VHF radiotelephone apparatus with an antenna which is separately mounted shall be provided with arrangements for siting and securing the antenna effectively in its operating position.

6.13.7.9 Lifeboats intended for launching down the side of a ship shall have skates and fenders as necessary to facilitate launching and prevent damage to the lifeboat.

6.13.7.10 A manually controlled exterior light shall be fitted outside the lifeboat. The light shall be white and be capable of operating continuously for at least 12 h with a luminous intensity of not less than 4,3 cd in all directions of the upper hemisphere. However if the light is a flashing light it shall flash at a rate of not less than 50 flashes and not more than 70 flashes per min for the 12 h operating period with an equivalent effective luminous intensity.

6.13.7.11 A manually controlled interior light shall be fitted inside the lifeboat capable of continuous operation for a period of at least 12 h. It shall produce an arithmetic mean luminous intensity of not less than 0,5 cd when measured over the entire upper hemisphere to permit reading of survival and equipment instructions; however, oil lamps shall not be permitted for this purpose.

6.13.7.12 Every lifeboat shall be so arranged as an adequate view forward, aft and to both sides is provided from the control and steering position for safe launching and manoeuvring the lifeboat.

6.13.8 Lifeboat equipment.

6.13.8.1 All items of lifeboat equipment, whether required by this paragraph or elsewhere in 6.13, shall be secured within the lifeboat by lashings, storage in lockers or compartments, storage in brackets or similar mounting arrangements or other suitable means. However, in the case of a lifeboat to be launched by falls the boat-hooks shall be kept free for fending off purposes. The equipment shall be secured in such a manner as not to interfere with any abandonment procedures. All items of lifeboat equipment shall be as small and of as little mass as possible and shall be packed in a suitable and compact form. Except where otherwise stated, the normal equipment of every lifeboat shall consist of:

.1 except for free-fall lifeboats, sufficient buoyant oars to make headway in calm seas. Thole pins, crutches or equivalent arrangements shall be provided for each oar provided. Thole pins or crutches shall be attached to the boat by lanyards or chains;

- .2 two boat-hooks;
- .3 one buoyant bailer and two buckets;
- .4 a survival manual;
- .5 an operational compass which is luminous or provided with suitable means of illumination. In a totally enclosed lifeboat, the compass shall be permanently fitted at the steering position; in any other lifeboat, it shall be provided with a binnacle if necessary to protect it from the weather, and suitable mounting arrangements;
- .6 a sea-anchor of adequate size fitted with a shock-resistant hawser which provides a firm hand grip when wet. The strength of the sea-anchor, hawser and tripping line if fitted shall be adequate for all sea conditions;
- .7 two efficient painters of at least 14 mm in diameter each with a breaking load not less than 0,35 of the lifeboat's mass with full complement of persons, equipment and engine and of a length equal to not less than twice the distance from the stowage position of the lifeboat to the waterline in the lightest sea-going condition or 15 m, whichever is greater. On lifeboats to be launched by free-fall launching, both painters shall be stowed near the bow ready for use. On other lifeboats, one painter attached to the release device required by 6.13.7.7 shall be placed at the forward end of the lifeboat and the other shall be firmly secured at or near the bow of the lifeboat ready for use;
- .8 two hatches, one at each end of the lifeboat;
- .9 watertight receptacles containing a total of 3 l of fresh water as specified in 6.8.5.1.19 for each person the lifeboat is permitted to accommodate, of which either 1 l per person may be replaced by a desalting apparatus capable of producing an equal amount of fresh water in 2 days, or 2 l per person may be replaced by a manually powered reverse osmosis desalinator as described in 6.13.7.5 capable of producing an equal amount of fresh water in 2 days;
- .10 one rustproof dipper with lanyard;
- .11 one rustproof graduated drinking vessel;
- .12 a food ration as described in 6.8.5.1.18 totalling not less than 10 000 kJ for each person the lifeboat is permitted to accommodate; these rations shall be kept in airtight packaging and be stowed in a watertight container;
- .13 four rocket parachute flares complying with the requirements of 6.7.1;
- .14 six hand flares complying with the requirements of 6.7.2;
- .15 two buoyant smoke signals complying with the requirements of 6.7.3;
- .16 one waterproof electric torch suitable for Morse signalling together with one spare set of batteries and one spare bulb in a waterproof container;
- .17 one daylight signalling mirror (heliograph) with instructions for its use;
- .18 one copy of the illustrated table of the life-saving signals in a waterproof container or made of a watertight material;
- .19 one signal whistle or one equivalent sound signal providing a sound pressure level of about 100 dB at a distance of 1 m;
- .20 a first-aid outfit in a waterproof case capable of being closed tightly after use;
- .21 anti-seasickness medicine sufficient for at least 48 h and one seasickness bag for each person;
- .22 a jack-knife attached to the lifeboat by a lanyard;
- .23 three tin openers;
- .24 two buoyant rescue quoits attached to not less than 30 m of buoyant line;
- .25 if the lifeboat is not automatically self-bailing, a manual pump suitable for effective bailing;
- .26 one set of fishing tackle;
- .27 one set of tools and spares for the engine;
- .28 portable fire extinguishing equipment of an approved type suitable for extinguishing oil fires;
- .29 a searchlight with a horizontal and vertical sector of at least 6° and a measured luminous intensity of 2500 cd which can work continuously for not less than 3 h;
- .30 one radar reflector, unless a survival craft search and rescue locating device is fitted in the lifeboat;

.31 thermal protective aids complying with the requirements of 6.6 sufficient for 10 % of the number of persons the lifeboat is permitted to accommodate but not less than two;

.32 lifeboats intended for the ships engaged in voyages in which, depending on their purpose and duration, when substantiated by the procedure approved by the Register, the items specified in 6.13.8.1.12 and 6.13.8.1.26 may be unnecessary.

6.13.8.2 Lifeboats intended for the coastal ships not engaged in the international voyages shall be equipped with the following items:

.1 one buoyant oar for each thwart with a rowlock;

.2 one bailer and one bucket;

.3 one painter attached to the stem and ready for use (dimensions according to 6.13.8.1.7);

.4 six hand flares in watertight containers giving a bright red light;

.5 the items specified in 6.13.8.1.19 and 6.13.8.1.20.

6.13.9 Lifeboat markings.

6.13.9.1 The number(s) of persons for which the lifeboat is approved, for passenger ships and/or cargo ships, as applicable, shall be clearly marked on it in clear permanent characters.

6.13.9.2 The name and port of registry of the ship to which the lifeboat belongs shall be marked on each side of the lifeboat's bow in block capitals of the Roman alphabet.

6.13.9.3 Marking permitting to identify the ship to which the lifeboat belongs and the lifeboat's number shall be made in such a way that it is visible from above.

6.14 PARTIALLY ENCLOSED LIFEBOATS

6.14.1 Partially enclosed lifeboats shall comply with the requirements of 6.13 and the present Chapter.

6.14.2 Partially enclosed lifeboats shall be provided with permanently attached rigid covers extending over not less than 20 % of the length of the lifeboat from the stem and not less than 20 % of the length of the lifeboat from the aftermost part of the lifeboat. The lifeboat shall be fitted with a permanently attached foldable canopy which together with the rigid covers completely encloses the occupants of the lifeboat in a weatherproof shelter and protects them from exposure.

The lifeboat shall have entrances at both ends and on each side. Entrances in the rigid covers shall be weathertight when closed.

The canopy shall comply with the following requirements:

- .1** be provided with adequate rigid sections or battens to permit its erection;
- .2** can be easily erected by not more than two persons within not more than 2 min;
- .3** provide insulation to protect the occupants against heat and cold by means of not less than two layers of material separated by an air gap or other equally efficient means. Means shall be provided to prevent accumulation of water in the air gap;
- .4** its exterior shall be of a highly visible colour and its interior shall be of a colour which does not irritate the occupants;
- .5** entrances in the canopy are provided with efficient adjustable closing arrangements which can be easily and quickly opened and closed from inside or outside so as to permit ventilation but exclude seawater, wind and cold; means shall be provided for holding the entrances securely in the open and closed position;
- .6** with the entrances closed, it admits sufficient air for the occupants at all times;
- .7** have means for collecting rainwater;
- .8** the occupants can escape in the event of the lifeboat capsizing.

6.14.3 The interior of the lifeboat shall be of a light colour which does not cause discomfort to the occupants.

6.14.4 If a fixed two-way VHF radiotelephone apparatus is fitted in the lifeboat, it shall be installed in a cabin large enough to accommodate the radiotelephone apparatus and the operator. No separate cabin is required if the construction of the lifeboat provides a sheltered space at which operational capacity of the apparatus is not affected if the boat is flooded by water up to the level of upper seat pans.

6.15 TOTALLY ENCLOSED LIFEBOATS

6.15.1 Totally enclosed lifeboats shall comply with the requirements of 6.13 as well as with the requirements of the present Chapter.

6.15.2 Enclosure.

Every totally enclosed lifeboat shall be provided with a rigid watertight enclosure which completely encloses the lifeboat. The enclosure shall comply with the following requirements:

- .1** protect the occupants against heat and cold;
- .2** access to the lifeboat shall be provided by hatches which can be closed to make the lifeboat watertight;
- .3** except for free-fall lifeboats, hatches are positioned so as to allow launching and recovery operations to be performed without any occupant having to leave the enclosure;
- .4** provide reliable and easy opening and closing of access hatch covers from both inside and outside. Hatch covers shall be equipped with means to hold them securely in open position;
- .5** except for a free-fall lifeboat, it is possible to row the lifeboat;
- .6** with the hatches closed and without significant leakage to support the entire mass of the lifeboat including all equipment, machinery and its full complement of persons, when the lifeboat is in a capsized position;
- .7** have windows or portholes which admit sufficient daylight to the inside of the lifeboat with the hatches closed;
- .8** its exterior shall be of a highly visible colour and its interior of a light colour which does not irritate the occupants;
- .9** have handrails providing a secure handhold for persons moving about the exterior of the lifeboat;
- .10** persons shall have access to their seats from an entrance without having to climb over thwarts or other obstructions;
- .11** during operation of the engine with the enclosure closed, the atmospheric pressure inside the lifeboat shall never be above or below the outside atmospheric pressure by more than 20 hPa.

6.15.3 Capsizing and re-righting.

6.15.3.1 Except in free-fall lifeboats, a safety belt shall be fitted at each indicated seating position. The safety belt shall be designed to hold a person with a mass of 100 kg securely in place when the lifeboat is in a capsized position.

Each set of safety belts for a seat shall be of a colour which contrasts with the belts for seats immediately adjacent. Free-fall lifeboats shall be fitted with a safety harness at each seat in contrasting colour designed to hold a person with a mass of 100 kg securely in place during a free-fall launch as well as with the lifeboat in capsized position.

6.15.3.2 The stability of the lifeboat shall be such that it is inherently or automatically self-righting when loaded with its full or a partial complement of persons and equipment and all entrances and openings are closed watertight and the persons are secured with safety belts.

6.15.3.3 The lifeboat shall be capable of supporting its full complement of persons and equipment when the lifeboat is in the damaged condition prescribed in 6.13.1.1 and its stability shall be such that in the event of capsizing, it will automatically attain a position that will provide an above-water escape for its occupants. When the lifeboat is in the stable flooded condition, the water level inside the lifeboat, measured along the seatback, shall not be more than 500 mm above the seat pan at any occupant seating position.

6.15.3.4 The design of all engine exhaust pipes, air ducts and other openings shall be such that water is excluded from the engine when the lifeboat capsizes and re-rights.

6.15.4 Lifeboat propulsion.

6.15.4.1 The engine and transmission shall be controlled from the helmsman's position.

6.15.4.2 The engine and engine installation shall be capable of running in any position during capsizing and continue to run after the lifeboat returns to the upright or shall automatically stop on capsizing and be easily restarted after the lifeboat returns to the upright. The design of the fuel and lubricating systems shall prevent the loss of fuel and the loss of more than 250 ml of lubricating oil from the engine during capsizing.

6.15.4.3 Air-cooled engines shall have a duct system to take in cooling air from, and exhaust it to, the outside of the lifeboat. Manually operated dampers shall be provided to enable cooling air to be taken in from, and exhausted to, the interior of the lifeboat.

6.15.5 Construction and fendering.

Notwithstanding the requirements of 6.13.1.6 a totally enclosed lifeboat shall be so constructed and fendered as to ensure that the lifeboat renders protection against harmful accelerations resulting from an impact of the lifeboat, when loaded with its full complement of persons and equipment, against the ship's side at an impact velocity of not less than 3,5 m/s.

6.16 FREE-FALL LIFEBOATS

6.16.1 Free-fall lifeboats shall comply with the requirements of 6.15 and in addition shall comply with the requirements of this section.

6.16.2 Carrying capacity of a free-fall lifeboat.

6.16.2.1 The carrying capacity of a free-fall lifeboat is the number of persons having an average mass of 82,5 kg that can be provided with a seat without interfering with the means of propulsion or the operation of any of the lifeboat's equipment. The seating surface shall be smooth and shaped and provided with cushioning of at least 10 mm over all contact areas to provide support for the back and pelvis and flexible lateral side support for the head. The seats shall be of the non-folding type, permanently secured to the lifeboat and arranged so that any deflection of the hull or canopy during launching will not cause the injury to the occupants. The location and structure of the seat shall be arranged to preclude the potential for injury during launch if the seat is narrower than the occupant's shoulders. The passage between the seats shall have a clear width of at least 480 mm from the deck to the top of the seats, be free of any obstruction and provided with an antislip surface with suitable footholds to allow safe embarkation in the ready-to-launch position. Each seat shall be provided with a suitable locking harness capable of quick release under tension to restrain the body of the occupant during launching.

6.16.2.2 The angle between the seat pan and the seat back shall be at least 90° . The width of the seat pan shall be at least 480 mm. Free clearance in front of the backrest (buttock to knee length) shall be at least 650 mm measured at an angle of 90° to the backrest. The backrest shall extend at least 1075 mm above the seat pan. The seat shall provide for shoulder height, measured along the seat back, of at least 760 mm. The footrest shall be oriented at not less than half of the angle of the seat pan and shall have a foot length of at least 330 mm (refer to Fig. 6.16.2.2).

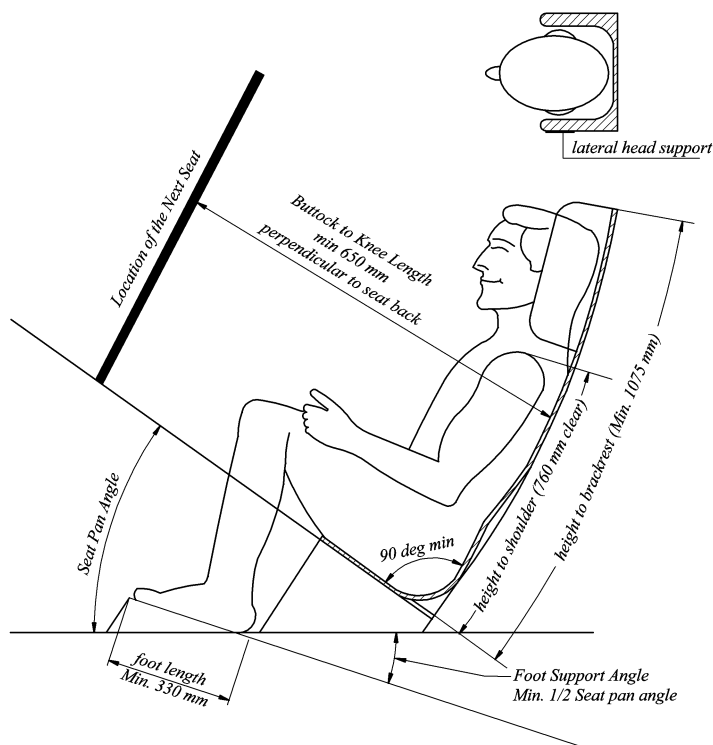


Fig. 6.16.2.2

6.16.3 Each free-fall lifeboat shall make positive headway immediately after water entry and shall not come into contact with the ship after a free-fall launching against a trim by the bow or by the stern of up to 10° and a heel of up to 20° either way from the certification height fully equipped and loaded with:

- .1 its full complement of persons;
- .2 occupants so as to cause the centre of gravity to be in the most forward position;
- .3 occupants so as to cause the centre of gravity to be in the most aft position; and
- .4 its operating crew only.

6.16.4 For oil tankers, chemical tankers and gas carriers with a final angle of heel greater than 20° calculated in accordance with the requirements of Part V "Subdivision" of the Rules for the Classification and Construction of Sea-Going Ships, a lifeboat shall be capable of being free-fall launched at the final angle of heel and on the base of the final waterline of that calculation.

6.16.5 Each free-fall lifeboat shall be of sufficient strength to withstand, when loaded with its full complement of persons and equipment, a free-fall launch from a height of at least 1,3 times the free-fall certification height.

6.16.6 Each free-fall lifeboat shall be so constructed as to ensure that the lifeboat is capable of rendering protection against harmful accelerations resulting from being launched from the height for which it shall be certified in calm water under unfavourable conditions of trim of up to 10° and heel of up to 20° either way when it is fully equipped and loaded with:

- .1 its full complement of persons;
- .2 occupants so as to cause the centre of gravity to be in the most forward position;
- .3 occupants so as to cause the centre of gravity to be in the most aft position;
- .4 the operating crew only.

6.16.7 Each free-fall lifeboat shall be fitted with a release system which shall:

- .1 have two independent activation systems for the release mechanisms which may only be operated from inside the lifeboat and be marked in a colour that contrasts with its surroundings;
- .2 be so arranged as to release the boat under any condition of loading from no load up to at least 200 % of the normal load caused by the fully equipped lifeboat when loaded with the number of persons for which it shall be approved;
- .3 be adequately protected against accidental or premature use;
- .4 be designed to test the release system without launching the lifeboat;
- .5 be designed with a factor of safety of 6 based on the ultimate strength of the materials used.

6.16.8 In addition to the requirements of 6.13.1.8, the document on approval for a free-fall lifeboat issued in compliance with Section 5, 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 shall also state:

- .1 free-fall certification height;
- .2 required launching ramp length; and
- .3 launching ramp angle for the free-fall certification height.

6.17 LIFEBOATS WITH A SELF-CONTAINED AIR SUPPORT SYSTEM

6.17.1 Lifeboats with a self-contained air support system shall comply with the requirements of 6.15 and shall be equipped with the compressed air system. The capacity of compressed air cylinders of this system shall be sufficient to ensure safety of people and reliable functioning of the engine for at least 10 min with all entrances closed. During this period the atmospheric pressure inside the lifeboat shall never fall below the outside atmospheric pressure nor shall it exceed this pressure by more than 20 hPa. The system shall have visual indicators to indicate the pressure of the air supply at all times.

6.18 FIRE-PROTECTED LIFEBOATS

6.18.1 A fire-protected lifeboat shall comply with the requirements of 6.17 and, in addition, shall provide protection of the number of persons it is permitted to accommodate when subjected to a continuous oil fire that envelops the lifeboat for a period of not less than 8 min.

6.18.2 The lifeboat shall be provided with detailed instructions on operation in fire conditions, as well as with the first aid outfit for burns and for CO poisoning.

6.18.3 Under the conditions specified in 6.18.1, CO concentration inside the lifeboat shall not exceed 0,2 mg/l and CO₂ concentration — 3 % by volume.

6.18.4 Water spray system.

A lifeboat which has a water spray fire-protection system shall comply with the following requirements:

.1 water for the system shall be drawn from the sea by a self-priming motor pump, and it shall be possible to turn on and turn off the flow of water over the exterior of the lifeboat;

.2 the seawater intake shall be so arranged as to prevent the intake of flammable liquids from the sea surface;

.3 the system shall be arranged for flushing with fresh water and allowing complete drainage.

6.18.5 Water spray system or thermal insulation of the hull shall provide air temperature inside the lifeboat at the level of sitting person's head not over 60 °C under the conditions specified in 6.18.1.

6.19 RESCUE BOATS

6.19.1 General.

6.19.1.1 Except as provided by this section, all rescue boats shall comply with the requirements of 6.13.1 to 6.13.7.4 (except 6.13.6.9) and 6.13.7.6, 6.13.7.7, 6.13.7.9, 6.13.7.10 and 6.13.9, except that, for all rescue boats, an average mass of 82,5 kg shall apply to 6.13.2.2.1. A lifeboat may be approved and used as a rescue boat if it meets all of the requirements of this section, if it successfully completes the testing for a rescue boat required by 1.3.2 and if its stowage, launching and recovery arrangements on the ship meet all of the requirements for a rescue boat.

6.19.1.2 Notwithstanding the requirements of 6.13.4 required buoyant material for rescue boats may be installed external to the hull, provided it is adequately protected against damage and is capable of withstanding exposure as specified in 6.19.3.3.

6.19.1.3 Rescue boats may be either of rigid or inflated construction or a combination of both and shall:

.1 be not less than 3,8 m and not more than 8,5 m in length;

.2 be capable of carrying at least five seated persons and a person lying on a stretcher all wearing immersion suits, and lifejackets if required. Notwithstanding 6.13.1.4, seating, except for the helmsman, may be provided on the floor, provided that the seating space analysis in accordance with 6.13.2.2.2 uses shapes similar to figure 6.13.2.2, but altered to an overall length of 1190 mm to provide for extended legs. No part of a seating space shall be on the gunwale, transom, or on inflated buoyancy at the sides of the boat.

6.19.1.4 Rescue boats which are a combination of rigid and inflated construction shall comply with the appropriate requirements of this Chapter.

6.19.1.5 Unless the rescue boat has adequate sheer, it shall be provided with a bow cover extending for not less than 15 % of its length.

6.19.1.6 Every rescue boat shall be provided with sufficient fuel, suitable for use throughout the temperature range expected in the area in which the ship operates, and be capable of manoeuvring at a speed of at least 6 knots and maintaining that speed, for a period of at least 4 h, when loaded with its full complement of persons and equipment.

6.19.1.7 Rescue boats shall have sufficient mobility and manoeuvrability in a seaway to enable persons to be retrieved from the water, marshal liferafts and tow the largest liferaft carried on the ship when loaded with its full complement of persons and equipment or its equivalent at a speed of at least 2 knots.

6.19.1.8 A rescue boat shall be fitted with an inboard engine or outboard motor. If it is fitted with an outboard motor, the rudder and tiller may form part of the engine. Notwithstanding the requirements of 6.13.6.1, rescue boats may be fitted with petrol-driven outboard motors with an approved fuel system provided the fuel tanks are specially protected against fire and explosion.

6.19.1.9 Arrangements for towing shall be permanently fitted in rescue boats and shall be sufficiently strong to marshal or tow liferafts as required by 6.19.1.7.

6.19.1.10 Rescue boats shall be fitted with weathertight stowage for small items of equipment.

6.19.1.11 Unless expressly provided otherwise, every rescue boat shall be provided with effective means of bailing or be automatically self-bailing.

6.19.1.12 Every rescue boat shall be so arranged that an adequate view forward, aft and to both sides is provided from the control and steering position for safe launching and manoeuvring and, in particular, with regard to visibility of areas and crew members essential to man-overboard retrieval and marshalling of survival craft.

6.19.2 Rescue boat equipment.

6.19.2.1 All items of rescue boat equipment, with the exception of boat hooks which shall be kept free for fending off purposes, shall be secured within the rescue boat by lashings, storage in lockers or compartments, storage in brackets or similar mounting arrangements, or other suitable means. The equipment shall be secured in such a manner as not to interfere with any launching or recovery procedures. All items of rescue boat equipment shall be as small and of as little mass as possible and shall be packed in suitable and compact form.

6.19.2.2 The normal equipment of every rescue boat shall consist of:

.1 sufficient number of buoyant oars or paddles to make headway in calm seas. Thole pins, crutches or equivalent arrangements shall be provided for each oar. Thole pins or crutches shall be attached to the boat by lanyards or chains;

.2 a buoyant bailer;

.3 a binnacle containing an efficient compass with luminous card or provided with suitable means of illumination;

.4 a sea-anchor and tripping line with a hawser of adequate strength not less than 10 m in length;

.5 a painter of sufficient length and strength, attached to the release device complying with the requirements of 6.13.7.7 and placed at the forward end of the rescue boat;

.6 one buoyant line, not less than 50 m in length, of sufficient strength to tow a liferaft as required by 6.19.1.7;

.7 one waterproof electric torch suitable for Morse signalling together with one spare set of batteries and one spare bulb in a waterproof container;

.8 one whistle or equivalent sound signal;

.9 a first-aid outfit in a waterproof case capable of being closed tightly after use;

.10 two buoyant rescue quoits, attached to not less than 30 m of buoyant line;

.11 a searchlight with a horizontal and vertical sector of at least 6° and a measured luminous intensity of 2500 cd which can work continuously for not less than 3 h;

.12 an efficient radar reflector;

.13 thermal protective aids complying with the requirements of 6.6 sufficient for 10 % of the number of persons the rescue boat is permitted to accommodate or two, whichever is greater;

.14 portable fire extinguishing equipment of an approved type suitable for extinguishing oil fires.

6.19.2.3 In addition to the equipment required by 6.19.2.2, the normal equipment of every rigid rescue boat shall include a boat hook, a bucket, a knife or a hatchet.

6.19.2.4 In addition to the equipment required by 6.19.2.2, the normal equipment of every inflated rescue boat shall include:

.1 a buoyant safety knife;

.2 two sponges;

.3 an efficient manually operated bellows or pump;

.4 a repair kit for repairing punctures in a suitable container;

.5 a safety boat hook.

6.19.3 Additional requirements for inflated rescue boats.

6.19.3.1 The requirements of 6.13.1.3 and 6.13.1.5 do not apply to inflated rescue boats.

6.19.3.2 An inflated rescue boat when suspended by its bridle or lifting hook shall be:

.1 of sufficient strength and rigidity to enable it to be lowered and recovered with its full complement of persons and equipment;

.2 of sufficient strength to withstand a load of 4 times the mass of its full complement of persons and equipment at an ambient temperature of $20 + 3\text{ }^{\circ}\text{C}$ with all relief valves inoperative;

.3 of sufficient strength to withstand a load of 1,1 times the mass of its full complement of persons and equipment at an ambient temperature of $-30\text{ }^{\circ}\text{C}$ with all relief valves operative.

6.19.3.3 Inflated rescue boats shall be so constructed as to be capable of withstanding exposure when stowed on an open deck of ship at sea and be capable to withstand exposure for 30 days afloat in all sea conditions.

6.19.3.4 In addition to complying with the requirements of 6.13.9 inflated rescue boats shall be marked with a serial number, the manufacturer's name or trade mark and the date of manufacture.

6.19.3.5 The buoyancy of an inflated rescue boat shall be provided by either a single tube subdivided into at least five separate compartments of approximately equal volume or two separate tubes neither exceeding 60 % of the total volume. The buoyancy tubes shall be so arranged that the intact compartments shall be able to support the number of persons which the rescue boat is permitted to accommodate, each having a mass of 82,5 kg, when seated in their normal positions with positive freeboard over the rescue boat's entire periphery under the following conditions:

- .1 with the forward buoyancy compartment deflated;
- .2 with the entire buoyancy on one side of the rescue boat deflated; and
- .3 with the entire buoyancy on one side and the bow compartment deflated.

6.19.3.6 The buoyancy tubes forming the boundary of the inflated rescue boat shall on inflation provide a volume of not less than 0,17 m³ for each person the rescue boat is permitted to accommodate.

6.19.3.7 Each buoyancy compartment shall be fitted with a non-return valve for manual inflation and means for deflation. A safety relief valve shall also be fitted.

6.19.3.8 Underneath the bottom and on vulnerable places on the outside of the inflated rescue boat, rubbing strips shall be provided.

6.19.3.9 Where a transom is fitted it shall not be inset by more than 20 % of the overall length of the rescue boat.

6.19.3.10 Suitable patches shall be provided for securing the painters fore and aft and the becketed lifelines inside and outside the boat.

6.19.4 Fast rescue boats.

6.19.4.1 The fast rescue boat and its launching appliances shall be such as to enable it to be safely launched and retrieved under adverse weather and sea conditions.

6.19.4.2 All fast rescue boats shall comply with the requirements to rescue boats except for 6.13.1.4.3, 6.13.1.5, 6.13.7.2, 6.19.1.6 and 6.19.1.11 and also comply with the requirements of this Chapter.

6.19.4.3 Notwithstanding 6.19.1.3.1 fast rescue boats shall have a full length of not less than 6 meters and not more than 8,5 m, including inflated structures or fixed fenders.

6.19.4.4 Fully equipped fast rescue boats shall be capable of manoeuvring for at least 4 h at a speed of at least 20 knots in calm water with a crew of 3 persons and at least 8 knots with a full complement of persons and equipment.

6.19.4.5 Fast rescue boats shall be self-righting or capable of being readily righted by not more than two of their crew.

6.19.4.6 Fast rescue boats shall be either self-bailing or be capable of being rapidly cleared of water.

6.19.4.7 Fast rescue boats shall be steered by a wheel at a helmsman's position remote from the tiller. An emergency steering system providing direct control of the rudder, water jet or outboard motor shall be also provided.

6.19.4.8 Engines in fast rescue boat shall stop automatically or be stopped by the helmsman's emergency release switch shall the rescue boat capsize. When the rescue boat has righted, each engine or motor shall be capable of being restarted, provided the helmsman's emergency release, is fitted, has been reset. The design of the fuel and lubricating systems shall prevent the loss of more than 250 ml of fuel or lubricating oil from the propulsion system shall the rescue boat capsize.

6.19.4.9 Fast rescue boats shall, if possible, be equipped with an easily and safely operated fixed single point suspension arrangement or equivalent.

6.19.4.10 A rigid fast rescue boat shall be constructed in such a way that, when suspended by its lifting point it is sufficient strength to withstand a load without residual deflection on removal of load of 4 times the mass of its full complement of persons and equipment.

6.19.4.11 The normal equipment of the fast rescue boat shall include a hands free and portable VHF radiocommunication set.

6.19.4.12 The crew of the fast rescue boat shall consist of at least the helmsman and two crew members trained and drilled regularly having regard to the Seafarers' Training, Certification and Watchkeeping (STCW) Code requirements.

6.19.5 Outboard petrol engines.

Outboard petrol engines shall comply with the requirements of 6.13.6.2 to 6.13.6.4, 6.13.6.8, 6.13.6.9, 6.13.6.11, 6.13.6.13 and additionally with the following requirements.

6.19.5.1 The engine shall be equipped with a speed regulator to provide overspeed protection, oil low level and oil (cooling liquid) temperature indicators. Means of reversing and setting the throttle control at any position shall be provided.

6.19.5.2 Anti-syphon devices shall be provided in the fuel tanks and fuel piping to prevent fuel spillage when the hose is disconnected. Applicable flexible joints and hoses shall be fireproof and resistant to the effects of conducted medium.

6.19.5.3 The fuel tank shall be of a design recommended by the manufacturer of the engines and be securely attached to the boat.

6.19.5.4 It is recommended to fit the motor with means of supplying power to the truck light.

6.20 LAUNCHING AND EMBARKATION APPLIANCES

6.20.1 General.

6.20.1.1 With the exception of the secondary means of launching the free-fall lifeboats, each launching appliance shall be so arranged that the fully equipped survival craft or rescue boat it serves can be safely launched against unfavourable conditions of trim by the bow or by the stern of up to 10° and heel of up to 20° either way:

- .1 when boarded, as required by 3.3 or 4.3, by its full complement of persons; and
- .2 with not more than the required operating crew on board.

6.20.1.2 Notwithstanding the requirements of 6.20.1.1, lifeboat launching appliances for oil tankers, chemical tankers and gas carriers with a final angle of heel greater than 20° calculated in accordance with Part V "Subdivision" of the Rules for the Classification and Construction of Sea-Going Ships shall be capable of operating at the final angle of heel on the lower side of the ship taking into consideration the final damaged waterline of the ship.

6.20.1.3 A launching appliance shall not depend on any means other than gravity or stored mechanical power supplies to launch the survival craft or rescue boat it serves in the fully loaded and equipped condition and also in the light condition.

6.20.1.4 Each launching appliance shall be so constructed that a minimum amount of routine maintenance is necessary. All parts requiring regular maintenance by the ship's crew shall be readily accessible and easily maintained.

6.20.1.5 The launching appliances and its attachments other than winches shall be of sufficient strength to withstand a factory static proof load test of not less than 2,2 times the maximum working load.

6.20.1.6 Structural members and all blocks, falls, padeyes, links, fastenings and all other fittings used in connection with launching equipment shall be designed with a factor of safety on the basis of the maximum working load assigned and the ultimate strength of the materials used for construction. A minimum factor of safety of 4,5 shall be applied to all structural members including winch structural components and a minimum factor of safety of 6 shall be applied to falls, suspension chains, links and blocks.

6.20.1.7 Each launching appliance shall, as far as practicable, remain effective under conditions of icing.

6.20.1.8 A lifeboat launching appliance shall be capable of recovering the lifeboat with its crew.

6.20.1.9 Each rescue boat launching appliance shall be fitted with a powered winch motor capable of raising the rescue boat from the water with its full rescue boat complement of persons and equipment at a rate of not less than 0,3 m/s.

6.20.1.10 The arrangements of the launching appliance shall be such as to enable safe boarding of the survival craft in accordance with the requirements of 6.8.4.2, 6.8.4.3, 6.13.3.1 and 6.13.3.2.

6.20.1.11 Rescue boat launching appliances shall be provided with foul weather recovery strops for recovery where heavy fall blocks constitute a danger.

6.20.2 Launching appliances using falls and a winch.

6.20.2.1 Every launching appliance using falls and a winch, except for secondary launching appliances for free-fall lifeboats, shall comply with the requirements of 6.20.1 and in addition shall comply with the requirements of this paragraph.

6.20.2.2 The launching mechanism shall be so arranged that it may be actuated by one person from a position on the ship's deck and, except for secondary launching appliances for free-fall lifeboats, from a position within the survival craft or rescue boat. When launched by a person on the deck, the survival craft or rescue boat shall be visible to that person.

6.20.2.3 Falls shall be of rotation-resistant and corrosion-resistant steel wire rope.

6.20.2.4 In the case of a multiple drum winch the falls shall be so arranged as to wind off the drums at the same rate when lowering, and to wind on to the drums evenly at the same rate when hoisting, unless an efficient compensatory device is fitted.

6.20.2.5 The winch brakes of a launching appliance shall be of sufficient strength to withstand:

- .1 a static test with a proof load of not less than 1,5 times the maximum working load;
- .2 a dynamic test with a proof load of not less than 1,1 times the maximum working load at maximum lowering speed.

6.20.2.6 An efficient hand gear shall be provided for recovery of each liferaft, lifeboat and rescue boat. Hand gear handles or wheels shall not be rotated by moving parts of the winch when the liferaft, lifeboat or rescue boat is being lowered or when being hoisted by power.

6.20.2.7 Where davit arms are recovered by power, devices shall be fitted which will automatically cut off the power before the davit arms reach the stops in order to avoid overstressing the falls or davits, unless the motor is designed to prevent such overstressing.

6.20.2.8 The speed at which the fully loaded survival craft or rescue boat is lowered to the water shall not be less than that determined by the formula

$$S = 0,4 + 0,02H \quad (6.20.2.8)$$

where H = the height from the davit head to the waterline with the ship at the lightest sea-going condition, m.

6.20.2.9 The lowering speed of a fully equipped liferaft without persons onboard shall be at least 50 %, the lowering speed of other survival craft, fully equipped but without persons on board, shall be at least 70 % of that required by 6.20.2.8.

6.20.2.10 The maximum lowering speed shall be established having regard to the design of the survival craft or rescue boat, the protection of the occupants from excessive forces, and the strength of the launching arrangements taking into account inertia forces during an emergency stop but shall not exceed 1 m/s with full complement of persons on board the lifeboat, rescue boat or liferaft. The launching appliances shall be fitted with the means preventing the exceeding of this speed.

6.20.2.11 Every launching appliance shall be fitted with brakes capable of stopping the descent of the survival craft or rescue boat and holding them securely when loaded with its full complement of persons and equipment; where necessary, the brake pads shall be protected from water and oil.

6.20.2.12 Manual brakes shall be so arranged that the brake is always applied unless the operator either on deck or in survival craft or rescue boat, holds the brake control handle in the "off" position.

6.20.2.13 A lifeboat launching appliance shall be provided with means for hanging-off the lifeboat to free the on-load release mechanism for maintenance.

6.20.3 Float-free launching.

Where a survival craft requires a launching appliance and is also designed to float free, the float-free release of the survival craft from its stowed position shall be automatic.

6.20.4 Launching appliances for free-fall lifeboats.

6.20.4.1 Every free-fall launching appliance shall comply with the applicable requirements of 6.20.1 and, in addition, shall comply with the requirements of this paragraph.

6.20.4.2 The launching appliance shall be designed and installed so that it and the lifeboat it serves operate as a system to protect the occupants from harmful acceleration forces as required by 6.16.6, and to ensure effective clearing of the ship as required by 6.16.3 and 6.16.4.

6.20.4.3 The launching appliance shall be constructed so as to prevent sparking and incendiary friction during the launching of the lifeboat.

6.20.4.4 The launching appliance shall be designed and arranged so that in its ready to launch position, the distance from the lowest point on the lifeboat it serves to the water surface with the ship in its lightest seagoing condition, as defined in 1.2.1, does not exceed the lifeboat's free-fall certification height, taking into account the requirements of 6.16.3 (trims and heels required by 6.16.3 and 6.20.1.1 shall be ignored).

6.20.4.5 The launching appliance shall be arranged so as to preclude accidental release of the lifeboat in its unattended stowed position. If the means provided to secure the lifeboat cannot be released from inside the lifeboat, it shall be so arranged as to preclude boarding the lifeboat without first releasing it.

6.20.4.6 The release mechanism shall be arranged so that at least two independent actions from inside the lifeboat are required in order to launch the lifeboat.

6.20.4.7 Each launching appliance shall be provided with a secondary means to launch the lifeboat by falls. Such means shall comply with the requirements of 6.20.1 (except 6.20.1.3) and 6.20.2 (except 6.20.2.6). Tests, required by 6.20.1.5 shall be carried out with secondary means to launch the lifeboat being at the full outboard position. Secondary means for launching shall be capable of launching the lifeboat against unfavorable conditions of trim of up to only 2° and heel of up to only 5° either way and it need not comply with the speed requirements of 6.20.2.8 and 6.20.2.9. If the secondary launching appliance is not dependent on gravity, stored mechanical power or other manual means, the launching appliance shall be connected both to the ship's main and emergency sources of power.

6.20.4.8 The secondary means of launching shall be equipped with at least a single off-load capability to release the lifeboat.

6.20.5 Liferaft launching appliances.

Every liferaft launching appliance shall comply with the requirements of 6.20.1 and 6.20.2, except with regard to embarkation in the stowed position, recovery of the loaded liferaft and that manual operation is permitted for turning out the appliance. The launching appliance shall include an automatic release hook arranged so as to prevent premature release during lowering and shall release the liferaft when waterborne. The release hook shall include a capability to release the hook under load. The on-load release control shall:

- .1 be clearly differentiated from the control which activates the automatic release function;
- .2 require at least two separate actions to operate;
- .3 with a load of 150 kg on the hook, require a force of at least 600 and not more than 700 N to release the load, or provide equivalent adequate protection against inadvertent release of the hook;
- .4 be designed such that the crew members on deck can clearly observe when the release mechanism is properly and completely set.

6.20.6 Fast rescue boats launching appliances.

6.20.6.1 Each fast rescue boat launching appliance shall comply with the requirements of 6.20.1 and 6.20.2, except for 6.20.2.10.

6.20.6.2 The launching appliance shall be fitted with a device to dampen the forces due to interaction with waves when the fast rescue boat is launched and recovered. The device shall include a flexible element to soften shock forces and a dampening element to minimize oscillations.

6.20.6.3 The winch shall be fitted with an automatic high-speed tensioning device which prevents the wire from going slack in all sea state conditions in which the fast rescue boat is intended to operate.

6.20.6.4 The winch brake shall have a gradual action. When the fast rescue boat is lowered at full speed and brakes are applied sharply, the additional force induced in the wire due to retardation shall not exceed 0,5 times the working load of launching appliance.

6.20.6.5 The lowering speed for a fully equipped fast rescue boat with its full complement of persons on board shall not exceed 1 m/s. Notwithstanding the requirements of 6.20.1.9, the launching appliances shall be capable of hoisting the fully equipped rescue boat with 6 persons at a speed of not less than 0,8 m/s. The appliance shall be also capable of lifting the rescue boat with the maximum number of persons that can be accommodated in the rescue boat as calculated under 6.13.2.

6.20.6.6 At least three turns of wire shall remain on the winch after the fast rescue boat is lowered to the sea with the ship at its lightest seagoing condition, a trim of up to 10° and a heel of up to 20°, either way.

6.20.7 Embarkation ladders.

6.20.7.1 Handholds shall be provided to ensure a safe passage from the deck to the head of the ladder and vice versa.

6.20.7.2 The steps of ladder shall be:

- .1 made of hardwood, free from knots or other irregularities, smoothly machined and free from sharp edges and splinters, or of suitable material of equivalent properties;
- .2 provided with a non-slip surface either by longitudinal grooving or by the application of an approved non-slip coating;

.3 not less than 480 mm long, 115 mm wide and 25 mm in depth, excluding any non-slip surface or coating;

.4 equally spaced not less than 300 mm or more than 380 mm apart and secured in such a manner that they will remain horizontal.

6.20.7.3 The sides ropes of the ladder shall be made of two uncovered manila ropes not less than 65 mm in circumference on each side. Each rope shall be continuous with no joints below the top step. Other materials may be used provided the dimensions, breaking strain, weathering, stretching and gripping properties are at least equivalent to those of manila rope. All rope ends shall be secured to prevent unravelling.

6.20.8 Marine evacuation systems.

6.20.8.1 Construction of the marine evacuation system.

6.20.8.1.1 The passage of the marine evacuation system shall provide for safe descent of person of various ages, sizes and physical capabilities wearing approved lifejackets from the embarkation station to the floating platform or survival craft.

6.20.8.1.2 Strength and construction of the passage shall be such as to provide safe evacuation of persons with regard to the capacity specified by the manufacturer.

6.20.8.1.3 The platform if fitted shall be:

.1 such that sufficient buoyancy will be provided for the working load. In the case of an inflatable platform, the main buoyancy chambers, which for this purpose shall include any thwarts or floor inflatable structural members are to meet the requirements of 6.9 based upon the platform capacity except that the capacity shall be obtained by dividing by 0,25 the usable area given in 6.20.8.3.3;

.2 stable in a seaway and provide a safe working area for the system operators;

.3 of sufficient area that will provide for the securing of at least two liferafts for boarding and to accommodate at least the number of persons that at any time are expected to be on the platform. This usable platform area shall be at least equal to

20 % of total number of persons the Marine Evacuation System is certificated for

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or 10 m², whichever is greater. However, the Register may approve alternate arrangements which are demonstrated to comply with all the prescribed performance requirements;

.4 self draining;

.5 sub-divided in such a way that the loss of gas from any one compartment will not restrict its operational use as a means of evacuation. The buoyancy tubes shall be sub-divided or protected against damage occurring from contact with the ship's side;

.6 fitted with a stabilizing system to the satisfaction of the Register;

.7 restrained by a bousing line or other positioning systems which are designed to deploy automatically and if necessary, to be capable of being adjusted to the position required for evacuation;

.8 provided with mooring and bousing line patches of sufficient strength to securely attach the largest inflatable liferaft associated with the system.

6.20.8.1.4 If the passage gives direct access to the survival craft, it shall be provided with a quick release arrangement.

6.20.8.2 Performance of the marine evacuation system.

6.20.8.2.1 A marine evacuation system shall be:

.1 capable of deployment by one person;

.2 such as to enable the total number of persons for which it is designed, to be transferred from the ship into the inflated liferafts within a period of 30 min in the case of a passenger ship and of 10 min in the case of a cargo ship from the time abandon ship signal is given;

.3 arranged such that liferafts may be securely attached to the platform and released from the platform by a person either in the liferaft or on the platform;

.4 capable of being deployed from the ship under unfavourable conditions of trim of up to 10° and heel of up to 20° either way;

.5 in the case of being fitted with an inclined slide, such that the angle of the slide to the horizontal is:

within a range of 30° to 35° when the ship is upright and in the lightest sea-going condition; and

in the case of a passenger ship, a maximum of 55° in the final stage of flooding set by the requirements of Part V "Subdivision" of the Rules for the Classification and Construction of Sea-Going Ships;

.6 evaluated for capacity by means of timed evacuation deployments conducted in harbour;

.7 capable of providing a satisfactory means of evacuation in a sea state associated with a wind of force 6 on the Beaufort scale;

.8 designed to, as far as practicable, remain effective under conditions of icing;

.9 so constructed that only a minimum amount of routine maintenance is necessary. Any part requiring maintenance by the ship's crews shall be readily accessible and easily maintained.

6.20.8.2.2 Where one or more marine evacuation systems are provided on a ship, at least 50 % of such systems shall be subjected to a trial deployment after installation. Subject to these deployments being satisfactory, the untried systems shall be deployed within 12 months of installation.

6.20.8.3 Inflatable liferafts associated with marine evacuation systems.

6.20.8.3.1 Any inflatable liferaft used in conjunction with the marine evacuation system shall:

.1 conform with the requirements of 6.9;

.2 be sited close to the system container but be capable of dropping clear of the deployed system and boarding platform;

.3 be capable of release one at a time from its stowage rack with arrangements which will enable it to be moored alongside the platform;

.4 be stowed in accordance with 2.4.4 to 2.4.6;

.5 be provided with pre-connected or easily connected retrieving lines to the platform.

6.20.8.4 Containers for marine evacuation systems.

6.20.8.4.1 The evacuation passage and platform shall be packed in a container that is:

.1 so constructed as to withstand hard wear under conditions encountered at sea;

.2 as far as practicable watertight, except for drain holes in the container bottom.

6.20.8.4.2 The container shall be marked with:

.1 manufacturer's name or trade mark;

.2 serial number;

.3 name of approval authority and the capacity of the system;

.4 SOLAS;

.5 date of manufacture (month and year);

.6 date and place of last survey;

.7 maximum permitted height of stowage above waterline;

.8 stowage position on board.

6.20.8.4.3 Launching and operating instructions shall be marked on or in the vicinity of the container.

6.20.8.5 Marking on marine evacuation systems.

6.20.8.5.1 The marine evacuation system shall be marked with:

.1 manufacturer's name or trade mark;

.2 serial number;

.3 date of manufacture (month and year);

.4 name of approving authority;

.5 name and place of servicing station where it was last serviced, along with the date of servicing;

.6 the capacity of the system.

6.20.9 Means of rescue.

6.20.9.1 The means of rescue shall provide for the safe transfer of persons, including helpless persons, from the water level to the deck of the ship.

6.20.9.2 The means of rescue shall provide an area of at least 9 m² at water level and have sufficient lighting from the ship deck.

6.20.9.3 The means of rescue shall be one of the following.

6.20.9.3.1 A marine evacuation system complying with the requirements of 6.20.8 providing a suitable floating platform, with a ladder or other means to ascend to the deck for able-bodied persons, and a mechanically powered means to safely hoist persons lying down. If an inclined passage of a marine evacuation system is intended to provide the means of transfer from the platform to the deck of the ship for able-bodied persons, the inclined passage shall be provided with suitable handholds or portable ladder with steps having an efficient non-slip surface.

6.20.9.3.2 A device equipped with the floating platform which comply with the requirements of 6.8.3.1, 6.8.4.1, 6.8.5.1.11. and requirements of 6.9.2, 6.9.2.1, 6.9.2.3, 6.9.2.4, 6.9.7, 6.9.8.1, 6.9.8.2 (if fitted) and 6.9.9.1 in the case of an inflatable device; or requirements of 6.10.1, 6.10.2, 6.10.6.2 to 6.10.6.4, 6.10.6.6, 6.10.6.9, 6.10.6.10 and 6.10.7 1 in the case of a rigid device. The device shall be used by a launching appliance, complying with the requirements of 6.20.1, with a powered winch motor capable of raising the loaded device from the water to the deck of the ship with the total number of persons for which it is approved as a means of rescue at a rate of not less than 0,3 m/s. A safety device shall be fitted to prevent over stressing the launching appliance. Additionally, the device shall comply with the following:

.1 the device shall be of a highly visible colour, and shall be protected against damage when moving against the ship's side;

.2 the occupants shall be protected against injury caused by the launching appliance;

.3 two boarding ramps complying with 6.9.4.1 or 6.10.4.1 shall be fitted;

.4 the maximum number of persons permitted on the device shall be conspicuously marked;

.5 the floor shall be self-draining;

.6 suitable means shall be provided for bowing in the device to the ship's side;

.7 one knife of a type described in 6.8.5.1.2 shall be stowed in a pocket close to each bowing line attachment patch;

.8 a special arrangement shall be fitted to close the gap between the loaded device and deck when the rescued persons board the ship;

.9 the device shall be conspicuously marked to prevent confusion with liferafts;

.10 if inflatable, the inflation system shall be quickly initiated by a manual control;

.11 means shall be provided for preventing occupants from falling from the device on impact with the ship's side.

6.20.9.3.3 A means of rescue approved in compliance with the requirements of 1.3.3.

6.21 LINE-THROWING APPLIANCES

6.21.1 Every line-throwing appliance shall:

- .1** be capable of throwing a line with reasonable accuracy;
- .2** include not less than four projectiles each capable of carrying the line at least 230 m in calm weather;
- .3** include not less than four lines each having a breaking strength of not less than 2 kN;
- .4** have brief instructions or diagrams clearly illustrating the use of the line-throwing appliance.

6.21.2 The rocket, in the case of a pistol fired rocket, or the assembly, in the case of an integral rocket and line, shall be contained in a water resistant casing. In addition in the case of a pistol-fired rocket, the line and rockets together with the means of ignition shall be stowed in a container which provides protection from the weather.

6.22 GENERAL ALARM AND PUBLIC ADDRESS SYSTEM

6.22.1 General emergency alarm system.

6.22.1.1 The general emergency alarm system shall be capable of sounding the general emergency alarm signal consisting of seven or more short blasts followed by one long blast on the ship's whistle or siren and additionally on an electrically operated bell or klaxon or other equivalent warning system, which shall be powered from the ship's main supply and the emergency source of electrical power required by Sections 9 and 19, Part XI "Electrical Equipment" of the Rules for the Classification and Construction of Sea-Going Ships, as appropriate. The system shall be capable of operation from the navigation bridge and, except for the ship's whistle, also from other strategic points.

The alarm shall continue to function after it has been triggered until it is manually turned off or is temporarily interrupted by a message on the public address system.

6.22.1.2 The minimum sound pressure levels for the emergency alarm tone in interior and exterior spaces shall be 80 dB(A) and at least 10 dB(A) above ambient noise levels existing during normal equipment operation with the ship underway in moderate weather.

6.22.1.3 The sound pressure levels at the sleeping position in cabins and in cabin bathrooms shall be at least 75 dB(A) and at least 10 dB(A) above ambient noise levels.

6.22.1.4 With the exception of bells, audible signals shall have a signal frequency between 200 and 2500 Hz. The sound pressure level shall be measured within the 1/3-octave band about the fundamental frequency and in no case shall exceed 120 dB(A).

6.22.2 Public address system.

6.22.2.1 The public address system shall be a loudspeaker installation enabling the broadcast of messages into all spaces where crew members or passengers, or both, are normally present, and to muster stations. Such spaces may not include under deck passageways, bosun's lockers, hospitals, pump rooms. It shall allow for the broadcast of messages from the navigation bridge and such other places on board the ship. It shall be installed with regard to acoustically marginal conditions and not require any action from the addressee. It shall be protected against unauthorized use.

6.22.2.2 With the ship underway in normal conditions, the minimum sound pressure levels for broadcasting emergency announcements shall be:

.1 in interior spaces 75 dB(A) and at least 20 dB(A) above the speech interference level (with respect to cabin/state rooms, the above sound pressure levels shall also be attained during sea trials);

.2 in exterior spaces 80 dB(A) and at least 15 dB(A) above the speech interference level.

6.22.2.3 Where an individual loudspeaker has a device for local silencing, an override arrangement from the control station(s), including the navigation bridge, shall be provided.

6.22.2.4 The public address system shall comply with the requirements of 3.8 and Section 11, Part IV "Radio Equipment".

RECOMMENDATION ON THE USE AND FITTING OF RETRO-REFLECTIVE MATERIALS ON LIFE-SAVING APPLIANCES

1 LIFEBOATS AND RESCUE BOATS

1.1 Retro-reflective materials shall be fitted on top of the gunwale as well as on the outside of the boat as near the gunwale as possible. The materials shall be sufficiently wide and long to give a minimum area of 150 cm² and shall be spaced at suitable intervals (approximately 80 cm from centre to centre). If a canopy is fitted, it shall not be allowed to obscure the materials fitted on the outside of the boat, and the top of the canopy shall be fitted with retro-reflective materials similar to those mentioned above and spaced at suitable intervals (approximately 80 cm from centre to centre). In the case of partially enclosed or totally enclosed lifeboats, such materials should be placed as follows:

.1 for detection by horizontal light beams, at suitable intervals at half the height between the gunwale and the top of the fixed cover;

.2 for detection by vertical light beams (e.g. from helicopters), at suitable intervals around the outer portion of the horizontal (or comparable) part of the top of the fixed cover;

.3 retro-reflective materials shall also be fitted on the bottom of lifeboats and rescue boats which are not self-righting.

2 LIFERAFTS

2.1 Retro-reflective materials shall be fitted around the canopy of the liferaft. The material shall be sufficiently wide and long to give a minimum area of 150 cm² and shall be spaced at suitable intervals (approximately 80 cm from centre to centre) at a suitable height above the waterline, doorways included, if suitable. On inflatable liferafts, retro-reflective materials shall also be fitted to the underside of the floor, cross-shaped in the centre. The dimension of the cross shall be half the diameter of the liferaft, and a similar cross shall be applied to the top of the canopy.

On liferafts which are not equipped with canopies, materials which shall be sufficiently wide and long (to give a minimum area of 150 cm²) shall be attached to the buoyancy chamber at suitable intervals (approximately 80 cm from centre to centre) in such a manner that they are visible both from the air and from a ship.

3 LIFEBOUOYS

3.1 Retro-reflective materials of a sufficient width (approximately 5 cm) shall be applied on the closed circuit round the body of the lifebuoy at four evenly-spaced points.

4 BUOYANT APPARATUS

4.1 Buoyant apparatus shall be fitted with retro-reflective materials in the same manner as liferafts without canopies, always depending on the size and shape of the object. Such materials shall be visible both from the air and from a ship.

5 LIFEJACKETS

5.1 Lifejackets shall be fitted with patches of retro-reflective materials with a total area of at least 400 cm² distributed so as to be useful for search from air and surface craft from all directions. In the case of a reversible lifejacket, the arrangement shall be complied with no matter which way the lifejacket is put on. Such material shall be placed as high up on the lifejacket as possible.

6 IMMERSION SUITS

6.1 Immersion suits shall be fitted with patches of retro-reflective material with a total area of at least 400 cm² distributed so as to be useful for search from air and surface craft from all directions.

For an immersion suit that does not automatically turn the wearer face up, the back of the suit should be fitted with retro-reflective material with a total area of at least 100 cm².

7 GENERAL REMARKS

7.1 Retro-reflective materials shall be such as will meet the requirements of Part XIII "Materials" of the Rules for the Classification and Construction of Sea-Going Ships.

7.2 The illustrations 7.2-1 to 7.2-11 reproduced in this Appendix are intended to provide Flag State Administration with examples from which guidance may be taken when fitting retro-reflective materials in accordance with these guidelines.

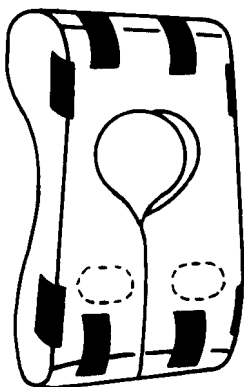


Fig. 7.2-1



Fig. 7.2-2

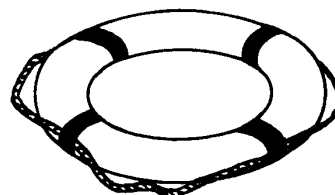


Fig. 7.2-3

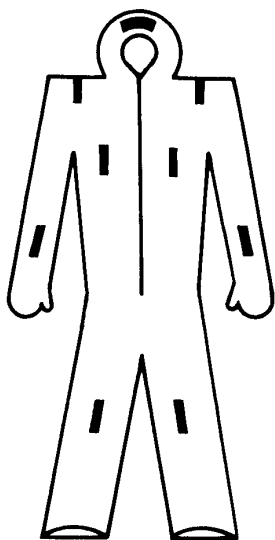


Fig. 7.2-4

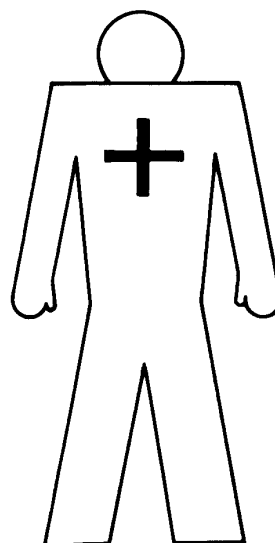


Fig. 7.2-5

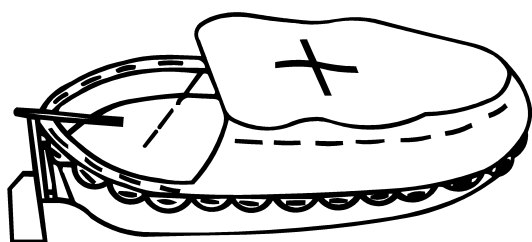


Fig. 7.2-6

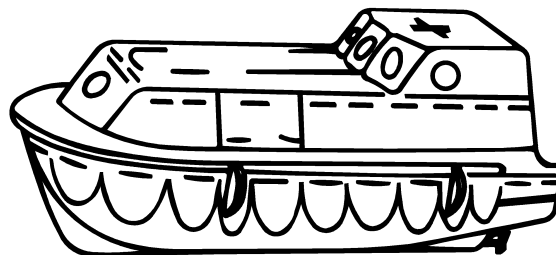


Fig. 7.2-7

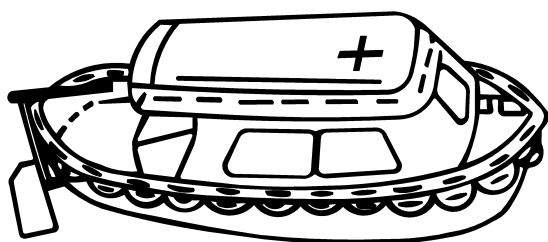


Fig. 7.2-8

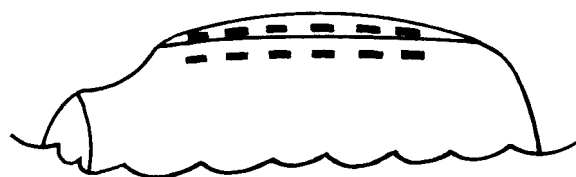


Fig. 7.2-9

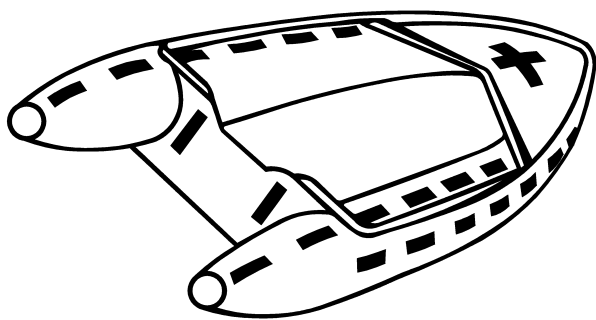


Fig. 7.2-10

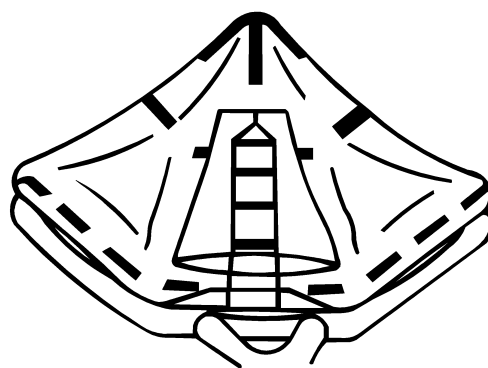


Fig. 7.2-11

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