RUSSIAN MARITIME REGISTER OF SHIPPING

RULES

FOR THE CLASSIFICATION AND CONSTRUCTION OF SMALL SEA FISHING VESSELS

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Saint-Petersburg
2021

Rules for the Classification and Construction of Small Sea Fishing Vessels of Russian Maritime Register of Shipping have been approved in accordance with the established approval procedure and come into force on 1 January 2021.

The present edition of the Rules is based on the 2020 edition taking into account the amendments and additions developed immediately before publication.

The Rules are published in the following parts:

Part I "Classification";
Part II "Hull";
Part III "Equipment, Arrangements and Outfit";
Part IV "Stability and Freeboard";
Part V "Subdivision";
Part VI "Fire Protection";
Part VII "Machinery Installations";
Part VIII "Systems and Piping";
Part IX "Machinery";
Part X "Boilers, Heat Exchangers and Pressure Vessels";
Part XI "Electrical Equipment";
Part XII "Refrigerating Plants";
Part XIII "Materials";
Part XIV "Welding";
Part XV "Automation";
Part XVI "Hull Structure and Strength of Glass-Reinforced Plastic Ships";
Part XVII "Radio Equipment";
Part XVIII "Navigational Equipment".

REVISION HISTORY

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

For this version, there are no amendments to be included in the Revision History.

PART I. CLASSIFICATION

1 GENERAL

1.1 APPLICATION

1.1.1 Russian Maritime Register of Shipping (hereinafter referred to as "the Register") as the body of technical supervision and classification of ships establishes the technical requirements ensuring conditions of safe navigation of small sea fishing vessels.

Rules for the Classification and Construction of Small Sea Fishing Vessels (hereinafter referred to as "the present Rules") are applied by the Register for carrying out the technical supervision and classification of small sea fishing vessels having the length of 12 up to 24 m and with the power of main engines from 55 to 375 kW. For the vessels in service having the same characteristics, the Rules may be applied to the possible and reasonable extent.

1.1.2 The present Rules do not cover undecked vessels.

1.1.3 Small sea fishing vessels are to the full extent covered by the Rules for the Prevention of Pollution from Ships Intended for Operation in Sea Areas and Inland Waterways of the Russian Federation. Rules for the Classification and Construction of Sea-Going Ships (hereinafter referred to as "the RS Rules") and the Rules for the Equipment of Sea-Going Ships are applied to the extent specified in the respective parts of the present Rules.

1.1.4 During performance of technical supervision over small sea fishing vessels, in addition to the above mentioned Rules, also the Rules for the Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships, the Rules for the Classification Surveys of Ships and respective guidelines for technical supervision of ships under construction and in service are applied.

1.1.5 The present Rules establish the requirements, compliance with which will allow the ship to be classified by the Register.

1.1.6 Confirmation of the ship or its separate parts compliance with the requirements of the present Rules is a prerogative of the Register and is carried out according to the procedure established by the Register.

Any statements of the item of supervision compliance with the requirements of the present Rules, made or laid out in the form of a document by organization another than the Register, which are not approved by the Register in the due way, may not serve the confirmation of such compliance.

1.1.7 Technical supervision of the Register does not substitute the activity of the technical supervisory bodies of the shipowners, shipyards and manufacturers.

1.1.8 The Register is responsible for failure to perform or for improper performance of its commitments only when found guilty (by intent or carelessness). The Register covers the losses to persons entering with it into contractual relations, as stipulated by the Rules, and whose losses result from its failure to perform or improper performance of its contractual commitments due to carelessness, to the amount not exceeding the contract fees determined on the basis of the Register scales of fees and provided solely the causal relationship has been proved between such failure to perform or improper performance of contractual commitments by the Register and the suffered losses.

1.2 DEFINITIONS AND EXPLANATIONS

For the purpose of the present Rules, the following definitions and explanations have been adopted, unless expressly provided otherwise in particular parts.

1.2.1 Definitions.

Amidships is at the middle of the ship's length *L*.

Crew of a fishing vessel are persons engaged in any business aboard the vessel connected with its purpose.

Deckhouse is a decked structure on the freeboard or superstructure deck, which is set in from the sides of the ship for more than 4 % of the breadth *B*, and has doors, windows or other similar openings in the outer bulkheads. The deckhouses may be arranged in a single or several tiers.

Existing ship is a ship, which is not a new ship.

Fishing vessel is a vessel used for catching or for catching and processing of fish and other living resources of the sea.

Forward and after perpendiculars are the vertical lines passing in the centre line at the fore and after ends of the ship's length *L*, respectively.

Freeboard deck is the deck, from which the freeboard is measured.

In a ship having a discontinuous deck the lowest line of this deck and the continuation of that line parallel to upper part of the deck is taken as a freeboard deck.

Full-load displacement is the ship's displacement up to the load line mark.

Length of ship *L* is taken as 96 % of the total length on a waterline at 85 % of the least moulded depth or as the length from the fore side of the stem to the axis of the rudder stock on that waterline, if that be greater.

Where the stem contour is concave above that waterline, the length of the ship shall be measured from the vertical projection to that waterline of the aftermost point of the stem contour (above that waterline).

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

Lightweight ship is a completely outfitted ship less deadweight. The deadweight comprises liquid ballast.

Load waterline is the waterline indicated by the upper edge of the line, which passes through the center of the ring of the load line mark for a ship in upright position.

Moulded breadth *B* is the maximum breadth measured amidships from outside of frame to outside of frame in a ship with a metal shell and to the outer surface of the hull in a ship with a shell of any other material.

Moulded depth *D* is the vertical distance measured amidships from the top of the plate keel, or from the point where the inner surface of the shell abuts upon the bar keel, to the top of the freeboard deck beam at side.

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

Where 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.

Moulded draught *d* is the vertical distance measured amidships from the top of the plate keel or from the point where the inner surface of the shell (outer surface in a ship with a non-metal shell) abuts upon the bar keel, to the summer load waterline.

New ship is a ship constructed after the Rules for the Classification and Construction of Small Sea Fishing Vessels have come into force.

R a i s e d q u a r t e r d e c k is the after upper part of a stepped deck, the forward lower part of which is taken as a portion of the freeboard deck.

S h i p i n s e r v i c e is a ship, which is not a ship under construction.

S h i p u n d e r c o n s t r u c t i o n is a ship during the period from the date of laying the keel till the date of issuing the documents to the ship.

The date of laying the keel means the beginning of construction identifiable with a specific ship when the mass of the assembled part of the hull comprises not less than 1 % of the estimated mass of all structural material.

S p a c i n g is the distance between the primary members determined on the basis of the value of standard spacing a_0, in m, determined by the formula $a_0 = 0{,}002L + 0{,}48$.

Deviation from standard spacing within the range of $0{,}65a_0$ to $1{,}25a_0$ may be permitted.

S u p e r s t r u c t u r e is a decked structure on the freeboard deck, extending from side to side of the ship or with the side plating not being inboard of the shell plating more than 4 % of the breadth B.

S u p e r s t r u c t u r e d e c k , d e c k h o u s e t o p o r t r u n k d e c k is the deck forming the top of a superstructure, deckhouse or trunk, respectively.

The superstructure may be either complete, i.e. extending over the entire ship's length L, or detached, i.e. extending only over a definite part of this length. Both complete and detached superstructures may be arranged either in a single or several tiers.

T i g h t u n d e r p r e s s u r e h e a d u p t o ... is the term pertaining to closing appliances of openings, which means that under specified pressure the liquid will not penetrate through the openings inside the ship.

T r u n k is a decked structure on the freeboard deck, which is set in from the sides of the ship for more than 4 % of the breadth B, and has no doors, windows or other similar openings in the outer bulkheads.

U p p e r d e c k is the uppermost continuous deck extending for the full length of the ship.

The upper deck may be stepped.

W e a t h e r t i g h t is the term pertaining to closing appliances of openings in the above-water hull, which means that in any sea conditions water will not penetrate through the openings inside the ship. The specified closing appliances shall withstand testing by water pouring from hose nozzle, the output opening of which is at least 16 mm in diameter and water head in the hose ensures at least 10 m height of the water stream jetted upwards; at that water shall be poured transversely to the tested surface from the distance till the tested area being not more than 3 m.

1.2.2 Explanations.

1.2.2.1 For the purpose of the present Rules classification means development, publication and application of the rules, continuous compliance with which along with maintenance of the objects by the shipowner in the due technical state will ensure safe operation of ship in compliance with its purpose.

1.2.2.2 Where in the text of the present Rules the arising stresses are mentioned, these stresses stand for reduced stresses, σ_{red}, in MPa, calculated by the formula

$$\sigma_{red} = \sqrt{\sigma^2 + 3\tau^2} \qquad (1.2.2.2)$$

where σ = normal stresses in the considered cross-section, in MPa;
τ = shear stresses in the considered cross-section, in MPa.

Strength conditions shall be tested on the basis of these stresses.

1.2.2.3 Permissible stresses, with which the reduced stresses are compared during testing of strength conditions, are specified by the present Rules as parts of yield stress of the material applied; at that (unless expressly provided otherwise) the yield stress shall be accepted equal to not more than 0,7 of the ultimate strength of the same material.

1.3 DEVIATIONS FROM THE RULES

1.3.1 On agreement with the Register, deviations from the present Rules may be allowed, provided that the data are submitted proving that safety of the ship operation, safety of life at sea, safe carriage of goods by sea and prevention of pollution from ships are ensured.

1.4 DOCUMENTS

1.4.1 Based on results of technical supervision and classification of small sea fishing vessels the Register issues documents in compliance with the applicable provisions of the General Regulations for the Classification and Other Activity.

1.4.2 Ship measurement is carried out in compliance with Section 4 of the Rules for the Measurement of Sea-Going Ships.

2 CLASS OF A SHIP. AREA OF NAVIGATION

2.1 If the ship complies with the requirements of the present Rules, it may be assigned a class notation with the character of classification:

.1 КМ⍟SFV — for self-propelled ships built according to the rules and under the supervision of the Register;

.2 КМ★SFV — for self-propelled ships, which were as a whole (or their hull, or machinery installation, machinery and equipment) built and/or manufactured according to the rules and under the supervision of another classification body recognised by the Register;

.3 (КМ)★SFV — for self-propelled ships, which were as a whole (or their hull, or machinery installation, machinery and equipment) built and/or manufactured without supervision of the classification body recognised by the Register, or without any supervision of the classification body at all.

2.2 For the ships, which comply with the requirements of the respective parts of the present Rules, the following marks are added to the character of classification:

.1 ice class mark **Ice1**;

.2 distinguishing automation mark **AUT3** (ship's operation with unattended machinery spaces).

2.3 For the ships, which comply with the requirements of the present Rules, area of coastal navigation with an allowable distance from the place of refuge not more than 25 miles is determined.

2.4 The Register may delete or alter any mark in the class notation in the case of any alteration of, or non-compliance with the requirements defining the insertion of this mark in the class notation.

3 TECHNICAL DOCUMENTATION

3.1 Prior to the beginning of the construction of the ship, technical design documentation proving that the requirements of the present Rules, applicable to the ship concerned, are complied with shall be submitted to the Register for review. The documentation shall be submitted to the Register in electronic format as PDF file completed in accordance with the lists given in 3.2.1 — 3.2.12.

3.2 Amount of technical design documentation.

3.2.1 General:

.1 general ship's specification (no stamps of approval are needed);

.2 general arrangement plans with indication of escape routes and explosion-dangerous zones.

3.2.2 Hull documentation:

.1 midship section;

.2 constructional profile;

.3 deck plan with indication of openings;

.4 shell expansion with indication of openings;

.5 drawings of transverse bulkheads;

.6 drawing of propeller brackets and bossings.

In drawings listed in 3.2.2.1 — 3.2.2.6 hull member scantlings, their material, typical details, types and dimensions of fillet welds shall be indicated;

.7 drawings of seatings of main machinery;

.8 drawing of superstructure/deckhouse;

.9 scheme of welding quality control and table of hull welding containing the following information:

.9.1 marks of materials of hull member scantlings and welding consumables;

.9.2 names of structural components to be joined and their thickness;

.9.3 symbol of edge preparation;

.9.4 method of welding and position of welded joints.

If the data listed in 3.2.2.9.1 — 3.2.2.9.4 are stated to the full in the drawings of the ship hull, then submission of the table of welding is not required;

.10 scheme of tightness test of hull structures;

.11 for fiber-reinforced plastic ships — detailed procedure for hull construction containing the information on materials, methods of hull elements' formation and on the required and mandatory conditions of hull construction.

3.2.3 Documentation on the arrangements, equipment and outfit:

.1 arrangement plan of openings in hull, superstructures and deckhouses with indication of coamings height and type of closing appliances;

.2 general arrangement plans of the steering gear, anchor, mooring and towing arrangement, life-saving appliances, cargo handling gear, signal masts, guard railing;

.3 calculations of steering gear, anchor, mooring and towing arrangements, life-saving appliances, cargo handling gear, signal masts, guard railing (no stamps of approval are needed);

.4 general arrangement plan of signal means.

3.2.4 Documentation on stability (no stamps of approval are needed):

.1 lines drawing, coordinate table of lines drawing;

.2 hydrostatic curves;

.3 curves of areas of hull cross-sections;

.4 curves of arms of form stability;

.5 table of displacements, position of center of gravity, trim and initial stability for various loading conditions;

.6 summary table of the stability verification according to the present Rules;

.7 capacity curves.

3.2.5 Documentation on fire protection:

.1 arrangement plan of fire-proof divisions;

.2 diagram fire-extinguishing systems;

.3 schemes of insulation;

.4 list of fire-fighting outfit.

3.2.6 Documentation on machinery installations:

.1 general arrangement plans of machinery and equipment in the engine room;

.2 diagram and description of the remote control for main machinery;

.3 drawings of shafting and the sterntube;

.4 drawings of shaft connections, shafting bearings and their fastening to the seatings;

.5 strength calculation of shafts (no stamps of approval are needed);

.6 drawing of propeller;

.7 torsional vibration calculations in compliance with the requirements of Section 8, Part VII "Machinery Installations" (no stamps of approval are needed).

3.2.7 Documentation on automation equipment:

.1 list of systems, devices and elements used in automation systems, their technical description with indication of the purpose and principle of operation, data on reliability and approval by the Register;

.2 circuit schemes and block diagram of alarm and warning systems (including diagrams of power supply) with the list of controlled parameters;

.3 technical documentation on remote automated control of main engines, automation of electric generating plant, auxiliary machinery and systems (bilge systems, compressed air systems and service systems of main engines): circuit schemes and block diagrams with indication of all devices, diagrams of power supply, protection, signaling and indication of parameters;

.4 drawings of front panels and general arrangement plans of automation equipment on navigating bridge.

3.2.8 Documentation on systems and piping:

.1 diagrams of ship's systems: bilge, ballast systems, air, overflow and sounding pipes, sewage, ventilation systems;

.2 diagrams of machinery installation systems (cooling, fuel, lubrication, gas exhausting, starting air, shafting bearings cooling and lubrication).

3.2.9 Documentation on electrical equpment:

.1 output calculation results of the main source of electrical power with regard to the following ship's operating conditions (no stamps of approval are needed):

running;

manoeuvring;

emergency (fire, hole in the hull, etc.);

fish catching, cooling, processing, catch delivery;

.2 output calculation of emergency sources of electrical power (no stamps of approval are needed);

.3 circuit diagrams of power generation and distribution from the main and emergency sources of electrical power: ship's mains, lighting, navigation lights;

.4 circuit diagrams and general arrangement plans of the main and emergency switchboards and other current switchboards of non-standard design;

.5 calculations of cable cross-sections with indication of their types, currents and protection (no stamps of approval are needed);

.6 calculations of illumination intensity of compartments and spaces (no stamps of approval are needed);

.7 calculations of voltage dip when a consumer with the maximum starting power is switched on (no stamps of approval are needed);

.8 circuit diagrams of essential electric drives;

.9 drawings of electrical equipment arrangement and installation in all spaces and zones of the ship;

.10 circuit diagram of cable runs with indication of spaces, which they pierce, and tightenings for their penetration through the watertight bulkheads and decks;

.11 circuit diagrams of general alarm system, fire detection systems, alarms to warn that fire smothering system is put into action, ship's communication system.

3.2.10 Documentation on radio equipment:

.1 wiring diagram of radio equipment and commutation of aerials (with indication of types and cross-sectional areas of cables and protective means from radio interference);

.2 arrangement plans (plan and side view) of radio equipment with indication of heating, ventilation, communication, alarm and lighting systems;

.3 arrangement plan of aerials (plan and side view).

3.2.11 Documentation on navigational equipment:

.1 wiring diagram of navigational instruments (with indication of types and cross-sectional areas of cables and protective means from radio interference);

.2 arrangement plans (plan and side view) of navigational equipment with indication of heating, ventilation, communication, alarm and lighting systems.

3.2.12 In addition programme of mooring tests and sea trials for the objects listed in 3.2.3, 3.2.5 — 3.2.9 is submitted.

3.3 Amount of working documentation for a ship under construction is defined for each particular case on agreement with the RS Branch Office for supervision under construction.

Working documentation may be submitted for approval both prior to commencement of the ship construction and in the course of its construction.

3.4 After the ship construction, tests and commissioning, the final documentation on a ship shall be submitted to the Register; this is one of the mandatory conditions for issue of the Seaworthiness Certificate to the ship.

Amount of the reports shall be agreed with the RS Branch Office for supervision under construction before completion of the ship construction.

PART II. HULL

1 PRINCIPLES OF DESIGN

1.1 GENERAL

1.1.1 Scope.

Requirements of the present Part apply to metal decked sea fishing vessels from 12 to 24 m in length.

1.1.2 Scope of supervision.

1.1.2.1 All structures regulated by the present Part are subject to the Register technical supervision.

1.1.2.2 The definitions and explanations relating to the general terminology of the present Rules are given in Part I "Classification".

1.1.3 General provisions for determining the scantlings of hull members.

Determination of scantlings of hull members of the decked sea fishing vessels is made in compliance with the RS Rules. The thicknesses of plate structures shall not be less than those determined according to 1.1.5.

1.1.4 Corrosion allowance.

1.1.4.1 For plate structures the corrosion allowance Δs, in mm, shall be determined by the formula

$$\Delta s = u(T - 12) \qquad (1.1.4.1)$$

where u = average annual diminution in thickness of the member taken with regard to service conditions, in mm per annum;
T = planned service life of structure (24 years).

1.1.4.2 In the absense of special requirements to service conditions nor to the means of corrosion protection of the hull, for determining the scantlings of hull members according to the present Rules, refer to the data on the average annual wastage in thickness of structural members given in Table 1.1.4.2.

Table 1.1.4.2

Average annual reduction in thickness of structural members

Nos.	Hull structural member	u, in mm per annum
1	**Plating of decks and platforms**	
	cargo, accommodation and working spaces	0,10
	other	0,06
2	**Side plating**	
	freeboard	0,06
	the region of waterlines	0,10
	below the region of waterlines	0,10
3	**Bottom plating, including bilge**	
	plate keel or garboard strakes	0,10
	in way of ballast compartments	0,10
	other	0,10
4	**Plating of inner bottom**	
	margin plate	0,10
	in way of engine room	0,10
	in way of ballast compartments	0,10
	other	0,06
5	**Plating of bulkheads**	
	bottom strake	0,06
	other	0,06
6	**Hull framing**	
	in ballast compartments	0,10
	other	0,06
7	**Superstructures, deckhouses, bulwark**	
	lower portion of the walls adjoining the decks	0,06
	other	0,06

1.1.5 Minimum thickness. Spacing.

1.1.5.1 Scantlings of plate structures of shell plating.

In any cases the thickness of shell plating, in mm, shall not be less than

$$s_{min} = 3{,}1 + 0{,}12L. \quad (1.1.5.1\text{-}1)$$

The thickness of bilge strake, in mm, shall not be less than

$$s_{min} = 3{,}1 + 0{,}12L. \quad (1.1.5.1\text{-}2)$$

The thickness of plate keel shall be 2 mm greater than that of bottom shell plating.

The thickness of sheerstrake, in mm, shall not be less than

$$s_{min} = 3{,}1 + 0{,}12L. \quad (1.1.5.1\text{-}3)$$

The shell plates adjoining the sternframe, as well as the plates, to which the arms of propeller shaft brackets are attached, shall have the thickness, in mm, not less than

$$s_{min} = 4{,}4 + 0{,}1L. \quad (1.1.5.1\text{-}4)$$

The thickness of garboard strakes, in mm, directly adjoining the bar keel, shall not be less than

$$s_{min} = 3{,}1 + 0{,}12L + 2 \quad (1.1.5.1\text{-}5)$$

and the width shall be

$$b = (800 + 5L)/2. \quad (1.1.5.1\text{-}6)$$

1.1.5.2 Scantlings of single bottom members.

The thickness s_{min} of single bottom members, in mm, shall not be less than

$$s_{min} = 5{,}3 + 0{,}04L. \quad (1.1.5.2)$$

For the centre girder, s_{min} shall be increased by 1,5 mm.

Floor web thickness shall not exceed the bottom shell plating thickness.

1.1.5.3 Scantlings of double bottom members.

At centre girder the depth of double bottom h shall not be less than 0,65 m.

The thickness of plate floors, in mm, between the fore peak bulkhead and 0,25L from the forward perpendicular, and in the engine room and peaks shall not be less than

$$s_{min} = 5 + 0{,}035L. \quad (1.1.5.3\text{-}1)$$

In any case the thickness of centre girder shall be 1 mm greater than that of a plate floor.

The thickness of side girders shall not be less than that of plate floors.

In any case thickness of watertight floors shall not be less than that required for plate floors.

In any case thickness of inner bottom plating s_{min}, in mm, shall not be less than

$$s_{min} = 3{,}8 + 0{,}05L. \quad (1.1.5.3\text{-}2)$$

In the engine room the plating thickness shall be increased by 2 mm.

The thickness of brackets of centre girder and margin plate, as well as the brackets of bracket floors shall not be less than that of the plate floors accepted in this region.

Inside the double bottom the structural members, including primary members, stiffeners, brackets, etc. shall have thickness s_{min}, in mm, not less than

$$s_{min} = 3,9 + 0,045L. \quad (1.1.5.3\text{-}3)$$

The thickness of the walls and bottom plates of a bilge well shall exceed that of watertight floors not less than by 2 mm.

1.1.5.4 Side framing.

The thickness of structural members of side framing in the tanks, holds, where water ballast may be taken, and in tanks shall not be less than

$$s_{min} = 5,5 + 0,035L. \quad (1.1.5.4)$$

1.1.5.5 Scantlings of deck members.

When thickness of deck plating is taken less than the side plating thickness, then a deck stringer shall be provided. The width of deck stringer b, in mm, shall not be less than

$$b = 800 + 5L. \quad (1.1.5.5\text{-}1)$$

The thickness of deck stringer, in mm, shall not be less than that of side shell plating

$$s_{min} = 3,1 + 0,12L. \quad (1.1.5.5\text{-}2)$$

The thickness of deck plating and platforms shall not be less than 5,5 mm.

The thickness of sheerstrake shall exceed that of deck stringer by not less than 1 mm.

1.1.5.6 Scantlings of bulkhead members.

The plating thickness of watertight bulkheads and bulkheads of lubricating oil tanks, in mm, shall not be less than

$$s_{min} = 4 + 0,02L. \quad (1.1.5.6)$$

For bulkheads of tanks (except lubricating oil tanks) thickness of plating, face plates and webs of framing members, in mm, shall not be less than 5,5 mm.

The thickness of bottom plates of bulkheads shall not be less than 6 mm.

Where sterntubes penetrate through the bulkhead plating, the thickness of the latter shall be doubled.

1.1.5.7 Scantlings of deckhouses and superstructures.

The minimum thickness of bulkheads and deck plating of deckhouses and superstructures shall not be less than 3 mm.

The thickness of the bottom plate of bulkheads of deckhouses and superstructures at least 0,5 m wide shall not be less than 4 mm.

Framing of superstructures and deckhouses shall have wall and profile flange thickness not less than 3 mm.

1.1.5.8 Spacing.

Normal spacing a_0 is 500 — 600 mm. When the distance between the primary members exceeds the normal spacing, the minimum thicknesses of the shell plates shall be increased. In any case spacing shall not exceed 700 mm.

1.2 SELECTION OF MATERIALS

1.2.1 All hull members of small sea fishing vessels belong to category I according to member categories given in Part II "Hull" of the RS Rules.

Use of steels of category A is permitted for all hull structural members.

1.3 DESIGN LOADING

1.3.1 General.

1.3.1.1 The present Chapter contains the basic formulae for determining the design loading on the ship's hull.

1.3.1.2 If the provisions on load points of design loading are absent, the loading is assumed to be:

on the lower edge of the plate;

at the middle of design span of the member;

at the centre of the area taking up the design pressure.

1.3.1.3 The basic parameter of design loading on the ship's hull exposed to weather is the wave factor c_w determined by the formula

$$c_w = 0{,}0856\varphi_r L \qquad (1.3.1.3)$$

where $\varphi_r = 0{,}75 - 0{,}0018L$.

1.3.2 External loading on the ship's hull exposed to weather.

The design pressure p, in kPa, acting on the ship's hull exposed to weather, is determined by the formulae:

for load application points below the load waterline (downwards for positive z)

$$p = 10z + k_x c_w(1 - 0{,}5z/c_w); \qquad (1.3.2\text{-}1)$$

for load application points above the load waterline (upwards for positive z)

$$p = k_x c_w(1 - 0{,}5z/c_w) \qquad (1.3.2\text{-}2)$$

where k_x = factor of pressure distribution over the ship's length determined according to Fig. 1.3.2-1;
z = distance of the considered hull area from the current waterline, in m,

but not less than 5 kPa.

Pressure distribution over the ship's hull section contour is shown in Fig. 1.3.2-2.

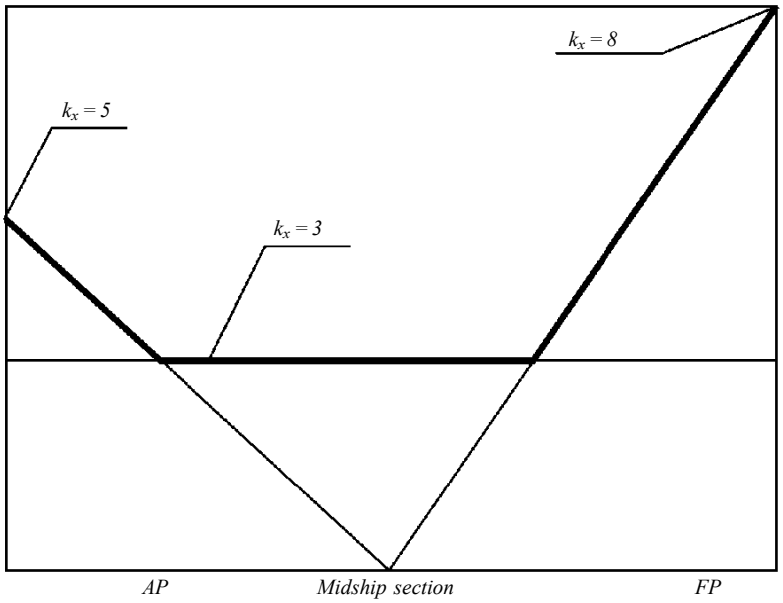


Fig. 1.3.2-1

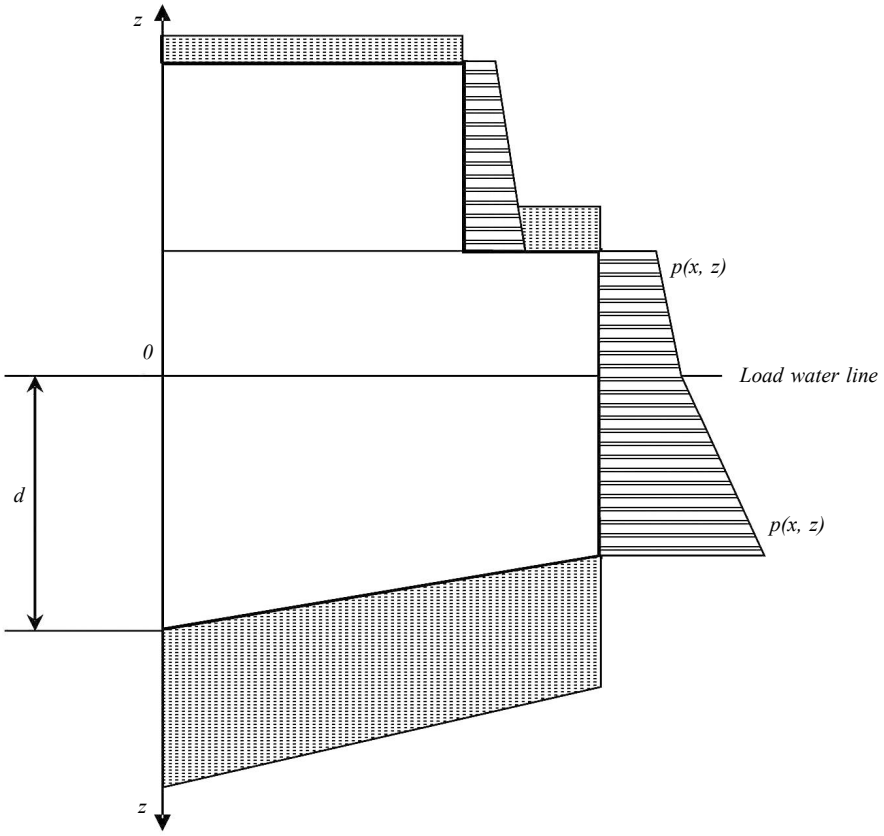


Fig. 1.3.2-2

2 GENERAL REQUIREMENTS FOR HULL STRUCTURAL MEMBERS

2.1 GENERAL

2.1.1 The present Section contains general requirements for connecting elements and framing.

2.1.2 The term "framing" includes primary and deep members strengthening the plate structures.

2.1.3 Generally scantlings of primary and deep members are determined by the requirements to section modulus, moment of inertia, web cross-section area, web thickness, width of face plate.

Section modulus and moment of inertia of the member section are determined taking into account the effective flange, unless stated otherwise.

If the member is not normal to the effective flange, the section modulus shall be increased in proportion to $1/\cos\alpha$.

Rounding of the required scantlings of structural members generally shall be made in direction of increase. Plate structure thicknesses shall be rounded to the nearest 0,5 mm or integer of millimeters.

2.2 SPAN AND EFFECTIVE FLANGE OF MEMBER

2.2.1 The design span of framing l is measured along the member face plate as the shortest distance between its span points.

The span point position if the bracket with straight or effective flange is installed at the end of the bracket (refer to Fig. 2.2.1-1). For the bracket with a free or curvilinear (concave) edge, the span point position is taken according to Fig. 2.2.1-2 but not more than half the bracket leg from its end.

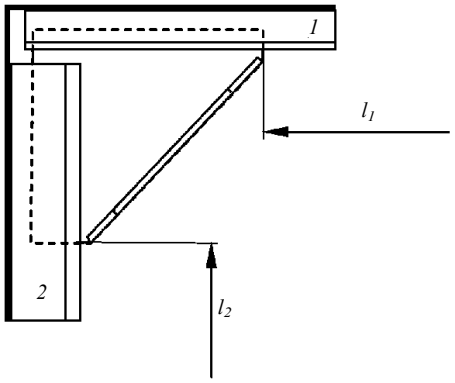


Fig. 2.2.1-1

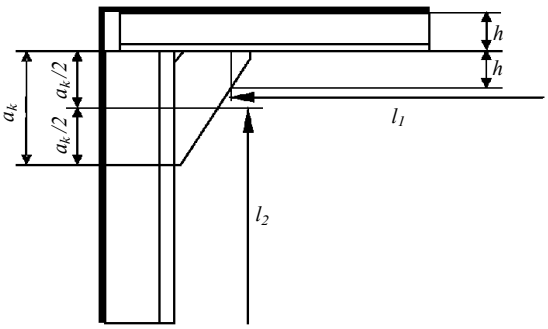


Fig. 2.2.1-2

2.2.2 The thickness of the effective flange is taken equal to its mean thickness in the considered section of the member.

The width of the effective flange a_f, in m, is determined by the following formulae and taken equal to the lesser value:

$a_f = l/6$;

$$a_f = (a_1 + a_2)/2 \qquad (2.2.2)$$

where a_1, a_2 = distances of the considered member from the nearest members of the same direction located on both sides of the considered member, in m.

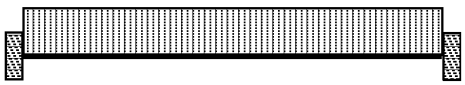
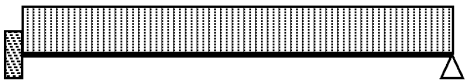
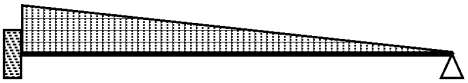
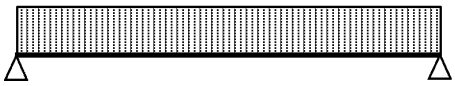
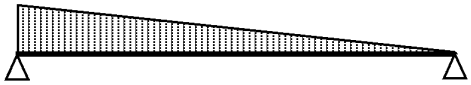
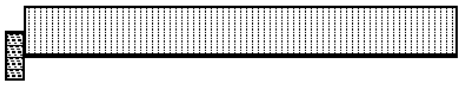
2.3 FRAMING

2.3.1 Section modulus of primary members and deep members W, in cm^3, shall not be less than

$$W = 1000 \frac{Ql}{m\sigma_s k_\sigma} \omega_k \qquad (2.3.1)$$

where $Q = pal$ — total load on the member considered, in kN;
l = design span, in m;
m = factor of bending moment, which value for the basic primitive cases of member insertion and fixation of the ends is accepted according to Table 2.3.1;
$k_\sigma = 0{,}8$ — factor of permissible stresses;
σ_s = yield stress of member material, in MPa;
$\omega_k = 1 + 0{,}2\Delta s$ — factor of corrosion allowance for rolled section;
a = distance between the considered primary and deep members, longitudinal or transverse; if the members are located at various distances, a means half the sum of distances of the adjoining members from the considered member, in m;
p = design pressure on the structures, in kPa.

Table 2.3.1

Nos.	Designed structure type	On support		Over span
		m	*n*	*m*
1		12	0,5	24
2		10	0,7	23,3
3		8	0,63	14,2
4		7,5	0,8	16,8
5		—	0,5	8
6		—	0,67	7,8
7		2	1	—
8		3	1	—

For built-up welded members the required web cross-section area shall be determined by Formula (2.3.2) with a subsequent increase in thickness by the value of Δs.

For built-up welded members the section modulus shall comply with the requirements of 2.3.1, the section elements thickness shall be increased by the value of corrosion allowance Δs.

2.3.2 The net sectional area of primary and deep member webs f_w, in cm^2, shall not be less than

$$f_w = 10 \frac{nN_{\max}}{0{,}57\sigma_s k_\tau} \omega_k \qquad (2.3.2)$$

where $N_{\max}$ = the maximum shear force, in kN;
n = shear force factor in the span point, which value for the basic primitive cases of members insertion and fixation of the ends shall be taken according to Table 2.3.1;
σ_s = yield stress of member material, in MPa;
k_τ = 0,7 — factor of permissible shear stresses;
for ω_k, refer to 2.3.1.

2.3.3 Width of flanges of deep members generally shall not be less than 15 thicknesses for angle and 30 thicknesses for T-section. Deep members made of flat bars are not allowed.

2.3.4 In the case of framing member connections, the flanges of the smaller members being cut, generally shall be continued in their plane in the form of stiffeners or brackets welded to the webs (refer to Fig. 2.3.4). All elements of such connections shall be welded with double weld.

2.3.5 In the case of overlapping member connections (refer to Fig. 2.3.5), the smaller member shall have the welded area of the length, as a rule, not less than 1,5 the member height. This member area shall be welded all round by continuous weld.

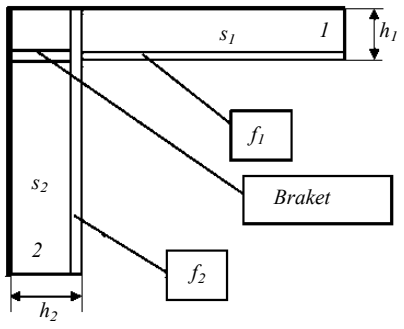


Fig. 2.3.4

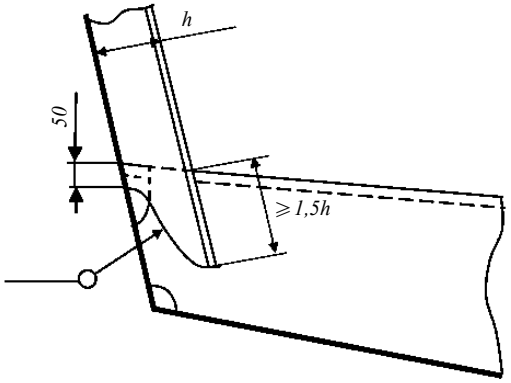


Fig. 2.3.5

2.4 OPENINGS IN HULL STRUCTURES

2.4.1 It is recommended to allocate all the openings in the longitudinal ship hull bracings in such a way that their longer side goes along the ship.

2.4.2 All the corners of any rectangular opening in the longitudinal bracings shall be rounded by the radius not less than 0,1 of the cutout breadth.

2.4.3 Openings (if there are several ones) in the shell plating and bulkheads shall be allocated in such a way that they would not cause considerable weakening of the hull cross-section.

2.4.4 It is allowed to make lightening openings without cross-section compensation in the walls of the bottom stringers and floors, if the following is provided:

.1 height of the opening is not less than 0,4 of the bracing height, and axis of the opening is located amidst the bracing height;

.2 opening lenght/height ratio is below two;

.3 distance between two adjacent openings is not less than the length of the smallest one of these both openings;

.4 corners of the openings are rounded in the appropriate way.

If height of the openings in the framing wall exceeds 0,6 of its height, then the framing wall shall be reinforced.

2.4.5 It is not allowed to make openings in the beam wall right under ends of the knees that fix the beam, and close to the supports either. The opening edge shall be located at the distance from the knee end not less than 1/2 of the beam height. Distance from the edges of any openings in floors and web bracings to the edges of the openings used for passing the longitudinal framing beams shall not be less than the height of these beams.

2.4.6 Height of the fastening openings in the framing shall not exceed 1/5 of the beam height, but shall not be less than 90 mm. Length of the fastening openings shall be taken equal to 15 thicknesses of the plating adjacent to the framing, but not more than 150 mm. If dimensions of the fastening openings are increased, thickness of the framing areas weakened due to the openings shall be increased also.

2.5 PILLARS AND PANTING BEAMS

2.5.1 Pillars shall be fitted in the areas where the deep members are connected. Pillar heel shall be connected with the doubling deck plating or flange of deep members.

2.5.2 The web of the framing members connecting with heels of pillars or panting beams shall be strengthened by stiffeners or brackets to prevent the member deviation or web buckling.

2.5.3 Total loading on the pillar, panting beam of bracket floor or panting beam Q, in kN, is determined by the formula

$$Q = pl_m b_m \tag{2.5.3}$$

where p = design pressure in way of pillar axis or panting beam exposed to weather or from the shipping cargo, whichever is greater, in kPa;
l_m = extension of the area supported by the pillar or panting beam fore and aft the ship, in m;
b_m = extension of the area supported by the pillar or panting beam athwartships, in m.

2.5.4 The cross-section area of the pillar or panting beam f, in cm^2, shall not be less than the one determined by iterative method according to the formula

$$f = 10k \frac{Q}{\sigma_{cr} k_\tau} \omega_k \tag{2.5.4}$$

where k = 2 — buckling strength margin;
Q = total loading according to 2.6.3;
ω_k = factor of corrosion allowance according to 2.3.1;
k_τ = 0,7 — factor of permissible shear stresses;
σ_{cr} = critical stresses determined according to Euler stresses:

$\sigma_{cr} = \sigma_s(1 - \frac{\sigma_s}{4\sigma_e})$ at $\sigma_e > 0{,}5\sigma_s$;

$\sigma_{cr} = \sigma_s$ at $\sigma_e \leqslant 0{,}5\sigma_s$

where $\sigma_e = 206 \frac{i}{fl^2}$;

σ_s = yield stress of member material, in MPa;
i = the minimum moment of inertia of the pillar or panting beam cross section, in cm^4;
l = design length of pillar or panting beam, in m.

2.6 ALUMINUM ALLOY STRUCTURES

2.6.1 Dimensions of aluminum alloy bracings shall be determined by converting the respective dimensions of bracings for steel structures. Converting shall be carried out according to the formulae given in Table 2.6.1 without taking into account the minimum bracing dimensions for steel structures.

Table 2.6.1

Parameter	Design formula
Thickness of the shell deck plating (without coating), plating of bulkheads, internal enclosures and other plate parts	For superstructures: $s_a = \sqrt{s\sigma_s/\sigma_{sa}}$ For the main hull: $s_a = 0{,}9s\sqrt{\sigma_s/\sigma_{sa}}$
Section modulus of members	$W_a = W\sigma_s/\sigma_{sa}$
Cross-section area of pillars	$f_a = f\sigma_s/\sigma_{sa}$
Moment of inertia of pillars and members	$I_a = 3 \times I$
Notes: 1. Values s, W, f, I required by the present Rules for steel may be taken without taking into consideration the corrosion allowance. 2. Value σ_{sa} is the conventional yield stress of aluminum alloy, in MPa, but not more than 0,7 of its ultimate strength.	

2.6.2 Dimensions of cross-sections of the stempost, sternpost, bar keel and propeller shaft brackets made from aluminum alloys shall exceed dimensions of the cross-sections recommended for the case when steel is used by 1,3 times.

2.6.3 If continuous welds (fillet and butt ones) are located in the maximum stress areas, then, depending on the aluminum alloy used and welding technique applied, strength reduction in the weld area shall be taken into account.

2.6.4 The bimetallic (steel — aluminum) pressed elements for connection of steel and aluminum alloy structures may be used.

2.7 CORRUGATED STRUCTURES

2.7.1 The thickness of bulkhead plating is determined according to 1.1.5.6 taking a equal to b and f, whichever is the greater, shown in Fig. 2.7.1.

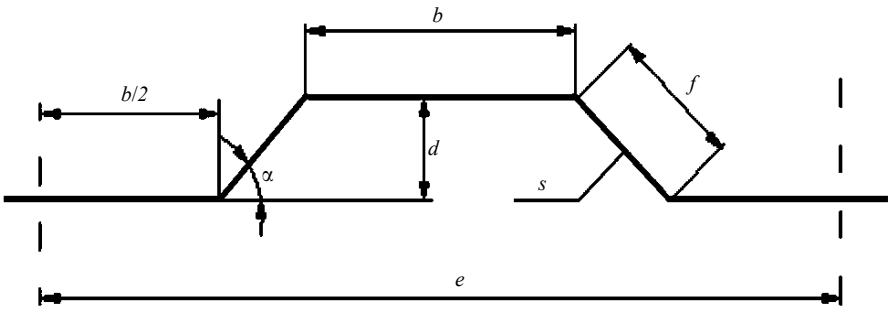


Fig. 2.7.1

2.7.2 The section modulus of trapezoidal corrugation W, in cm^3 (refer to Fig. 2.7.1), shall not be less than that determined by the formula

$$W = kezl^2(b/80s)^2 \qquad (2.7.2\text{-}1)$$

where k = factor equal to:
15 — for the forepeak and afterpeak bulkheads;
12 — for watertight bulkheads;
9 — for other bulkheads;
z = height measured from amidst height l to the deck, in m;
for e, s, b, refer to Fig. 2.7.1, in cm;
l = height of the bulkhead, in m.

For the calculations made according to Formula (2.7.2-1) b/s ratio shall not be taken more than 46 and angle α shall not be less than 45°.

Section modulus of trapezoidal corrugation W, in cm^3 (refer to Fig. 2.7.1), is determined by the formula

$$W = sd(b + f/3) \qquad (2.7.2\text{-}2)$$

where for d, s, b, f, refer to Fig. 2.7.1, in cm.

For other corrugations the strength equal to the strength of corrugations shown in Fig. 2.7.1 shall be provided.

2.7.3 It is allowed to use corrugated structures for watertight hull bulkheads and secondary structures — enclosures, deckhouse walls and roofs, etc.

Strength of corrugated structures shall not be less than that of the respective flat structures.

2.7.4 For secondary structures corrugations of triangular cross-section with rounded apex are permitted (refer to Fig. 2.7.4). Recommended dimensions of corrugation elements for secondary structures are given in Table 2.7.4.

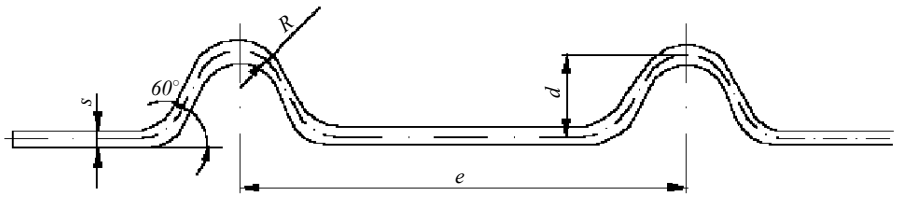


Fig. 2.7.4

Table 2.7.4

Corrugation height d, in mm	Distance between the axes e, in mm	Rounding apex radius R, in mm	Plate thickness s, in mm	Minimum section modulus W, in cm^3	Moment of inertia I, in cm^4
Corrugations of triangular cross-section					
30	390	15	3	3,18	7,67
			4	4,22	10,17
30	435	15	3	3,21	7,90
			4	4,26	10,50
30	470	15	3	3,22	8,02
			4	4,28	10,65
40	320	15	3	4,62	13,95
			4	6,18	18,65
40	370	15	3	4,68	14,6
			4	6,26	19,55
40	400	15	3	4,72	14,9
			4	6,30	19,9

2.7.5 Connection of flat and corrugated bulkheads with the bottom and deck by means of overlap joints of bottom and deck plates is shown in Fig. 2.7.5-1, and the same for bulkheads in superstructures — in Fig. 2.7.5-2.

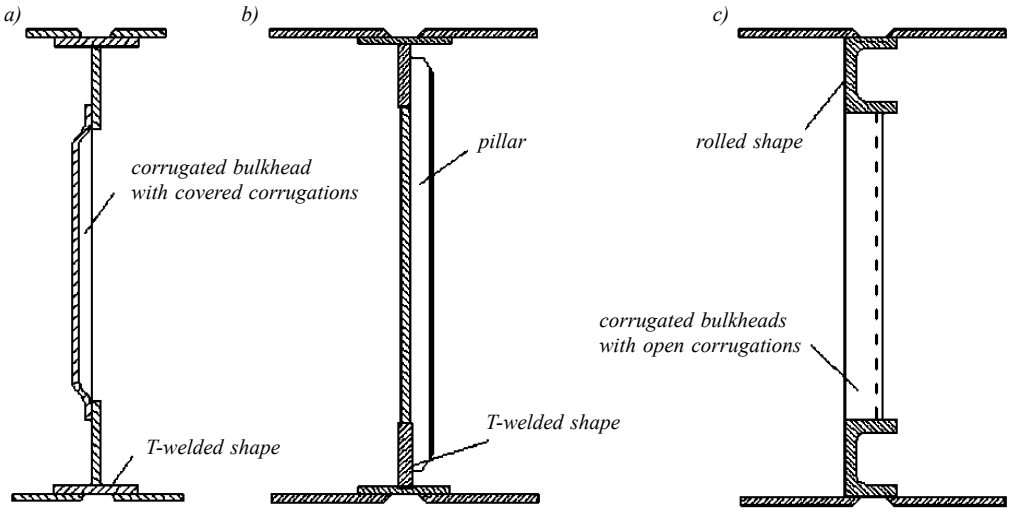


Fig. 2.7.5-1

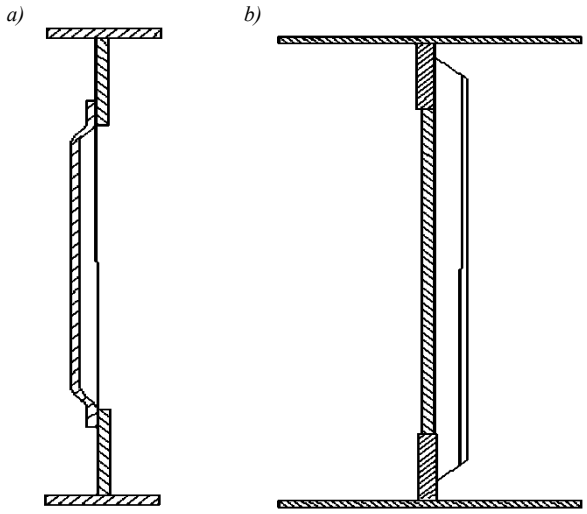


Fig. 2.7.5-2

2.8 STEMS AND SHAFT BRACKETS

2.8.1 Cross-section area of the underwater part of bar stem f, in cm^2, shall not be less than

$$f = 1{,}2L - 4. \qquad (2.8.1)$$

The welded stem plates shall be strengthened with transversal brackets, which shall overlap the joints of the stem with the shell plating at the distance less than 1 m. Thickness of the brackets shall not be less than the thickness of the adjoining shell plating.

Above the summer waterline the stem sectional area may be gradually reduced to 70 % of the value determined by Formula (2.8.1), as well as the distance between the brackets may be increased 1,5 times and the thickness of stem plates may be reduced to that of the shell plates adjoining the stem.

2.8.2 Over the ship area from the keel to the counter, the scantlings of rectangular solid propeller post of sternframe, in mm, shall not be less than

thickness $s = 1{,}6L + 20$;

width $b = 1{,}2L + 85$.

Above the counter sectional area of sternframe may be gradually reduced to 40 % of the value of the propeller post sectional area corresponding to the scantlings mentioned above.

If there is a rudder post joined with the propeller post, the solepiece at minimum required span shall have the sectional area 1,5 times more than that for the scantlings given in 2.10.2 and shall be made with the smooth rise in the rudder post direction.

The lower part of the sternframe shall be extended forward from the propeller post and shall be attached to not less than one floor.

The thickness of the propeller boss shall not be less than 30 % of the propeller shaft diameter.

3 WELDED STRUCTURES AND JOINTS

3.1 GENERAL

3.1.1 Any change in the shape or section of the members of welded hull structures shall take place gradually. All the openings shall have rounded corners and smooth edges.

3.1.2 The scantlings of sections and the thicknesses of plates used for longitudinal members shall change gradually throughout the ship's length.

3.1.3 Transition to the lower beam wall height shall take place over the length equal to not less than double difference between the height of the walls; flanges of the beams shall be joined smoothly.

3.1.4 Difference between thicknesses of the joined plates shall not exceed 0,3 times the thickness of the thicker plate. If the difference is higher, edge of the thicker plate shall be cut to edge. The cut shall extend over the length equal to at least 5 times the difference between the plates thickness $5\Delta s$, or according to the standards recognized by the Register.

3.1.5 In tight structures, as well as in non-tight subject to intense vibration, stiffeners and similar details shall be fitted to prevent hard spots in the plating in the way of face plates and at the toes of brackets.

3.1.6 The length of the unsupported plating between the end of longitudinal and the nearest web normal to direction of the member shall not be more than $4s$ or 40 mm, whichever is the lesser (s = plate thickness, in mm).

3.1.7 In way of the ends of bulwark, bilge keel and other details welded to the hull, as well as generally of gutterway bars, their height shall decrease on the length of not less than 1,5 times the height of these members.

3.2 CONNECTION OF FRAMING MEMBERS

3.2.1 Framing members shall have butt-welded joints, as well as overlapping joints.

3.2.2 Overlapping joints may be allowed, except in the regions with intense vibration.

3.2.3 Brackets, in general, shall be made of the material with the same yield stress as the material of the members connected.

3.2.4 Bracket leg size a_{br}, in mm, is determined by the formula

$$a_{br} = 50\sqrt{W/s} \tag{3.2.4}$$

where W = required section modulus of the smaller member connected, in cm^3;
s = web thickness of the wall of the mentioned member, in mm.

3.2.5 Thickness of bracket shall not be less than the web thickness of the mentioned member and not less than 2,5 % of length of the free edge of the bracket if the bracket has no flange or face plate.

3.2.6 Free edge of the bracket, which length is more than 45 bracket thicknesses, shall have a flange. Width of the flange shall not be less than 8s and not more than 10s (s = thickness of bracket). The bracket flange shall not be extended to the flanges (face plates) of the joined stiffeners (gap shall be 2 — 3s) and shall not be welded to them.

3.2.7 Width of face plate or flange b, in mm, depending on their thickness s_f, in mm, shall not be more than

$$b = \frac{200 s_f}{\sqrt{\sigma_s}} \tag{3.2.7}$$

where σ_s = yield stress of the flange material, in MPa.

3.2.8 The size of brackets may be reduced:

by 25 % where the joint is made without gaps and the bracket has a flange (face plate);

by 15 % where the joint is made with one gap and the bracket has a flange (face plate);

by 10 % where the joint is made with two gaps and the bracket has a flange (face plate).

For members with two gaps it is recommended to use the brackets with a flange (face plate) welded by overlapping with 40 mm overlap.

3.2.9 The radius of the rounded brackets shall not be less than the depth of the smaller members connected.

3.2.10 In general, the brackets shall be made of the material having the same yield stress as the material of the framing members connected. In order to reduce the weight of the joined assembly and improve its manufacturability it is allowed to use high-strength steels, if the appropriate validation is presented.

3.2.11 Framing members, which webs are located in one plane (beam with frame, frame with floor, etc.), may be joined with each other by brackets. Face plates of brackets shall not be welded to the face plates of framing members.

3.2.12 Thickness of the brackets shall not be less than thickness of the thinner web of the connected members; or 2,5 % of the working edge length for flat brackets and 2 % — for brackets with flange, whichever is the greater. For overlapping bracket joints it is reasonable to extend the bracket to the platings, increasing its thickness but reducing the height as shown in Fig. 3.2.12.

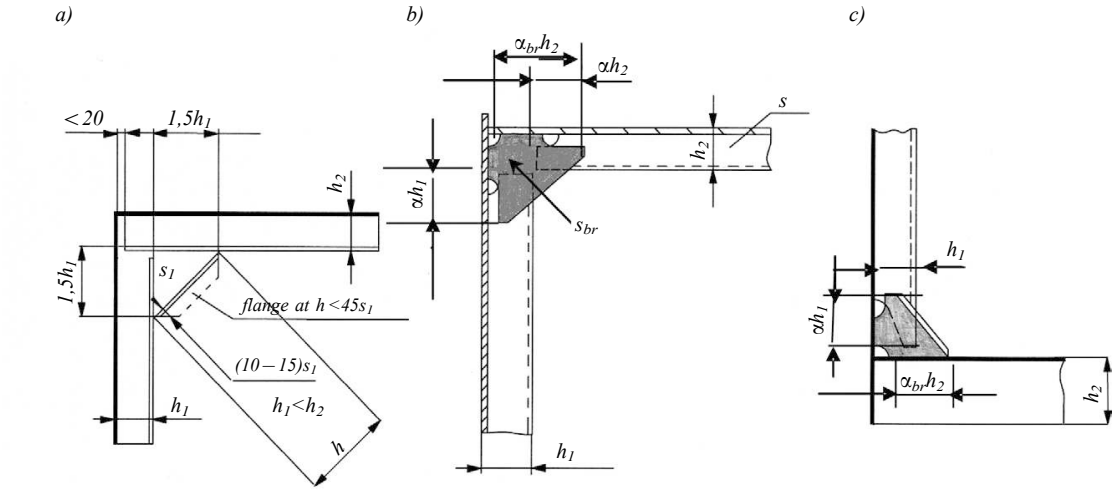


Fig. 3.2.12

3.2.13 For overlapping joints of the framing member connections shown in Fig. 3.2.12 (*b*, *c*) size of brackets is determined by the formulae:

bracket thickness

$$s_{br} = \frac{4\sigma_{sm} W_f}{\sigma_{s\,br}(\alpha_{br} h_m)^2} \qquad (3.2.13\text{-}1)$$

where σ_{sm} = yield stress of the member material, in MPa;
W_f = the maximum section modulus of the member with the effective flange, in cm^3;
$\sigma_{s\,br}$ = yield stress of the bracket material, in MPa;
α_{br} = 1,0 — 1,8 — specified factor of the bracket length increase with respect to the member depth;
h_m = depth of the largest framing member (h_1 or h_2), in cm;

overlap length factor

$$\alpha = \frac{F_m}{2h_m \alpha_1 B s_w k_3} \qquad (3.2.13\text{-}2)$$

where F_m = member cross-section area, in cm^2;
h_m = member depth (h_1 or h_2), in cm;
α_1 = strength factor of the fillet overlap weld;
B = 2 — single weld;
s_w = thickness of the member web, in cm;
k_s = 0,5 — safety factor.

3.2.14 In case of thickening of the deck and side plating, it is allowed to use simplified connections of transverse framing members of decks and sides and attachments of the bulkhead ends shown in Figs. 3.2.14-1 — 3.2.14-3.

Thicknening factor of the abutting plates is determined by the formula

$$\alpha_1 = \frac{2W_f \sigma_{sw}}{sa\sigma_s} \qquad (3.2.14\text{-}1)$$

where W_f = the maximum section modulus of the framing member, in cm^3;
σ_{sw} = yield stress of the member material, in MPa;
a = spacing of the primary members, in cm;
σ_s = yield stress of the strenghtened plate material, in MPa;
s = thickness of the deck or shell plating, in cm.

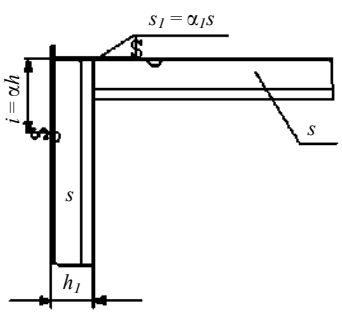


Fig. 3.2.14-1

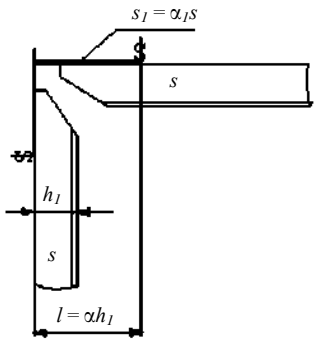


Fig. 3.2.14-2

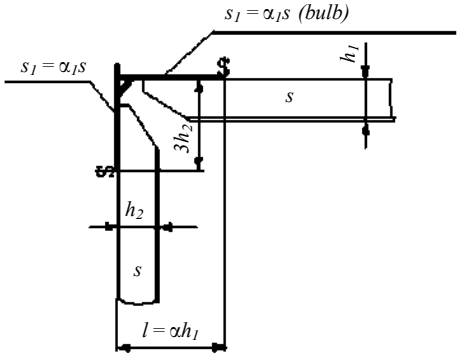


Fig. 3.2.14-3

Member overlapping length factor with respect to the strenghtened plate width is determined by the formula

$$\alpha = \frac{0{,}57F_m}{0{,}5hs} \qquad (3.2.14\text{-}2)$$

where F_m = cross-sectional area of the primary members, in cm^2;
h = depth of framing member, in cm;
s = thickness of framing web, in cm.

Thus the ends of the members shall be welded to the strenghtened plates with T-butt weld with full penetration over the length αh.

3.3 STRUCTURE OF DEEP MEMBERS

3.3.1 At the ends of the longitudinal deep members of the bottom, sides and deck (deck girders, side girders, side stringers, etc.), their height shall be gradually decreasing over the length equal to one and a half depth of the member web; their ends shall be attached to transverse members. When the end is on the transverse bulkhead, they shall be extended beyond the bulkhead in the form of brackets for the distance not less than one spacing.

3.3.2 The face plates and/or webs shall be sniped at the member ends depending on the structure used for attachment of members.

3.4 WELDED JOINT PARTS

3.4.1 Arrangement of welded joints. Welded joints shall be arranged in the least stressed structural sections, as far as possible from abrupt changes of sections, openings and areas that were subjected to cold forming.

3.4.2 Details of welded structures shall comply with 1.7.4, Part II "Hull" of the RS Rules.

3.4.3 There shall not be any welded joints within the areas that were subjected to cold bending and have the internal radius less than 3 plate thicknesses. Distance from the weld to commencement of such bend shall not be less than 3 plate thicknesses, the distance between welded joints may be reduced on the basis of appropriate technical background, which includes tests and strength calculations taking into account welding stresses and deformations.

3.4.4 When butt welds cross the fillet welds, openings shall be made in the latter ones right above the intersection points.

3.4.5 In the local stresses concentration zone it is required to install reinforced plates without use of overlay plates. If it is not possible to do without overlay plates, they shall be welded around the entire contour; if the surface is considerable, these plates shall be fastened with plug lap joints at the interval not exceeding 30 thicknesses of the overlay plate.

3.4.6 Edges of knees, face plates and member webs shall be welded around and have no strikes. The same is also relevant to cutouts of water pipes, air ducts, passages of beams and welds.

3.4.7 Shoulders of knees and brackets installed for reinforcement of the webs (longitudinal foundation frames inclusively) shall not be welded to the face plates of the latter.

3.4.8 It is not recommended to weld face plates of the longitudinal foundation beams to plating of transverse bulkheads or double bottom plating.

3.4.9 Welding of beam shoulders to the edges of cutouts is not allowed in the areas where beams pass through non-tight structures.

3.4.10 In order to form fastening cutouts (canals) near transverse watertight structures (bulkheads, floors), it is allowed not to extend longitudinal beams of the bottom and deck to the walls of these structures. Distance between the end face of the beam and the structure wall shall not be more than 20 mm.

3.5 TYPES AND DIMENSIONS OF FILLET WELDS

3.5.1 Fillet welds of hull structures shall be welded by continuous or intermittent welds (refer to Fig. 3.5.1) according to Table 3.5.2.

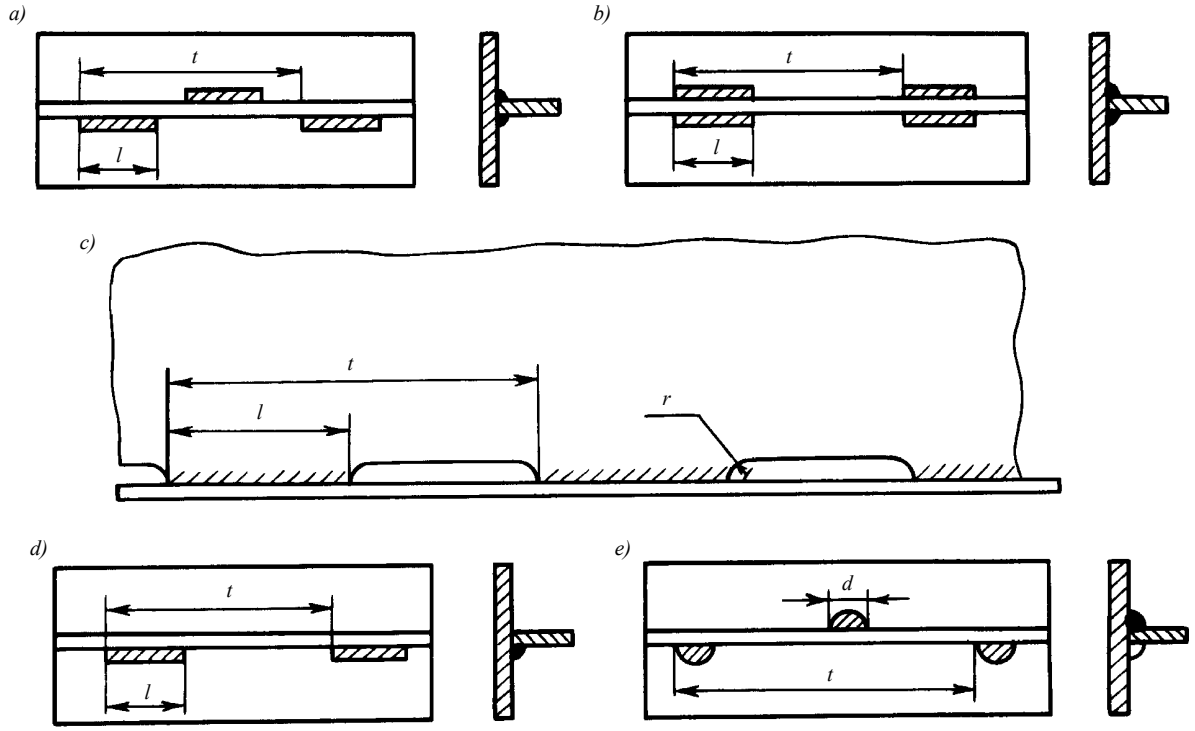


Fig. 3.5.1
Weld types: *a* — staggered intermittent; *b* — chain intermittent; *c* — scalloped; *d* — single intermittent; *e* — staggered spot

3.5.2 The design throat thickness of fillet welds *a*, in mm, for manual and semi-automatic welding shall not be less than

for single weld

$$a = 2{,}0\alpha st/l; \qquad (3.5.2\text{-}1)$$

for double weld

$$a = \alpha st/l \qquad (3.5.2\text{-}2)$$

where α = weld factor given in Table 3.5.2;
s = thicknesses of the lesser of the parts joined, in mm;
t = weld pitch, in mm;
l = weld length, in mm.

For continuous welding t/l in Formulae (3.5.2-1) and (3.5.2-2) shall be assumed as 1.

Table 3.5.2

Nos	Connection of structural member	Weld factor	Permitted:		
			staggered intermittent and chain intermittent welds	single continuous welds	single intermittent welds
1	**Stem and sternframe, propeller shaft brackets, bar keel**				
1.1	Separate parts with each other and with the plating	0,40			
2	**Bottom framing**				
2.1	Side girder webs and watertight floors to shell plating, double bottom plating and top face plates of stringers and floors	0,20	×		
2.2	Side girder webs and watertight floors to shell plating and face plates in the way of seatings of internal combustion engines	0,30			
2.3	Plate floors to side girders	0,35			
2.4	Webs of plate floors to bilge strake	0,40			
2.5	Watertight floors and side girders to shell plating and double bottom plating	0,35			
2.6	Side girders to bulkheads	0,40			
2.7	Side and bottom frames to shell plating	0,15	×	×	×
3	**Side framing**				
3.1	Walls of web frames and side stringers to shell plating and their face plates	0,20	×		
3.2	Web frames and side stringers with each other and to bulkheads	0,40			
3.3	Frames to shell plating and their face plates in region of 0,20 of the ship's length from perpendiculars and also in ballast and oil tanks and in engine room	0,20	×		
3.4	Ditto, elsewhere	0,15	×	×	×
3.5	Side longitudinals to shell plating				
4	**Deck framing**				
4.1	Deck transverses and girders to deck plating and face plates	0,20	×		
4.2	Deck transverses to side plating and girders	0,40			
4.3	Girders to bulkheads	0,40			
4.4	Hatch end beams to deck plating, their face plates and shell plating	0,35			
4.5	Beams to deck plating	0,15	×	×	×
4.6	Hatch cargo coamings to deck and fan coamings to deck	0,35			
4.7	Pillars to deck and double bottom plating	0,40			
4.8	Deck stringers of decks to shell plating	0,50			
4.9	Deck stringers of platforms to shell plating	0,40			
4.10	Bulkheads of superstructures and deckhouses to deck	0,40			
5	**Bulkheads**				
5.1	Vertical webs and horizontal girders to bulkheads plates and their face plates	0,20	×		
5.2	Vertical webs and horizontal girders with each other and to face plates of bottom, side and deck framings	0,20			
5.3	Vertical and horizontal stiffeners of bulkheads to bulkhead plates of bulkheads and their face plates		×	×	×
5.4	Forepeak and afterpeak bulkheads of water and oil tanks to shell plating and deck	0,40			
5.5	Other watertight bulkheads to shell plating or double bottom plating and deck	0,35			
6	**Seatings**				
6.1	Plates, brackets and knees of seatings for internal combustion engines with each other, to shell plating and face plates	0,40			
6.2	Member plates of other seatings for machinery and boilers to shell plating and face plates	0,30			
6.3	Brackets and knees of seatings for machinery to members	0,40			
6.4	Ditto to face plates	0,30			
6.5	Top plates (face plates) to vertical plates, brackets and knees	0,50			

The ratio between the leg length of the fillet weld and height of the isosceles triangle inscribed into cross-section of the weld (refer to Fig. 3.5.2) shall be assumed as $k = 1{,}4a$ or $a = 0{,}7k$.

When semi-automatic or automatic welding is employed instead of the proposed manual welding, the weld throat thickness or leg length (whichever is adopted in calculation) may be reduced in height for single-run welds but not more than 30 %.

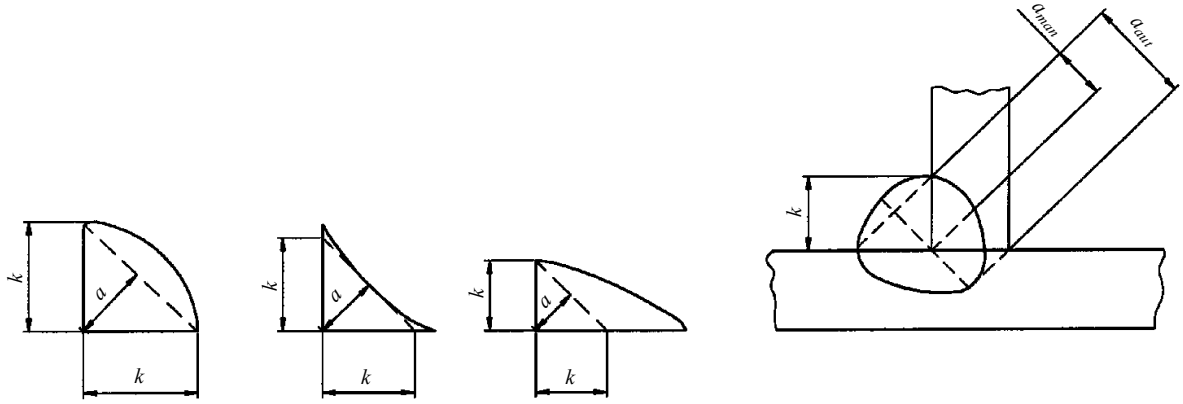


Fig. 3.5.2

Throat thickness of fillet weld shall not be less than

s, in mm	*a*, in mm
3 — 4 5 — 8	2,5 3,0

3.5.3 If the thickness of the joined plates is up to 5 mm, single intermittent fillet welds may be used.

3.5.4 For intermittent fillet welds length of fillet weld *l* shall not be less than 50 mm, weld pitch *t* shall not be more than 150 mm. The throat thickness of the intermittent fillet weld shall not be more than 0,6 times the plate thickness (for plate thickness up to 6 mm — 0,7 times the plate thickness).

3.5.5 In T-joints of hull structures that are subjected to effect of considerable impact and variable loads (seatings for internal combustion engines, etc.), abutting wall edges with the thickness over 8 mm shall have one-sided or double-sided bevel; the welds shall have concave shape in their cross-section with smooth transition to the surface of the welded plates (refer to Fig. 3.5.5).

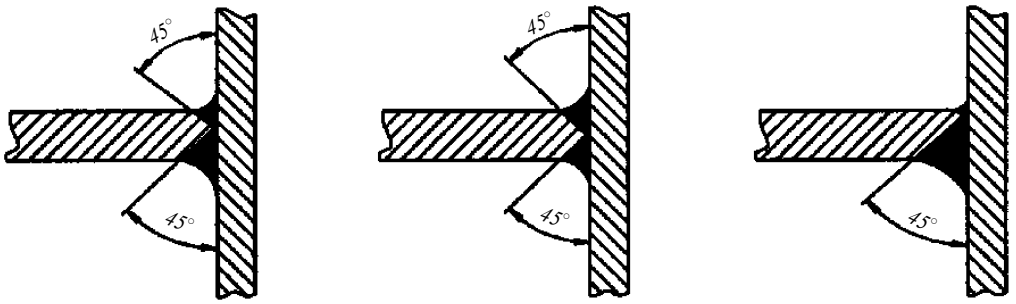


Fig. 3.5.5

3.6 WELDING OF PARTS

3.6.1 Webs and face plates of free ends of bulkhead pillars and other members, i.e. ends that are not secured by brackets or not welded to transversals, shall be welded by a double continuous fillet weld with weld factor $\alpha = 0{,}4$ (refer to Fig. 3.6.1).

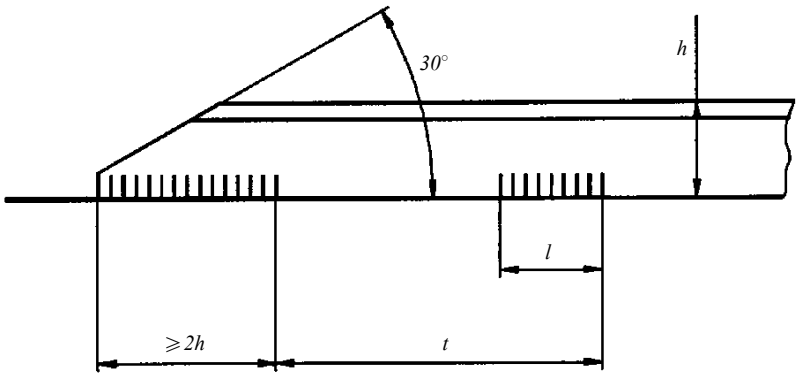


Fig. 3.6.1

3.6.2 Webs, on the edges with openings with length more than 20 mm, shall be welded by double weld by both sides of the openings on the length equal to the length of the applied intermittent weld (refer to Fig. 3.6.2).

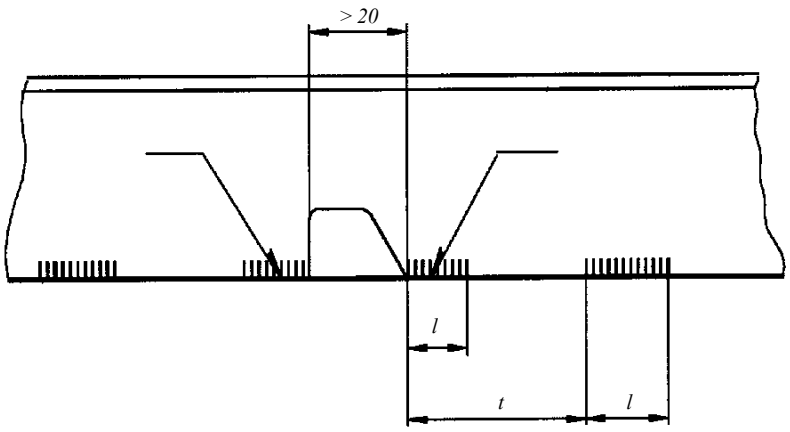


Fig. 3.6.2

3.6.3 Brackets shall be welded to the framing, plating and bulkheads by double continuous fillet weld with weld factor $\alpha = 0{,}4$.

3.6.4 On those member sections where brackets are installed, the welds for connection of the member web to face plate and to the joined plate shall correspond to dimensions of the weld (length, leg) that joins the bracket with the member.

3.7 WELDING OF OVERLAPPING CONNECTIONS

3.7.1 It is allowed to use overlapping welded connections for hull structures listed in 1.1.2.1, except the following:

.1 side, bottom and deck platings of engine room;

.2 hull structures in the way of main engines;

.3 bottom platings in the way of propeller shaft supports;

.4 bottom structures in the way of propellers;

.5 stern structures in the way of azimuth thrusters;

.6 web members, except overlapping welds for connection of ends of single board idle frames with ends of beams and floors and connection of elements of double bottom bracket floors;

.7 elements of hull structures subject to the effect of considerable efforts (at the limit of permissible stresses), and also members, which may be affected with overloading in the course of operation.

3.7.2 For arrangement of overlapping welds, the requirements of 3.4.1 and 3.4.2 shall be met.

3.7.3 The length of overlap shall not be less than b, in mm, determined by the formula

$$b = 1{,}5s + 20 \qquad (3.7.3)$$

where s = thicknesses of the thinner of the parts joined, in mm.

3.7.4 Overlapping connections of hull structures shall be welded allround by continuous fillet weld in such a way that the welds shall form closed contours. Fillet weld factor shall be 0,4.

3.7.5 It is allowed to join butts and grooves of the shell plating, inner bottom plating and inner sides by welding on the remaining backing, thickness of which shall not be less than thickness of the thicker of the plates joined; at that the backing shall be arranged on the internal side of the plating. Thus the plate edges shall be to the extent possible located in one line (refer to Fig. 3.7.5). Distance between the plate edges shall not be less than $3s_1$ where s_1 = thicknesses of the thicker of the parts joined.

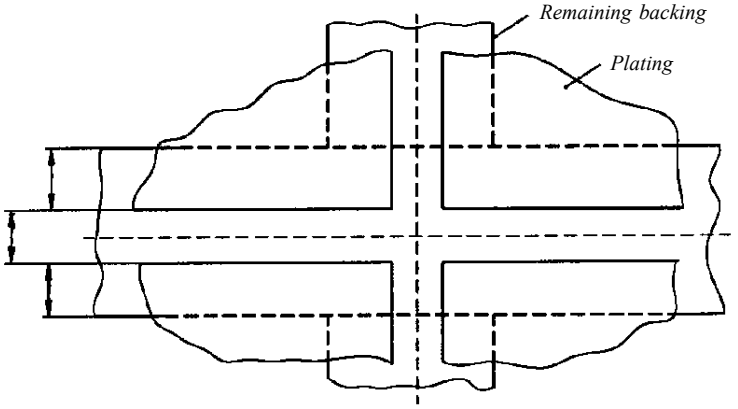


Fig. 3.7.5

3.7.6 The remaining backing mentioned in 3.7.5 for the plating butts shall be joined with a plate of a transverse bulkhead or transverse frame; for the plating slots it shall be joined with a plate of the inner bottom, side stringer or platform. It is allowed to use rolled sections as the remaining plating backing (refer to Figs. 3.7.6-1 and 3.7.6-2).

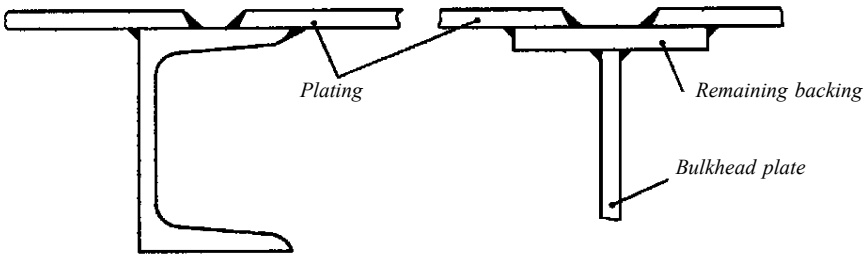


Fig. 3.7.6-1

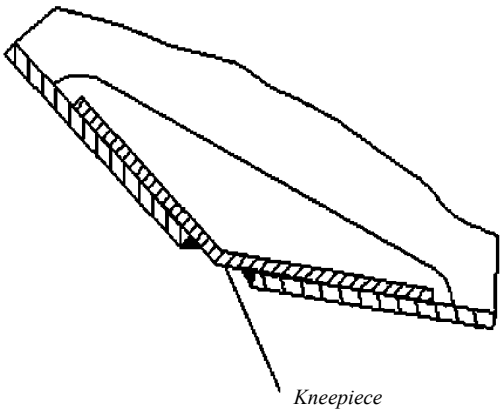


Fig. 3.7.6-2

Joint of the deep member web or bulkhead plate with the remaining backing of the shell or inner plating shall be arranged between two internal welds of the backed welded joints.

3.7.7 It is not allowed to make butts of plates of the deep member webs and flages at a distance less than 150 mm from the respective edges of the platings joined by overlapping welding (refer to Fig. 3.7.7).

3.7.8 Where welding of T-joints by fillet welds is impossible, plug welds (refer to Fig. 3.7.8, *a*) or tennon welds (refer to Fig. 3.7.8, *b*) may be used.

The length *l* and pitch *t* shall be determined as for scalloped frames according to 3.5.4.

3.7.9 Where aluminum alloy structures are welded according to Table 3.5.2, it is not permitted:

.1 to use intermittent welds (except in scalloped construction);

.2 to use scalloped construction in the regions of intense vibration (refer to 1.7.1.6, Part II "Hull" of the RS Rules).

The throat thickness of the welds shall not be less than 3 mm, but not more than 0,5*s* (for *s*, refer to 1.7.5.1, Part II "Hull" of the RS Rules).

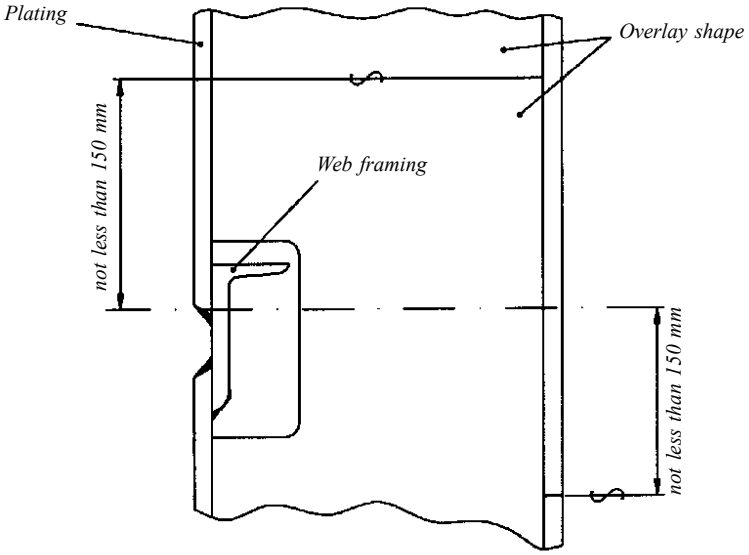


Fig. 3.7.7

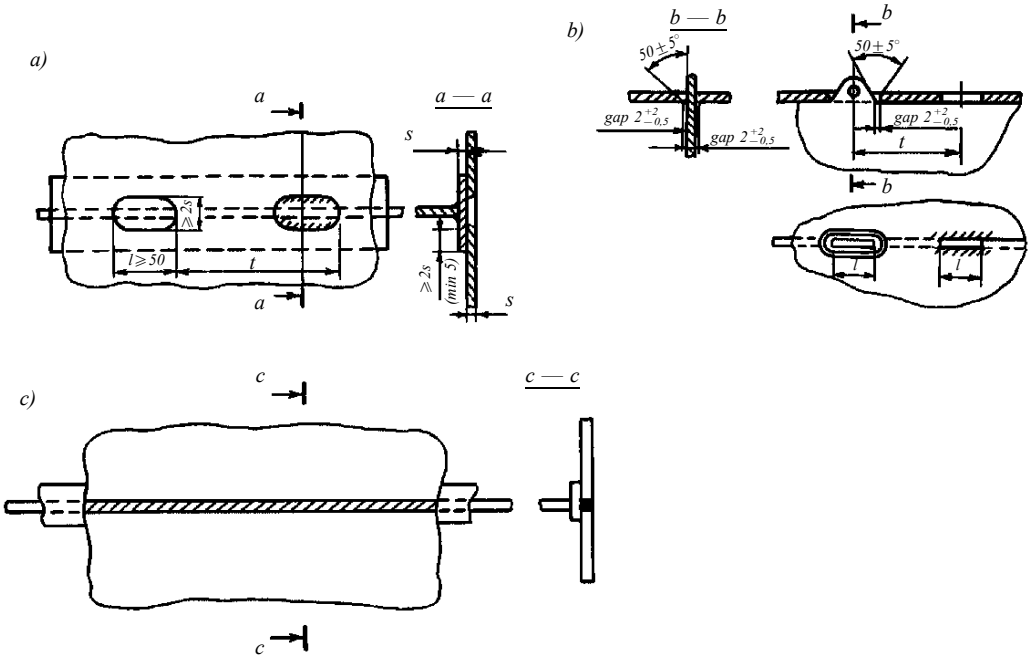


Fig. 3.7.8

4 SPECIAL HULL STRENGTHENING

4.1 GENERAL

4.1.1 Requirements of the present Section cover the ships mooring at sea and having trawling arrangements.

4.2 STRENGTHENING FOR MOORING AT SEA

4.2.1 To prevent damage during mooring at sea, at the shipowner's will the ship's hull is fitted with longitudinal fenders or other damping arrangements. Side grillage is strengthened by means of increasing the sheerstrake and deck stringer thickness by the value of up to 2 mm.

4.3 STRENGTHENING FOR TRAWLING OPERATIONS

4.3.1 For ships having stern or side trawling arrangements, due to increased diminution of thickness of the hull structures interacting with the trawl and its elements, the thickness of these structures is 2 mm greater than design value.

In the regions where the trawling machinery and devices are arranged, the hull is strengthened appropriately. Scantlings of the strengthening elements are determined by calculation.

4.4 ICE STRENGTHENING

4.4.1 The present requirements regulate the minimum strength level necessary to withstand ice load, as well as hull structure of ice class **Ice1** ship with intended for episodic independent navigation in fine broken open pack ice of non-Arctic seas up to 0,40 m thick.

4.4.2 To avoid high risk of damage due to interaction with ice the ship hull is recommended to have such a shape that the angle between the centerline plane and the tangent to the summer load waterline (drawn in way of the bow perpendicular) shall not be more than $\alpha_0 = 50°$.

4.4.3 Ice strengthening along the hull length are installed in the bow region A, and by the hull depth — in the region of alternating draught according to Fig. 4.4.3.

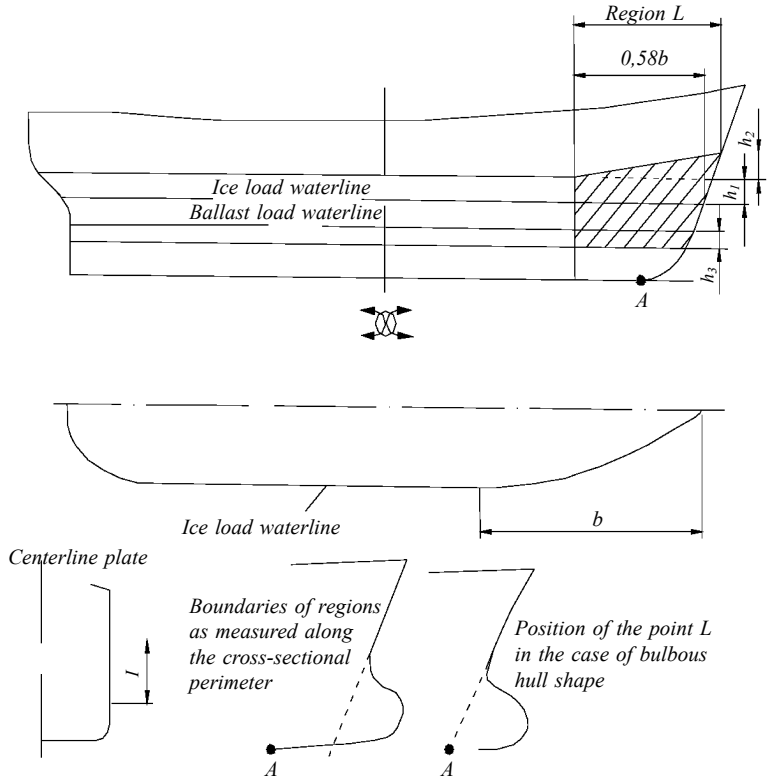


Fig. 4.4.3

4.4.4 The length of regions of ice strengthening along the ship at the load waterline level shall not be less than 58 % of distance b between the bow perpendicular and the section, in which the load waterline has the maximum width but not more than 0,23L.

4.4.5 The length of region of ice strengthening at the hull depth shall be such that:

lower boundary of strengthening is below the ballast waterline for not less than $h_3 = 0{,}50$ m;

upper boundary of strengthening in the stern section of region A is above the ice load waterline for not less than $h_1 = 0{,}50$ m; it shall be elevated above the load waterline as per the linear law to the forward boundary of region A for the value of $h_2 = 0{,}20$ m.

4.4.6 Structure of ice strengthening of ship's side grillage and design ice load are determined according to 3.10, Part "Hull" of the RS Rules.

5 WATERTIGTHNESS OF HULL, SUPERSTRUCTURES, DECKHOUSES

5.1 GENERAL

5.1.1 Requirements of the present Section are based on the following assumption that the ship design excludes easy water penetration inside the hull, superstructures and deckhouses under normal operating conditions.

5.1.2 Number of holes in the hull shell plating below the main deck shall be minimal.

5.1.3 Ships with the engine room located at the stern shall have not less than 3 watertight transverse bulkheads (including the fore peak bulkhead) extending to the deck. The engine room shall be separated from other compartments by two bulkheads. If the engine room has another location, number of transverse bulkheads shall not be less than 4.

5.1.4 As a rule, any hull compartment, superstructure or deckhouse except the fore peak and after peak shall have not less than two exits or manholes. Doors, manholes and ventilation openings in the fore peak bulkhead are not allowed.

5.1.5 All the openings in the plating that lead to compartments below the deck shall be fitted with reliable means preventing the water penetration.

5.1.6 Openings on the deck that may remain open for a long time under operating conditions (cargo handling operations, etc.) shall, to the extent possible, be shifted towards the ship's centerline plane.

5.1.7 Accesses, except emergency ones, to the main ship's spaces and compartments located under the deck shall, to the extent possible, be from the superstructure and deckhouse spaces.

5.1.8 External doors for passage to superstructures, deckhouses, companions, capes, as well as deck hatch covers, sidescuttles and windows shall have the strength not less than that of the hull structural members, in which they are installed.

5.2 TIGHTNESS TEST OF SHIP'S HULL

5.2.1 Tightness tests of ship’s hull shall be carried out according to the provisions of Appendix 1 to Part II "Hull" of the RS Rules.

PART III. EQUIPMENT, ARRANGEMENTS AND OUTFIT

1 GENERAL

1.1 APPLICATION

1.1.1 The requirements of the present Part apply to equipment, arrangements and outfit of small sea fishing vessels navigating in a displacement condition.

1.1.2 The equipment, arrangements and outfit designed for special purposes supply (for example, catching and processing arrangements) are not subject to the Register supervision.

1.2 DEFINITIONS AND EXPLANATIONS

The definitions and explanations relating to the general terminology of the present Rules are given in Part I "Classification".

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

A u x i l i a r y s t e e r i n g g e a r is the equipment other than any part of the main steering gear necessary to steer the ship in the event of failure of the main steering gear, but not including the tiller, quadrant or components serving the same purpose.

M a i n s t e e r i n g g e a r is the machinery, rudder actuators, steering gear power units, if any, ancillary equipment and the means of applying torque to the rudder stock (for example, tiller or quadrant) necessary for effective movement of the rudder for the purpose of steering the ship under normal service conditions.

P o w e r a c t u a t i n g s y s t e m is the hydraulic equipment provided for supplying power to turn the rudder stock, comprising a steering gear power unit or units, together with associated pipes and fittings, and a rudder actuator. The power actuating systems may share common mechanical components, i.e. tiller, quadrant and rudder stock, or components serving the same purpose.

S t e e r i n g g e a r u n i t is:

in the case of electric steering gear, an electric motor and its associated electrical equipment;

in the case of electrohydraulic steering gear, an electric motor and its associated equipment and connected pump;

in the case of other hydraulic steering gear, a driving engine and connected pump.

S t e e r i n g g e a r c o n t r o l s y s t e m is the equipment, by which orders are transmitted from the navigating bridge to the steering gear power units. The steering gear control systems comprise transmitters, receivers, hydraulic control pumps and their associated motors, motor controllers, piping and cables.

1.3 SCOPE OF SUPERVISION

1.3.1 General provisions on supervision over ship's equipment, arrangements and outfit are given in Part I "Classification".

1.3.2 The following items included into ship's equipment, arrangements and outfit are subject to the Register supervision during their manufacture.

1.3.2.1 Rudder and steering gear:

.1 rudder stocks;

.2 rudder blade;

.3 nozzle rudders;

.4 rudder axles;

.5 pintles of rudders and nozzle rudders;

.6 bushes of pintles;

.7 fastenings of rudder stocks, rudder stock with rudder blade or nozzle rudder, and also of rudder axles with sternfarme (muff couplings, keys, bolts, nuts, etc.);

.8 parts of the system of rudder stops;

.9 rudder stock bearings.

1.3.2.2 Anchor arrangement:

.1 anchors;

.2 chain cables or ropes;

.3 anchor stoppers;

.4 devices for securing and releasing the inboard end of chain cable or rope;

.5 anchor hawse pipes.

1.3.2.3 Mooring arrangement:

.1 mooring ropes;

.2 mooring bollards, belaying cleats, fairleaders, chocks, rollers and stoppers.

1.3.2.4 Towing arrangement:

.1 tow lines;

.2 towing bitts and chocks.

1.3.2.5 Life-saving appliances:

.1 rescue boats;

.2 liferafts (inflatable and rigid);

.3 lifebuoys;

.4 lifejackets;

.5 immersion and anti-exposure suits;

.6 thermal protective aids;

.7 launching appliance winches;

.8 engines of rescue boats;

.9 line-throwing appliances;

.10 means of rescue;

.11 self-igniting lights of lifebuoys;

.12 self-activating smoke signals of lifebuoys;

.13 launching appliances of liferafts and rescue boats;

.14 containers for inflatable liferafts;

.15 release mechanism of liferafts and rescue boats;

.16 hydrostatic release units;

.17 lights of liferafts and rescue boats;
.18 buoyant rescue quoits with buoyant line;
.19 parachute flares, hand flares and buoyant smoke signals;
.20 food rations;
.21 watertight receptacles with freshwater;
.22 sea-activated power sources for lights of lifejackets, liferafts and for lifebuoy self-igniting lights.

1.3.2.6 Cargo handling gear:
.1 ship derricks:
metal structures, winches and reels, components and ropes;
.2 cranes and hoists: metal structures, machinery,
components and ropes, safety devices;
.3 machinery drives;
.4 electrical equipment of cargo handling gear.

1.3.2.7 Masts and rigging:
.1 metal, wooden and glass-reinforced plastic spars;
.2 standing ropes;
.3 permanent attachments to masts and decks (eyeplates, hoops, etc.);
.4 loose gear of masts and rigging (shackles, turnbuckles, etc.).

1.3.2.8 Closing appliances of openings in hull, superstructures and deckhouses:
.1 side and deck scuttles;
.2 doors in superstructures and deckhouses;
.3 companion hatches, skylights and ventilating trunks;
.4 ventilators;
.5 manholes to tanks;
.6 hatchway covers.

1.3.2.9 Equipment of ship's spaces:
.1 ceiling and battens in holds;
.2 exit doors from ship's spaces in escape routs;
.3 stairways and vertical ladders;
.4 guard rails and bulwark.

1.3.2.10 Emergency outfit:
.1 collision mats;
.2 tools;
.3 materials.

1.3.3 The Register supervision of the manufacture of the items specified in 1.3.2.1.7, 1.3.2.1.8, 1.3.2.7, 1.3.2.9.1, 1.3.2.10.2 and 1.3.2.10.3 is confined to review of the relevent technical documentation.

1.3.4 For all the items specified in 1.3.2 the following documents shall be submitted to the Register:
.1 assembly drawing;
.2 calculations (no stamps of approval are needed);
.3 detail drawings, if parts or assemblies are not manufactured in accordance with standards or specifications approved by the Register.

1.3.5 The following equipment, arrangements and outfit are subject to the Register supervision when the ship is under construction:

.1 rudder and steering gear;

.2 anchor arrangement;

.3 mooring arrangement;

.4 towing arrangement;

.5 life-saving appliances;

.6 cargo handling gear;

.7 masts and rigging;

.8 openings in hull, superstructures and deckhouses and their closing appliances;

.9 arrangement and equipment of ship's spaces;

.10 emergency outfit.

1.4 MATERIALS AND WELDING

1.4.1 Steel forgings and castings, steel plates, sections and bars and also chain steel used for the items specified in 1.3.2.1.1 — 1.3.2.1.5, 1.3.2.1.7, 1.3.2.2.1, 1.3.2.2.2 shall meet the requirements of Part XIII "Materials" of the RS Rules. Steel forgings may be substituted with round rolled steel with a diameter of up to 150 mm. Materials for other items of equipment, arrangements and outfit shall meet the requirements specified in the design documentation approved by the Register, unless expressly provided otherwise in the present Rules.

1.4.2 The grades of steel plates and sections for the items specified in 1.3.2.1.2 and 1.3.2.1.3 shall be selected according to 1.2.3.1, Part II "Hull" of the RS Rules.

1.4.3 Welding of structural elements of ship's equipment, arrangements and outfit shall be carried out in accordance with the requirements of Part XIV "Welding" of the RS Rules; besides, welded structures and joints of items specified in 1.3.2.8.6 shall meet the applicable requirements of 1.7, Part II "Hull" of the RS Rules.

1.5 DESIGN ACCELERATIONS DUE TO HEAVE OF THE SEA

1.5.1 Necessity for use of dimensionless, gravity related, design accelerations shall be proved by the relevant calculations acknowledged by the Register.

2 RUDDER AND STEERING GEAR

2.1 GENERAL

2.1.1 Every ship shall be provided with a reliable device ensuring its steering and course-keeping facilities. Such devices may be: rudder, nozzle rudder, etc., approved by the Register.

2.1.2 The requirements of the present Section apply only to ordinary streamlined rudders. Rudder and steering gear of other types may be allowed by the Register, provided the calculations confirming their strength have been submitted.

2.2 TYPES AND COMPOSITION OF RUDDER AND STEERING GEAR

2.2.1 Rudder and steering gear comprises the following components:
rudder (rudder blade, rudder stock);
steering engine or control column;
steering drive;
rudder rests;
restricters.

2.2.2 The requirements of the present Section apply to the types of rudder and steering gear, which diagrams are shown in Fig. 2.2.2.

Rudder types

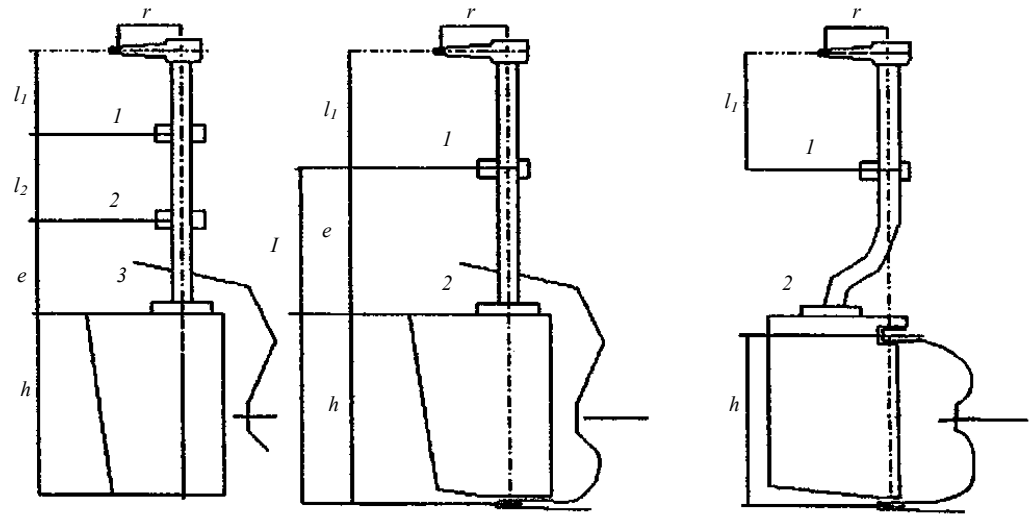


Fig. 2.2.2

2.2.3 All the main components of rudder and steering gear shall be calculated on the basis of the assumption that steel with yield stress not less than 235 MPa is used.

2.3 RUDDER STOCK

2.3.1 The diameter of the rudder stock head d_0, in cm, shall not be less than the value determined by the formula

$$d_0 = K\sqrt[3]{Av_s^2 r} \qquad (2.3.1\text{-}1)$$

where K = factor equal to:
2,54 — for rudders operating directly behind the propeller;
2,25 — for rudders not operating directly behind the propeller;
A = rudder blade area, in m^2;
v_s = the maximum ahead speed, in knots, with the ship on the summer load waterline, but not less than 8;
r = distance between the hydrodynamic force pressure center and the rudder blade centre line, in m, determined by the formula

$$r = [2{,}54(0{,}333 - \frac{A_1}{A}) + 0{,}119]\frac{A}{h_r} \qquad (2.3.1\text{-}2)$$

where A_1 = part of the rudder blade area located forward of its centre line, in m^2;
h_r = mean height of the rudder blade part abaft the centre line of the rudder stock, in m.

2.3.2 The diameter of the rudder stock d_1, in cm, in way of section 1 in Fig. 2.2.2 (in way of the upper bearing) shall not be less than determined by the formula

$$d_1 = d_0\sqrt[6]{1 + 4/3 + l_1^2/r_1^2} \qquad (2.3.2)$$

where l_1 = distance along the rudder stock centre line from the middle of the upper bearing to the middle of the quadrant or tiller, in m;
r_1 = radius of the steering gear quadrant or tiller resultant force arm measured from the centre line of the rudder stock, in m. When the quadrant or tiller are located forward of the rudder stock centre line, value of r_1 shall be assumed to be positive; when the quadrant or tiller are located aft of the rudder stock centre line, it is assumed to be negative.

2.3.3 For rudder of type I (refer to Fig. 2.2.2) the rudder stock diameter d_2, in cm, in way of section 2 (in way of the lower bearing) shall not be less than determined by the formula

$$d_2 = d_0\sqrt[6]{1 + \frac{1}{3} + \frac{(h+2e)^2}{r^2}} \qquad (2.3.3)$$

where h, e = dimensions shown in Fig. 2.2.2, in m.

The diameter of rudder stock of type I in way of section 3 is assumed to be equal to d_2.

2.3.4 For type II, diameter of rudder stock d_2, in cm, in way of section 2 in Fig. 2.2.2 (in way of rudder stock and rudder blade coupling) shall not be less than determined by the formula

$$d_2 = d_0\sqrt[6]{1 + \frac{4}{3} + \frac{h^2}{l_2^2}\left(\frac{l_1}{r_1} + \frac{1}{2} \times \frac{e}{r}\right)^2} \qquad (2.3.4)$$

where l_2 = dimension shown in Fig. 2.2.2, in m.

2.3.5 Rudder stock design shall not have any abrupt stepped transition. The change in the rudder stock diameter between the adjacent sections mentioned in the formulae shall not be more sudden than that permitted by the linear low.

Where the change of the rudder stock diameter is stepped, the steps shall be provided with fillets having as large radius as practicable. The transition of the rudder stock into the flange shall be carried out with a radius of fillet of not less than 0,12 times the diameter of the rudder stock in way of the flange.

2.4 RUDDER BLADE

2.4.1 Rudder blade area may be determined by calculation or selected on the basis of rudder blade area of a prototype ship, designation, dimensions, lines of the lines drawing and speed of which are close to the same of the designed ship.

2.4.2 In order to reduce hydrodynamic forces applied to the rudder and decrease resistance of self-propelled ships with relatively high speed, it is recommended to use profiled rudder blade.

2.4.3 From the standpoint of design, it is recommended to use steel, hollow profiled rudder blade, which represents a welded structure. In order to protect the internal chamber from water getting inside it, it is recommended to fill it with such materials like foamed polyurethane or apply corrosion protection coating on it.

2.4.4 Internal chamber of the rudder blade shall be watertight; it shall be tested for water tightness by 0,02 MPa during 15 min.

2.4.5 The thickness of the streamlined rudder blade side plating s, in mm, shall not be less than determined by the formula

$$s = 0{,}025d_0 + 3 \qquad (2.4.5)$$

where d_0 = rudder blade diameter.

2.4.6 The streamlined rudder blade side plating shall be stiffened from the inside by horizontal ribs and vertical web plates. The thickness of the web plates shall not be less than that of the rudder blade side plating.

2.4.7 The horizontal and vertical web plates shall be provided with sufficient number of openings for free drainage of water, which may penetrate inside the rudder blade.

2.4.8 The streamlined rudder blade shall be provided with top and bottom plates, the thickness of which shall not be less than 1,2 times the side plating thickness. The top and bottom plates shall be fitted with drain plugs of corrosion-resistant metal.

2.4.9 When plate rudder is used, thickness of side plating s_1 shall not be less than determined by the formula

$$s_1 = 0{,}08d_0 + 4. \qquad (2.4.9)$$

2.4.10 The section modulus of these web plates, including the effective flange, and the rudder piece W, in cm^3, shall be:

for rudder of type I at the upper edge — not less than

$$W = 0{,}1d_2^3. \qquad (2.4.10\text{-}1)$$

This section modulus may gradually decrease reaching 50 % of its value at the rudder lower edge;

for rudder of type II — not less than

$$W = 0{,}057\frac{d_0^3 h}{r}\left[\frac{r}{r_1}\times\frac{l_1}{l_2}+\frac{1}{2}\left(1+\frac{e}{l_2}\right)\right]^2; \qquad (2.4.10\text{-}2)$$

for rudder of type III — not less than

$$W = 0{,}012\frac{d_0^3 h}{r}. \qquad (2.4.10\text{-}3)$$

2.5 RUDDER BLADE AND RUDDER STOCK COUPLING

2.5.1 Design of the rudder blade and rudder stock coupling shall ensure strength and reliable connection of these two component parts and possibility to dismantle the rudder blade without dismantling the stock.

2.5.2 The following types of coupling may be accepted for joining rudder blade wth rudder stock: flange coupling, keyed flange coupling or keyed cone coupling.

2.5.3 If the parts are joined by horizontal flange coupling, the diameter of coupling bolts d_3, in cm, shall not be less than

$$d_3 = 0{,}62\sqrt{\frac{d_i^3}{zr_2}} \qquad (2.5.3)$$

where d_i = diameter of the rudder stock at the coupling flange, in cm;
z = number of coupling bolts;
r_2 = mean distance from the centre of the bolts to the centre of the system of the flange bolt holes, in cm.

For rudders of type I and type II, d_2, determined by Formulae (2.3.3) and (2.3.4), shall be taken as d_i; for rudder of type III d_0, determined by Formula (2.3.1-1), shall be taken.

2.5.4 Only the fitted bolts shall be employed. The bolts and nuts shall be efficiently secured.

2.5.5 The thickness of the coupling flanges shall not be less than the diameter of the bolts. The centers of the holes for bolts shall be distant from the outside edges of the flange by not less than 1,15 times the bolt diameter.

2.5.6 When the cone coupling is used, the cone length of the rudder stock fitted to the rudder blade shall not be less than 1,5 times the diameter of the rudder stock in way of the coupling; the cone on the diameter shall not be more than 1:10.

2.5.7 A key shall be set on the cone generatrix, the working sectional area of the key (product of the key length by its width) A_f, in cm^2, shall not be less than

$$A_f = 92{,}2\frac{d_0^2 h}{R_{eH}} \qquad (2.5.7)$$

where R_{eH} = upper yield stress of the key material, in MPa.

The key height shall not be less than half its width.

2.5.8 The external diameter of the rudder stock threaded portion shall not be less than 0,9 times the minimum cone diameter. The height of the nut shall not be less than 0,8 times the external diameter of the rudder stock threaded portion. To prevent self-unscrewing, the nut shall be securely fastened.

2.6 RUDDER PINTLES

2.6.1 The diameter of the pintle, including its liner, where fitted, d_4, in cm, shall not be less than determined by the formula

for rudder of type II

$$d_4 = 0{,}365\sqrt{\frac{d_0^3}{pr}\left[\frac{r}{r_1}\times\frac{l_1}{l_2}+\frac{1}{2}\left(1+\frac{e}{l_2}\right)\right]^2}; \qquad (2.6.1\text{-}1)$$

for rudder of type III

$$d_4 = 0{,}258\sqrt{\frac{d_0^3}{pr}} \qquad (2.6.1\text{-}2)$$

where p = the surface pressure specified in Table 2.6.1.

Table 2.6.1

Materials for rubbing parts	Surface pressure, p, in MPa
Stainless steel or bronze against lignum vitae	2,4
Stainless steel against kaprolon	5,0
Stainless steel against bronze or vice versa	6,9
Stainless and wear-resistant steels in combination	7,0

2.6.2 The ratio of bearing height of the pintle to diameter d_4 shall not be less than 1 or more than 1,3.

2.6.3 The length of the cone part of the pintles in rudder gudgeon shall not be less than the diameter d_4; the cone on the diameter shall not be more than 1:10.

2.6.4 The external diameter of the pintles threaded portion shall not be less than 0,8 times the minimum cone diameter. The nut height shall not be less than 0,6 times the external diameter of the pintle threaded portion.

2.6.5 To prevent self-unscrewing, the pin and the pintles shall be securely fastened.

2.7 RUDDER STOCK BEARINGS

2.7.1 A thrust bearing shall be installed to take the mass of the rudder and rudder stock.

Measures shall be taken against axial displacement of the rudder blade and rudder stock upwards for a value exceeding that permitted by the construction of the steering gear.

2.7.2 A stiffing box shall be fitted in way of passage of the rudder stock through the top of a rudder trunk, which is open to sea to prevent water from entering the ship's space. The stuffing box shall be fitted in a place accessible for examination and maintenance at all times.

2.7.3 It is required to check the chosen dimensions of the thrust friction bearings for surface pressure. To ensure the specified surface pressure, the height of the bearing bush h_b, in cm, shall not be less than

$$h_b = 0{,}01\frac{R_i}{pd_i} \tag{2.7.3-1}$$

where d_i = diameter of the rudder stock with liner at the point of the considered bearing installation, in cm;
R_i = design value of the reaction of the considered bearing, in N, determined by the formulae:

reaction of the upper bearing for rudder of type II

$$R_1 = 13{,}3\frac{d_0^3}{r}\left[\frac{r}{r_1}\left(1+\frac{l_1}{l_2}\right)+\frac{1}{2}\left(1+\frac{e}{l_2}\right)\right]; \tag{2.7.3-2}$$

reaction of the lower bearing for rudder of type I

$$R_2 = 13{,}3\frac{d_0^3}{r}\left[\frac{3}{2}+\frac{1}{2}\frac{a}{l_2}+\frac{r}{r_1}\frac{l_1}{l_2}\right]; \tag{2.7.3-3}$$

reaction of the upper bearing for rudder of type II

$$R_3 = 13{,}3\frac{d_0^3}{r}\left[\frac{r}{r_1}\left(1+\frac{l_1}{l_2}\right)-\frac{1}{2}\frac{h}{l_2}\right]; \tag{2.7.3-4}$$

reaction of the upper bearing for rudder of type III shall be assumed equal to zero.

2.8 STEERING GEAR SYSTEM OF STOPS

2.8.1 The steering gear shall be provided with a system of stops permitting to put the rudder over either side only to angle β°:

$$(\alpha^\circ + 1^\circ) < \beta^\circ < (\alpha^\circ + 1{,}5^\circ) \qquad (2.8.1\text{-}1)$$

where α° = the maximum hard-over angle, to which the steering gear control system is adjusted (as a rule, it shall be assumed $\alpha^\circ < 35^\circ$).

All parts of the system of stops, including those, which are at the same time the parts of the steering gear, shall be calculated to take forces corresponding to an ultimate reverse torque M_t, in $\text{kN} \times \text{cm}$, determined by Formula (2.8.1-2); at that the stresses in these parts shall not exceed 0,95 times the upper yield stress of their material

$$M_t = 2{,}7 d_0^3. \qquad (2.8.1\text{-}2)$$

2.9 STEERING GEAR

2.9.1 Each ship shall be provided with a main steering gear and an auxiliary steering gear.

2.9.2 The main steering gear shall be capable of putting the fully immersed rudder over at the maximum forward speed from 35° on either side to 30° on the other side in not more than 28 s.

2.9.3 The main steering gear may be hand-operated, provided the above-mentioned requirement is met, and with a force of not over 120 N applied to the steering wheel handles and with the number of steering-wheel rotations not more than 25 during shifting the rudder from hard over to hard over.

2.9.4 The auxiliary steering gear shall be independent from the main steering gear and shall be capable of putting the rudder over from 15° on one side to 15° on the other side in not more than 60 s with the ship running ahead at half the maximum speed, but not less than 5 knots.

2.9.5 The auxiliary steering gear may be hand-operated, provided the above-mentioned requirement is met; with a force of not over 160 N per helmsman. The rudder tackle may be used as the auxiliary steering gear.

2.10 REQUIREMENTS FOR LOCATION ONBOARD

2.10.1 Mutual location of the component parts of the steering gear shall ensure the safe and convenient operation.

2.10.2 Along the ship the rudder shall be located as far as possible from the ship's center of gravity to make sure that when the rudder is putting over, the maximum value of the ship's reverse torque is generated.

2.10.3 At all the hard-over angles, the rudder from top view shall not get beyond the hull lines (with the exception of ships with hinged type rudder).

2.10.4 In order to raise the rudder efficiency, it is required to take the minimum value of the gap between the upper rudder blade edge and the side plating, provided the condition of the required rudder hard-over angle is observed.

2.10.5 Location of the lower edge of the rudder blade shall take into consideration design and operation trim of the ship, so that the rudder damage due to hitting the ground is prevented.

2.10.6 Lower support shall be designed for the rudders of ships designated for operation in shallow waters.

2.10.7 Arrangement of the steering rope and roller drives shall ensure the location of the rollers and steering rope with the minimum number of sharp bends.

2.10.8 Rotaring and moving parts of the steering gear shall be fenced.

3 ANCHOR ARRANGEMENT

3.1 GENERAL

3.1.1 Each ship shall be provided with an anchor arrangement for riding the ship at anchor.
3.1.2 The anchor arrangement shall include:
anchor;
chain cables or ropes;
anchor hawse pipes;
anchor stoppers;
devices for securing and releasing the inboard end of chain cable or rope.

3.2 EQUIPMENT NUMBER

3.2.1 Anchor arrangement components shall be chosen in compliance with the Equipment Number according to Table 3.2.1. The Equipment Number N_c is determined by the formula

$$N_c = k_c(\Delta^{2/3} + 2Bh + 0{,}1A) \qquad (3.2.1\text{-}1)$$

where k_c = factor equal to 1,0 for ships, the maximum forward speed at draught to the summer load waterline does not exceed 5 knots, and equal to 0,75 for ships with higher speed;
Δ = ship's volume displacement to the summer load waterline, in m^3;
B = ship's breadth, in m;
h = height from the summer load waterline to the top of the foremost deckhouse, in m, which is determined by the formula

$$h = a + \Sigma h_i \qquad (3.2.1\text{-}2)$$

where a = distance from the summer load waterline amidships to the top of the upper deck plating at side, in m;
h_i = height at the center line of each tier of superstructure or deckhouse having a breadth greater than $0{,}25B$, in m. In case of ships with two or more superstructures or deckhouses along the length, only one superstructure or deckhouse of the considered tier with the greatest breadth is taken into account.
For the lowest tier h_i shall be measured at the center plane from the upper deck, or, in case of a stepped upper deck, from a notional line, which is continuation of the upper deck.
When calculating h, sheer and trim shall be ignored;
A = area in profile view of the hull, superstructures and deckhouses above the summer load waterline, which are within the ship's length L and also have a breadth greater than $0{,}25B$, in m^2.

Table 3.2.1

Equipment Number N_c		Bower anchors		Chain cables for bower anchors			Mooring ropes			Tow line	
Exceeding	Not exceeding	Number	Mass per anchor	Total length, in m	Grade, in mm		Number	Length of each rope, in m	Actual breaking strength, in kN	Length, in m	Actual breaking strength, in kN
					Grade 1	Grade 2					
10	15	1	30	55		—	2	30	29	—	—
15	20	1	40	55	1	—	2	30	29	—	—
20	25	1	50	82,5		—	2	40	29	—	—
25	30	1	60	82,5	1	—	2	50	29	—	—
30	40	2	80	165	11,0	—	2	50	29	120	65
40	50	2	100	192,5	11,0	—	2	60	29	150	81
50	60	2	120	192,5	12,5	—	2	60	29	180	98
60	70	2	140	192,5	12,5	—	2	80	29	180	98
70	80	2	160	220	14	12,5	2	100	34	180	98
80	90	2	180	220	14	12,5	2	100	37	180	98
90	100	2	210	220	16	14	2	110	37	180	98
100	110	2	240	220	16	14	2	110	39	180	98

[1]Chain cable or wire rope may be used; chain breaking load or actual breaking strength of wire rope being not less than 44 kN.

3.3 BOWER ANCHORS

3.3.1 Ships with Equipment Number of 35 and less may have only one bower anchor.

3.3.2 If the number of bower anchors determined in accordance with Table 3.2.1 is 2, the second bower anchor is supposed to be a spare anchor on condition that provision is made for it quick getting ready for use.

3.3.3 Anchors of the following types are permitted to be used on ships:

Hall's;

Gruson's;

admiralty.

3.3.4 The equipment of ships with anchors of other approved types is allowed.

3.3.5 In terms of their specifications, the anchors used shall comply with the requirements of Section 10, Part III "Equipment, Arrangements and Outfit" of the RS Rules.

3.4 CHAIN CABLES AND ROPES FOR BOWER ANCHORS

3.4.1 Ships, in which the second bower anchor is permitted to be a spare one, may be equipped with only one chain cable, the length of which is two times less than that required in Table 3.2.1.

Chain cables of bower anchors shall be graded 1 or 2 dependent on their strength as specified in Part XIII "Materials" of the RS Rules.

3.4.2 Chain lengths, which diameter is less than 15 mm, may have no studs.

3.4.3 Chains, which diameter is less than 15 mm, may not be divided into chain lengths. If the chain is divided into chain lengths, the length shall be interconnected with joining links or joining shackles.

Depending on their location in the chain cable, the lengths are divided into the following:

anchor length fastened to the anchor;

intermediate lengths;

inboard end chain length secured to the chain cable releasing device.

3.4.4 The anchor length of chain shall consist of a swivel, an end link and a minimum quantity of common and enlarged links, required to form an independent length of chains.

The anchor length of chains may consist only of a swivel, an end link and a joining link, provided the relation between the dimensions of the chain cable parts allows forming such a length. In chain cables, which are not divided into lengths of chains, the swivel shall be included into each chain cable as near to the anchor as possible. In all cases, the pins of swivels shall face the middle of the chain cable.

The anchor length shall be connected with the anchor shackle with the aid of an end shackle, the pin of which shall be inserted into the anchor shackle.

3.4.5 The intermediate lengths of chains shall not be less than 25 m and not more than 27,5 m; the chains consisting of the odd number of links. The total length of two chain cables given in the Equipment Tables is a sum of intermediate lengths of chains only without the anchor and inboard end lengths of chains.

If the number of intermediate lengths of chains is odd, the starboard chain cable shall have one intermediate lengths of chains more than the port chain cable.

3.4.6 For the ships equipped with only one chain cable, its length determined in compliance with requirements of 3.4.1 is a sum of intermediate lengths of chains without anchor lengths and the inboard end lengths of chains.

3.4.7 The inboard end length of chains shall consist of a special link of enlarged size (provided, however, that this link is capable of passing freely through the wildcat of the anchor machinery), being secured to the chain cable releasing device, and of the minimum number of common and enlarged links required for forming an independent chain length. The inboard end length of chains may consist of one end link only provided the relation between the dimensions of the chain cable parts and the chain cable releasing device allows forming such a length.

3.4.8 The chain cables may be replaced with wire ropes or synthetic fibre ropes.

The actual breaking strength of such ropes shall not be less than the breaking load of the corresponding chain cables; their length shall not be less than 1,5 times the length of the chain cables.

Wire ropes of trawl winches complying with these requirements may be used as anchor cables.

3.4.9 The end of each wire rope shall be spliced into a thimble, clamp or socket, and connected to the anchor by means of a joining shackle being equal to the wire ropes in strength.

3.5 ANCHOR APPLIANCES

3.5.1 Stoppers.

3.5.1.1 Each bower-anchor chain cable or rope shall be provided with a stopper holding the anchor in the hawse pipe when stowed for sea or, in addition, intended for riding the ship at anchor.

3.5.1.2 Where the stopper is intended only for securing the anchor in the hawse pipe when stowed for sea, its parts shall be calculated to withstand the chain cable strain equal to twice the weight of the anchor, the stresses in the stopper parts not exceeding 0,4 times the upper yield stress of their material. Where the stopper comprises a chain cable or rope, this shall have safety factor 5 in relation to the breaking load of the chain cable or actual breaking strength of the rope under the action of force equal to twice the weight of the anchor.

3.5.1.3 Where the stopper is intended for riding the ship at anchor, its parts shall be calculated on assumption that the stopper will be subjected to a force in the chain cable equal to 0,8 times its breaking load. The stresses in the stopper parts shall not exceed 0,95 times the upper yield stress of their material. Where the stopper comprises a chain cable or rope, they shall have strength equal to that of the chain cable, for which they are intended.

3.5.2 Device for securing and releasing the inboard end of the chain cable.

The parts of the device for securing and releasing the inboard end of the chain cable shall be calculated for strength under the force acting on device, which is equal to 0,6 times the chain breaking load, stresses in these parts not exceeding 0,95 times the upper yield stress of their material.

3.5.3 Laying of chain cables.

3.5.3.1 Laying of chain cables shall provide for their free run when dropping or hoisting the anchors.

3.5.3.2 The anchor shank shall easily enter the hawse pipe under the mere action of the chain cable tension and shall readily take off the hawse pipe when the chain cable is released.

3.5.3.3 The hawse pipe shall have the internal diameter equal to at least 10 diameters of the chain cable; the wall thickness shall not be less than 0,4 times the diameter of the chain cable.

3.5.3.4 When the anchor arrangement does not include anchor hawse pipe, anchor machinery and anchor stopper for rope securing when riding the ship at anchor, mooring arrangement elements (mooring bollards, fairleaders, cleats) may be used, or securing of the wire rope end to the ship's structures shall be provided.

3.5.4 Chain lockers.

3.5.4.1 For stowage of each bower anchor chain, lockers shall be provided.

When one chain locker is designed for two chains, it shall be provided with an internal division so that separate stowage of each chain is secured.

3.5.4.2 The chain locker shall be of a shape, capacity and depth adequate to provide an easy direct lead of the cables through the chain pipes, an easy selfstowing of the cables and their free veering away when dropping the anchors.

3.5.4.3 The chain locker design and closures of its access openings shall be watertight to the extent required to make sure that if the chain locker is flooded occasionally, it would not damage the essential auxiliary appliances or equipment (located outside the chain locker) or would not influence the proper ship's operation.

3.5.4.4 When a rope is used instead of the chain cable, a special reel shall be provided for its storage.

3.6 ANCHOR MACHINERY

3.6.1 Anchor machinery shall be fitted on the deck in the fore part of the ship for dropping and hoisting the anchors, as well as for holding the ship with the bower anchors dropped if the mass of the anchor exceeds 50 kg.

3.6.2 Hand-operated anchor machinery, as well as other deck machinery for dropping and hoisting the anchors may be used.

3.6.3 Anchor machinery with hand drive shall be fitted in such a way that the handle in its lowest position be at the height not less than 500 mm and in the uppermost position — not less than 1200 mm above the ship's deck.

3.7 SPARE PARTS

3.7.1 Each ship, carrying a spare anchor and equipped with a chain cable for bower anchor, shall have:
spare anchor length of chain — 1 pc.;
spare joining links — 2 pcs;
spare end shackle — 1 pc.

3.7.2 Each ship equipped with a spare anchor and wire rope for bower anchor shall have a spare set of parts for joining the wire rope and anchor shackle.

4 MOORING ARRANGEMENT

4.1 GENERAL

4.1.1 Each ship shall be supplied with mooring arrangement for warping to coastal or floating berths and for reliable fastening of the ship to them.

4.1.2 The number, length and actual breaking strength of mooring ropes shall be determined from Table 3.2.1.

4.1.3 The length of individual mooring ropes may be reduced by up to 7 % as against the prescribed value, provided that the total length of all mooring ropes is not less than the prescribed one.

4.1.4 In case mooring ropes made of synthetic fiber are used, their actual breaking strength F_s, in kN, shall not be less than determined by the formula

$$F_s = 0{,}0742\delta_m F_r^{8/9} \qquad (4.1.4)$$

where δ_m = mean elongation at breaking of a synthetic fiber rope, in %, but not less than 30 %. Where no data on δ_m are available, it shall be assumed equal to:
45 % for polyamide ropes;
35 % for polypropylene ropes;
F_r = actual breaking strength of the mooring rope specified in 3.2.1, in kN.

4.2 MOORING ROPES

4.2.1 Mooring ropes may be of steel wire, natural fibre or synthetic fiber material.

Notwithstanding the breaking strength specified in Table 3.2.1, the diameter of the mooring rope made from natural or synthetic fiber material shall not be less than 20 mm.

4.2.2 Steel wire ropes shall have at least 144 wires and not less than 7 fibre cores. The wires of ropes shall have a zinc coating in compliance with recognized standards.

4.2.3 Natural fibre ropes may be manilla, sizal or hemp ropes.

4.2.4 The synthetic fibre ropes shall be manufactured from approved homogenuous materials (polypropylene, capron, nylon, etc.).

4.2.5 In all other respects, the ropes shall meet the requirements of 6.6, Part XIII "Materials" of the RS Rules.

4.3 MOORING APPLIANCES

4.3.1 The number and position of mooring bollards, fairleaders and other mooring appliances depend on the constructional features, purpose and general arrangement of the ship.

4.3.2 Bollards may be of steel or cast iron. The ships equipped only with natural fibre or synthetic fibre ropes are permitted to use the bollards made of light alloys. As to the method of manufacture, the bollards may be welded or cast.

4.3.3 The outside diameter of the bollard column shall not be less than 10 diameters of the steel wire rope, not less than 5,5 diameters of the synthetic fibre rope, and not less than one circumference of the natural fibre rope, for which the bollard is designed. The distance between the axes of bollard columns shall not be less than 25 diameters of the steel wire rope or 3 circumferences of the natural fibre rope.

4.3.4 The mooring bollards, fairleaders and other mooring appliances, except wire stoppers, as well their beds shall be designed in such a way that with the strength equal to the actual breaking strength of the mooring rope, for which it is intended, stresses in the parts shall not exceed 0,95 of the upper yield stress of their material.

The breaking strength of the wire stopper shall not be less than 0,15 of the actual breaking strength of the rope, for which it is intended.

5 TOWING ARRANGEMENT

5.1 GENERAL

5.1.1 Each ship with Equipment Number N_c not less than 30 shall be provided with towing arrangement for its safe towing by another ship.

5.1.2 The towing arrangement shall be designed in complex with design of the anchor and mooring arrangement and other deck arrangement.

5.2 TOW LINE

5.2.1 The length and actual breaking strength of the tow line shall be determined from Table 3.2.1 according to Equipment Number.

5.2.2 The tow lines may be of steel wire, natural fibre or synthetic fibre material. The requirements of 4.1.4 — 4.2.5 for mooring ropes are also applicable to the tow line.

5.2.3 The tow lines shall have lights on one end and the respective marks on the other one.

5.2.4 The tow lines shall be stored on reels or raised platforms.

5.3 TOWING APPLIANCES

5.3.1 The number and location of towing bollards and chocks depend on the constructional features, purpose, type and general arrangement of the ship.

5.3.2 Requirements of 4.3.2 — 4.3.4 introduced for mooring bollards, fairleaders and chocks also apply to towing bollards and chocks.

6 LIFE-SAVING APPLIANCES

6.1 GENERAL

6.1.1 Application.

The present Section lays down the requirements, which the life-saving appliances and arrangements shall comply with, and specifies the number of these appliances and arrangements and their location on board the ship.

6.1.2 Definitions and explanations.

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

L i f e - s a v i n g a p p l i a n c e is an appliance capable of sustaining the lives of persons in distress from the time of abandoning ship.

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.

6.2 REQUIREMENTS FOR EQUIPMENT OF SHIPS WITH LIFE-SAVING APPLIANCES

6.2.1 Communications.

6.2.1.1 Visual signals.

Ships shall be equipped with at least 6 rocket parachute flares stored at the navigating bridge or nearby.

6.2.1.2 Onboard communications and alarm systems.

6.2.1.2.1 At least two two-way VHF radiotelephone apparatus shall be provided onboard the ship. This apparatus shall meet the requirements of Section 14, Part IV "Radio Equipment" of the Rules for the Equipment of Sea-Going Ships. At least one radar transponder shall be carried on the ship.

6.2.1.2.2 A general emergency alarm system shall be provided and shall be used for summoning crew to muster stations and to initiate the actions included in the muster list.

6.2.2 Personal life-saving appliances.

6.2.2.1 Lifebuoys.

6.2.2.1.1 Lifebuoys shall:

.1 be so distributed as to be readily available on both sides of the ship; at least one lifebuoy shall be placed in the vicinity of the stern;

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

.3 be available onboard to the amount of at least 4 items.

6.2.2.1.2 At least one lifebuoy on each side of the ship shall be fitted with a buoyant lifeline with length of not less than 30 m.

6.2.2.1.3 Not less than one half of the total number of lifebuoys shall be provided with lifebuoy self-igniting lights and lifebuoy self-activating smoke signals. Lifebuoys with lights and those with lights and smoke signals shall be equally distributed on both sides of the ship; they shall not be lifebuoys fitted with buoyant lifelines.

6.2.2.2 Lifejackets.

6.2.2.2.1 A lifejacket shall be provided for every person on board the ship. In addition, a sufficient number of lifejackets shall be carried for persons on watch. Lifejackets shall be stowed on the bridge and at any other manned watch station.

The ship may not be provided with lifejackets, except the lifejackets for persons on watch, if the immersion suits required in 6.2.2.3 may be classified as lifejackets.

6.2.2.2.2 Lifejackets shall be so placed as to be readily accessible and their position shall be plainly indicated.

6.2.2.3 Immersion suits.

An immersion suit shall be provided for every person onboard, except the cases, when the ship is constantly engaged in warm climates or when embarkation appliances are boarded from a position on deck less than 2 m above the waterline in the lightest sea-going condition.

6.2.3 Survival craft.

6.2.3.1 The ship shall carry liferafts on each side of such aggregate capacity as will accomodate all the persons on board. Unless these rafts can be easily transferred for launching on either side of the ship, additional rafts shall be provided on both sides so that their capacity will accomodate 50 % of the total number of persons on board. In the event of any liferaft being lost or rendered unserviceable, there shall be sufficient number of liferafts available for use on each side to accommodate the total number of persons on board, including the liferafts, which are stowed in a position providing for easy side-to-side transfer.

6.2.3.2 Taking into consideration nature of voyages and weather conditions, the ship may be fitted with liferafts with aggregate capacity sufficient to accommodate all the persons on board.

6.2.3.3 The ship shall carry one rescue boat. Capacity of the rescue boat may be less than six persons. The ship may be exempted from the requirement to carry a rescue boat, provided its dimensions and maneuverability, vicinity of search and rescue services, and hydrometeorological conditions in the area of navigation do not dictate necessary fulfillment of this requirement.

6.2.4 Line-throwing appliances.

6.2.4.1 All ships shall be provided with line-throwing appliances comprising two rockets and two lines each.

6.2.4.2 Lines shall have the length not less than 230 m.

6.3 TECHNICAL REQUIREMENTS FOR LIFE-SAVING APPLIANCES

6.3.1 Communications, namely visual signals (parachute flares), onboard communications and alarm systems shall meet the requirements of the Rules for the Equipment of Sea-Going Ships.

6.3.2 All life-saving appliances shall meet the requirements of the Rules for the Equipment of Sea-Going Ships.

6.3.3 Liferafts and rescue boats shall be stowed in compliance with the requirements in 2.4 of Part II "Life-Saving Appliances" of the Rules for the Equipment of Sea-Going Ships.

7 CARGO HANDLING GEAR

7.1 GENERAL

7.1.1 Cargo handling gear on board the ships is intended for loading, unloading and moving of loads from one position to another.

7.1.2 Cargo handling gear composition and lifting capacity shall be defined depending on the kind of cargo shipped, cargo carrying capacity of holds, dimensions of cargo hatches and the ship's design features.

7.1.3 It is recommended to use derricks or cat davits with a safe working load of not less than 1,0 t as cargo handling gear on board small ships.

7.1.4 When cargo handling gear with higher safe working load are used, they shall comply with the requirements of the Rules for the Cargo Handling Gear of Sea-Going Ships.

7.2 SELECTION OF EQUIPMENT AND TECHNICAL REQUIREMENTS

7.2.1 Cargo handling gear shall be designed in such a way that will enable their safe operation with up to 5° heel and up to 2° trim at the maximum jib radius.

7.2.2 Methods for calculation of forces and stresses in structural elements of cargo handling gear are not regulated.

The forces are determined in relative values. When forces are determined, it shall be assumed that all the forces applied to the boom head cross at the same point on the boom axis.

7.2.3 The length of ship derricks shall be selected on the basis of the requirement to ensure the required jib radius and the safe height for cargo transferring above the ship structures.

7.2.4 The cargo handling gear shall be designed in such a way that the operator's workplace would ensure sufficient view of the hatch opening and the ship deck and would be beyond the cargo transferring area. No ladders shall be located in the operation area of the derricks and cranes.

7.2.5 Provision shall be made to ensure efficient securing of derricks and cat davits when they are stowed for sea.

7.2.6 The ship cranes, ship derricks and hoists shall be so designed as to ensure their secure attachment to the ship's hull. Ship's hull structures at the point of the cargo handling gear attachment shall be appropriately reinforced.

7.2.7 In case manually driven cargo handling gear is used, the force on a handle to be applied by each operator shall not exceed 160 N when working with one hand and 250 N when working with two hands.

7.3 REQUIREMENTS FOR LOCATION ONBOARD

7.3.1 Location of cargo handling gear on board the ship shall be determined by the purpose, design features of the ship and the mutual location of the cargo hatches.

7.3.2 Cargo winches and other devices shall be arranged in such a way that they would not impede free passage along the deck. Distance between the device and other ship structures shall not be less than 600 mm.

7.3.3 Height of the winch controls location above the deck or deck plating shall not be less than 0,8 m but not more than 1,1 m.

7.3.4 Access shall be provided to all the parts that require maintenance, periodical examination and repair.

8 SIGNAL MASTS

8.1 GENERAL

8.1.1 The requirements of the present Section refer to the masts, which are intended only for carrying signal means: navigation lights, day signals (flags, signal shapes), antennas and radar reflectors.

8.1.2 Arrangement, height and provision of signal means on the signal masts shall comply with the requirements of Part III "Signal Means" of the Rules for the Equipment of Sea-Going Ships.

8.2 TECHNICAL REQUIREMENTS

8.2.1 The mast heel shall be rigidly fixed in all directions.

8.2.2 The masts with length l up to 8,0 m shall not be stayed masts. When the length l exceeds 8,0 m, along with unstayed masts, the stayed masts may also be used.

8.2.3 The outside diameter d and the thickness t, in mm, at the heel of the masts made of steel having the upper yield stress from 215 up to 255 MPa shall not be less than those given in Table 8.2.3.

Table 8.2.3

Mast length from the heel to top l, in m	Mast fastening			
	unstayed mast		stayed mast	
	d, mm	t, mm	d, mm	t, mm
3,0	39,9	4,0	—	—
4,0	93,4	4,0	—	—
5,0	120,5	4,0	—	—
6,0	149,5	4,0	—	—
7,0	175,6	4,0	—	—
8,0	207,4	4,0	—	—
9,0	241,5	5,0	198,0	5,0
10,0	278,2	5,0	220,0	5,0
11,0	319,5	5,0	251,5	5,0
12,0	360,2	5,0	294,0	5,0
Note. For intermediate length values the mast parameters shall be determined by means of interpolation.				

8.2.4 While the thickness of the mast plates is maintained constant throughout the length l, the diameter of the mast may be gradually decreased upwards to a value of:

$0,5d$ at $0,75l$ distance from the heel for unstayed masts;

$0,75d$ at the shroud eyeplates for stayed masts.

The mast length from the shroud eyeplates to the top shall not exceed $1/3l$.

The masts shall be stayed by the shrouds as follows:

.1 horizontal distance a, in m, from the deck (or bulwark) stay eyeplate to the transverse plane through the mast stay eyeplate shall not be less than $a = 0,15h$ where h is the vertical distance from the mast stay eyeplate to the deck (or bulwark) stay eyeplate;

.2 horizontal distance b, in m, from the deck (or bulwark) stay eyeplate to the longitudinal plane through the mast stay eyeplate shall not be less than $b = 0,30h$;

.3 the value a shall not exceed the value b.

8.2.5 The actual breaking strength of ropes F, in kN, used for the mast shrouds as specified in 8.2.4, shall not be less than $F = 0,49(l^2 + 10l + 25)$.

In other respects, the ropes for shrouds shall comply with the requirements of the RS Rules.

The loose gear of shrouds (shackles, turnbuckles, etc.) shall be such that their safe working load is not less than 0,25 times the actual breaking strength of the above mentioned ropes.

8.2.6 Where the mast is made of high tensile steel, light alloys, glass-reinforced plastics or wood, the mast is fitted, in addition to a yard arm, lights, day signals, antennas and radar reflectors, with other equipment having considerable weight, detailed strength calculation of this mast shall be carried out according to the procedure approved by the Register.

9 OPENINGS AND THEIR CLOSING APPLIANCES

9.1 SIDE SCUTTLES

9.1.1 Side scuttles shall not be fitted in the spaces below the upper deck.

In the bulkheads of enclosed superstructres and deckhouses it is allowed that instead of side scuttle the windows could be fitted. At that either hardened glass or triplex shall be used.

9.1.2 Skylights shall be made for illumination of under-deck spaces; at that height of the coamings above the deck shall not be less than 300 mm. No scuttles shall be fitted aflush the deck.

9.1.3 The main frame, glazing bead, deadlight and ring for securing the glass shall be made of steel, brass or aluminum alloy. The glasses used for the side scuttles shall be hardened. The glazing bead and deadlight shall be fitted with gaskets. The ear-nuts and nuts being screwed off by a special wrench shall be made of corrosion-resistant material.

9.1.4 The side scuttles and windows in the foremost walls of superstructures and deckhouses shall have the glass thickness with strength equivalent to thicknesses of not less than 8 mm for 250 mm diameter and not less than 12 mm for 350 mm diameter. For the side scuttles and windows in the side and aft walls, the glass thickness shall provide the strength equivalent to the thicknesses of not less than 6 mm for 250 mm diameter and not less than 10 mm for 400 mm diameter. All the above mentioned side scuttles and windows shall be fitted with deadlights.

9.1.5 Windows of the wheel house shall provide the required view, tightness and strength. The glasses shall be hardened and shatterproof, or made of the equivalent material, which permanently remains transparent. No stained glass is allowed.

9.2 CLOSING APPLIANCES OF OPENINGS IN WATERTIGHT BULKHEADS

9.2.1 Access openings in watertight bulkheads shall be equipped with permanently watertight hung doors (covers), strength of which shall be equivalent to the one of the bulkheads. Doors (covers) shall be fitted with sealing and quick-response fixtures for manual opening (or battening) from both sides of the bulkhead.

9.2.2 Sleeves, welded-on portions or other joints ensuring watertightness of the structure shall be used for laying pipelines through watertight bulkheads. Openings for fastening studs shall not pass through bulkhead panel, but shall end on the welded-on portions.

9.3 HATCH COVERS

9.3.1 Openings on the open deck areas for loading (unloading), for access to the lower rooms, illumination and ventilation, shall be protected with durable cargo hatches, companion hatches, skylights or ventilation hatches, which shall not open to inside.

9.3.2 As a standard tightening fixture, cargo hatches shall have hinged joint covers, shiftable or dismountable covers. Shift of the covers under the action of waves shall be excluded. Watertightness of these covers shall be ensured by means of sealers and efficient clamping and battening means. It is allowed to use tarpaulins and fasteners for them for dismountable covers.

9.3.3 Hatch cover hinges shall be located on the hatch forward edge to prevent it from opening by a wave. Hatch covers shall be of the same strength as structural elements of the deck, taking into consideration effect of the cargoes shipped on them.

9.3.4 All the hatches in the upper deck, which are not protected with a closed superstructure or deckhouse and are closed with covers, watertightness of which under the sea effect is ensured by means of tarpaulin pieces and fasteners for the same, shall have coamings of reliable design. Hatch coaming height shall not be less than 300 mm.

Design loads on covers of the hatches located in area 1 shall not be less than 6,9 kPa, and for those located in area 2 — not less than 5,2 kPa.

Height of fan coamings in all the cases shall not be less than 200 mm.

9.3.5 For skylights it is required to envisage for possibility to fix a dismountable plug, should the glass get damaged.

9.3.6 Hatches, which may remain open for a long time at sea due to operation conditions, shall meet the following requirements:

hatch area shall be minimal required one and, as a rule, shall not exceed 1 m^2;

maximal breadth of companion hatch opening, as a rule, shall not exceed 1 m;

hatch center shall be located maximally close to the center plane.

9.4 CLOSING APPLIANCES OF OPENINGS IN SUPERSTRUCTURES AND DECKHOUSES

9.4.1 All passage openings in the outer walls and superstructure and deckhouse decks shall be fitted with permanently hung doors (covers) with reliable sealing and fixtures for quick manual battening from both sides.

9.4.2 External doors and covers shall not open to the inside. Side wall doors shall open towards the bow. All the doors and covers shall be fitted with at least 300 mm height coamings.

9.5 HEIGHT OF HATCHWAY AND DOOR COAMINGS

9.5.1 Coamings of the openings of hatch covers and door openings shall be of such height, that their upper edge would not touch the water at 25° of the ship's heel.

9.5.2 Height of coamings, in mm, above the deck plating shall not be less than:

300 — for doors leading from the deck to the engine room, and all the hatches;

250 — for other doors.

9.5.3 Application of coamings with less height may be allowed, provided the designer confirms that the ship's safety is not diminished.

9.6 FREEING PORTS

9.6.1 If bulwark on the open deck areas forms wells, efficient freeing ports shall be provided to ensure quick water freeing from the deck.

9.6.2 Area of freeing ports shall not be less than 10 % of area of continuous bulwark section. Lower edges of freeing ports shall be located at the minimum practically possible height above the deck level.

9.6.3 Openings of freeing ports, as far as possible, shall be fitted with covers; actions shall be taken to prevent their jamming. Openings shall have a grid with up to 200 mm distance between the rods.

9.6.4 Efficient freeing ports shall be provided to ensure water freeing from the cockpits overboard.

9.7 VENTILATORS AND AIR PIPES

9.7.1 Ventilators shall as far as possible be located closer to the ship center plane and laid through the upper part of superstructures, deckhouses, companions and capes.

9.7.2 Ventilators to spaces below the deck shall be fitted with coamings efficiently connected to the deck. Height of the coamings shall make sure they will not be flooded at the ship heel up to 25°. In any case height of the coamings shall not be less than 300 mm for engine room fans and not less than 250 mm for other cases.

9.7.3 Outlet ends of ventilating pipes shall be fitted with permanently fastened watertight closing fixture.

9.7.4 Air pipe areas, which are protruding above the decks, shall be of high durability design.

In all the cases air pipe height measured from the upper deck to the lower edge of the opening, from where the fluid can flow downwards, shall not be less than 450 mm. On a superstructure or deckhouse deck this height shall not be less than 150 mm. Outlet ends of air pipes shall be fitted with automatically enabled closing fixtures, which are not mandatory for air pipes of ballast tanks.

10 ARRANGEMENT AND EQUIPMENT OF SPACES. DECK RAILS. EMERGENCY OUTFIT

10.1 LOCATION AND EQUIPMENT OF SPACES

10.1.1 The requirements for the arrangement and equipment of machinery spaces are specified in Part VII "Machinery Installations" and those relating to refrigerating machinery spaces, refrigerant storerooms, as well as refrigerated cargo spaces are set forth in Part XII "Refrigerating Plants".

10.1.2 No accommodation spaces shall be arranged forward of the collision bulkhead and abaft of the afterpeak bulkhead below the bulkhead deck.

10.1.3 The chart room and the wheelhouse shall be located in a common place.

10.1.4 The ship's control station shall be located on the navigating bridge of the wheelhouse. The navigating bridge shall be located so as to ensure:

proper visual control of the ship's running;

good visibility with the maximum view of water surface;

good audibility of sound signals of the approaching ships;

possibility of visual control of fishing gear functioning.

10.1.5 The view of the sea surface from the ship's control station shall not be obscured by more than two ship's lengths and forward of the bow to 10° on either side under all conditions of draught and trim. Presence of separate blind sectors not exceeding 5° is allowed.

10.1.6 The horizontal field of vision from the ship's control station shall be provided over an arc of at least 225°, i.e. to not less than 22,5° abaft the beam on either side of the ship.

From each bridge wing the horizontal field of vision shall be provided over an arc of not less than 225°, i.e., from at least 45° on the opposite side and then from right ahead to right astern.

From the main steering position the horizontal field of vision shall be provided at least 60° on each side.

10.1.7 The ship's side shall be visible. The lower edge of the navigating bridge front windows shall be as close as possible to the bridge deck and shall not obstruct to the view.

The upper edge of the navigating bridge front windows shall be at such height, which shall provide a forward view from the ship's control station for a person with a height of eye of 1800 mm, when the ship is pitching. Depending on the ship design, the specified height may be reduced to 1600 mm.

10.1.8 Design and location of windows in the wheelhouse shall comply with the following requirements:

number of framings between the windows shall be minimum and they shall not be installed immediately forward of workstation of watch officer;

to avoid reflections the wheelhouse front windows shall be inclined from the vertical plane top out, at an angle of not less than 10° and not more than 25°;

polarized and tinted glass for windows shall not be used;

at all times, regardless of weather conditions, at least two wheelhouse front windows shall provide a clear view and depending on the wheelhouse configuration an additional number of windows shall be fitted with means of effective cleaning, anti-icing and anti-fogging devices.

10.2 EQUIPMENT OF HOLDS

10.2.1 When in ships not having double bottom wooden ceiling is placed on top of the floors, it shall be solid and shall extend up to the bilge. The ceiling is recommended to be made of portable sections of such dimensions and so constructed as to allow of their ready removal at any place. The thickness of the wooden ceiling shall not be less than 40 mm.

10.2.2 When in ships having double bottom wooden ceiling is fitted, it shall have a thickness of not less than 50 mm.

The application of the ceiling made from approved synthetic material is allowed.

10.2.3 The wooden ceiling shall not be laid directly on the inner bottom metal plating, but shall be embedded in a bituminous or epoxy composition approved by the Register, or placed on battens of 25 — 30 mm in thickness along the floors. The wooden ceiling over the bilges shall be placed so as to be readily removable.

10.2.4 It is recommended that the cargo battens made of wood shall be fitted on sides in refrigerating spaces. The thickness of wooden battens shall not be less than 40 mm.

10.3 EXITS, DOORS, CORRIDORS, STAIRWAYS AND VERTICAL LADDERS

10.3.1 Location and arrangement of exits, doors, corridors, stairways and vertical ladders shall ensure ready access of persons from spaces to the places of embarkation into rescue means.

10.3.2 The wheelhouse shall have two exits, one to each side of the navigating bridge, with a passageway through the house from side to side.

10.3.3 The width of each exit from accommodation and service spaces shall not be less than 0,6 m. The sizes of the ladderways from cargo spaces shall not be less than $0,6 \times 0,6$ m.

10.3.4 The exit doors and ladderway covers shall be so arranged that they can be operated from both sides.

Doors shall open as follows:

.1 doors of accommodation and service spaces giving access to the corridor, inside the spaces or outside, if they do not hinder the exits from other spaces;

.2 doors of public rooms, outside or each side;

.3 doors in the end bulkheads of superstructures and in external transverse bulkheads of deckhouses, outside in the direction of the nearest side;

.4 doors in the external longitudinal bulkheads of deckhouses, outside in the forward direction.

In cargo ships the inner doors duplicating the doors specified in 10.3.4.3 and 10.3.4.4 on cargo ships may open inside the space.

No sliding doors shall be fitted at exits and means of escape, except for doors of the wheelhouse.

The doors referred to in 10.3.4.1 shall not be provided with hooks for holding the door open. It is permitted that such doors be fitted with buffers and spring catchers to fix the door in the open position and to allow for its closure without entering the space.

10.3.5 Doors of accommodation spaces shall have in their lower portions detachable panels $0,4 \times 0,5$ m in size.

10.3.6 All corridors and passageways shall ensure free movement of persons along them. Width of corridors and passageways shall not be less than 0,6 m.

10.3.7 All between deck stairways shall be of steel frame construction or of equivalent material on agreement with the Register (refer to 1.2, Part VI "Fire Protection" of the RS Rules).

10.3.8 The width of stairway shall not be less than the width of the corridor or passageway.

10.4 GUARD RAILS AND BULWARK

10.4.1 All exposed parts of the freeboard decks, superstructure decks and deckhouse tops shall be provided with efficient guard rails or bulwarks.

10.4.2 The height of the bulwarks or guard rails above the deck shall not be less than 1 m. However, where this height would interfere with the normal operation of the ship, a lesser height may be approved, provided the adequate protection of the crew is ensured to the satisfaction of the Register.

10.4.3 The distance between the stanchions of the guard rails shall not be more than 1,5 m, at least every third stanchion shall be supported by a stay.

Removable and hinged stanchions shall be capable of being locked in the upright position.

10.4.4 The gunwale, hand rails and guard rails shall be generally of rigid construction; wire ropes may only be accepted in lieu of guard rails in special circumstances and then only in limited lengths; wire ropes shall be made taut by means of turn-buckles.

Lengths of chains may only be accepted in lieu of rigid guard rails, if they are fitted between two fixed stanchions or between the fixed stanchion and bulwark.

10.4.5 The opening below the lowest course of the guard rails shall not exceed 230 mm. The outer courses of rails shall not be more than 380 mm apart.

10.4.6 Crew protection may be ensured by arrangement of combined railing on the upper deck, namely:

.1 in bottom part (1/2 — 2/3 of the total height), bulwarks, in upper part, one or two guard rails. Guard rails may be collapsible and made from rope or chain;

.2 in addition to fixed bulwark and guard rails there may be areas with collapsible railing.

In the areas where collapsible railing is used due to the process procedure, guard rails shall be provided.

It is allowed to install fishing gear on the deck areas not fitted with railings and bulwarks. In such case these deck areas shall be enclosed and fitted with guard rails.

10.4.7 To provide water removal from the deck, bulwarks shall be fitted with freeing ports in compliance with the requirements of 1.1.6.5, Part II "Hull" of the RS Rules.

10.4.8 Freeing ports may not be fitted, if the bulwark height is not more than 2/3 of the value required in compliance with the present Rules and if calculations confirm that the initial ship stability is sufficient at its loading with empty hold (holds) and with catch cargo on the deck up to the level of actual bulwark height.

10.4.9 Sea outlets shall be fitted with non-return shut-off valve with local control; openings shall be made in the bulwark in the water accumulation areas as scuppers for water draining from the upper deck.

10.5 EMERGENCY OUTFIT

10.5.1 The items listed in Tables 10.5.2 and 10.5.3 available in the ship but intended for other purposes may be included into the emergency outfit, provided these items have corresponding markings and their permanent storage places are situated above the bulkhead deck.

10.5.2 Recommended amount of emergency outfit is given in Table 10.5.2.

Table 10.5.2

Nos	Item, unit	Size	Quantity
1	Thrummed pad, pc	0,4 × 0,5 m	1
2	Set of rigging tools	As per Table 9.5.3	1
3	Set of fitter's tools	As per Table 9.5.3	1
4	Pine plugs for ships with side scuttles, pc	Side scuttle diameter 10 × 30 × 150 mm	2
5	Pine plugs, pc	Side scuttle diameter 10 × 30 × 150 mm	2
6	Unbleached canvas, m^2	—	2
7	Tarred tow, kg	—	10
8	Hexagon-head bolt, pc	M16 × 260 mm	2
9	Hexagonal nut, pc	M16	4
10	Washer for bolt, pc	M16	8
11	Construction nail, kg	l = 70 mm	1
12	Construction nail, kg	l = 150 mm	1
13	Cement (quick setting), kg	—	100
14	Sand, natural, kg	—	100
15	Accelerator for concrete setting, kg	—	5
16	Minium, kg	—	5
17	Carpenter's axe, pc	—	1
18	Hack-saw, pc	l = 600 mm	1
19	Shovel, pc	—	1
20	Bucket, pc	—	1
21	Lantern of explosion-proof type, pc	—	1
22	Stop of telescopic type, pc	—	1

10.5.3 Set of fitter's tools and rigging tools specified in Table 10.5.2 shall be completed according to Table 10.5.3.

10.5.4 Completeness and minimum amount of emergency outfit shall be determined by the shipowner.

10.5.5 The emergency outfit shall be stored in emergency station. Emergency stations may be special spaces, boxes or places allocated on the deck or in spaces.

10.5.6 A free passage shall be provided in front of the emergency station; the passage width shall be selected depending on the overall dimensions of the outfit stored in the station but not less than 0,6 m.

The passage to the emergency station shall be as straight and short as practicable.

10.5.7 Items of emergency outfit and cases for their storage shall be painted blue either entirely or in a stripe. The cases for emergency equipment storage shall have the distinct inscription to indicate the name of the material, weight and warranted storage period.

10.5.8 The emergency station shall be provided with distinct inscriptions "Emergency Station".

10.5.9 The pads shall be made of natural fibre rope strands and be thrummed with natural fibre spun yarn. A canvas shall be sewn on the bottom side of the pad.

Table 10.5.3

Nos	Item	Size	Quantity per set	
			rigging	fitter's
1	Tape measure	l = 2000 mm	1	—
2	Bench hammer	0,5 kg	1	1
3	Sledge hammer	3,0 kg	—	1
4	Rigger's mallet	—	1	—
5	Puncher (dumb iron)	—	1	—
6	Chisel	b = 20 mm; l = 200 mm	1	1
7	Marline spike	l = 300 mm	1	—
8	Carpenter's chisel	b = 20 mm	1	—
9	Screw auger	∅18 mm	1	—
10	Tongs	l = 200 mm	1	—
11	Hollow punch	∅18 mm	—	1
12	Hollow punch	∅25 mm	—	1
13	Triangular file	l = 300 mm	—	1
14	Half-round file	l = 300 mm	—	1
15	Multi-purpose tongs	l = 200 mm	—	1
16	Screw driver	b = 10 m	—	1
17	Adjustable wrench	Jaw width up to 36 mm	—	1
18	Wrench	Jaw width up to 24 mm	—	1
19	Rigger's knife	—	1	—
20	Hack-saw frame	—	—	1
21	Hack-saw blade	—	—	6
22	Kit-bag	—	1	1

PART IV. STABILITY AND FREEBOARD

1 GENERAL

1.1 APPLICATION

1.1.1 Requirements of the present Part apply to decked sea fishing vessels with length less than 24 m, as well as decked ships engaged in sea products catching.

To ships in service, the requirements of the rules effective for the period of construction of the given ship shall apply. After reconstruction, major repair, alteration or modification, the stability of ships shall comply with the requirements of the present Rules.

1.2 DEFINITIONS AND EXPLANATIONS

1.2.1 Definitions and explanations concerning the general terminology of the present Rules are given in Part I "Classification".

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

A n g l e o f f l o o d i n g is the angle of heel, at which the ship's interior spaces are flooded by water through openings considered to be open or openings, which may be opened as required by operation conditions of the ship in working position.

B o o k l e t is Stability Booklet.

L e n g t h o f s h i p is length as defined in accordance with the Load Line Rules for Sea-Going Ships.

L i g h t s h i p is a fully ready ship less deadweight. Water ballast is included in the deadweight.

O p e n i n g s c o n s i d e r e d t o b e o p e n are openings in upper deck or hull sides, as well as in decks, sides and bulkheads of superstructures and deckhouses, whose closures do not comply with the requirements of Section 7, Part III "Equipment, Arrangements and Outfit" of the RS Rules as to their strength, weathertightness and efficiency. Small openings, such as discharges of ship's systems and pipes, which actually have no effect on stability in dynamical heeling of a ship, are not considered to be open. If they submerge at an angle of 30° or less, these openings shall be assumed open if they can be considered a source of significant flooding.

S t o r e s are fuel, fresh water, provision, oil, expendable supplies, etc.

1.3 SCOPE OF SUPERVISION

1.3.1 For the ships subject to the requirements of the present Part, the scope of supervision shall be defined in compliance with 1.3, Part IV "Stability" of the RS Rules.

1.4 GENERAL TECHNICAL REQUIREMENTS

1.4.1 The general technical requirements given in 1.4, Part IV "Stability" of the RS Rules shall apply to the ships subject to the requirements of the present Part.

1.4.2 In all loading conditions, which might occur in the ship's service, liquid ballast may be accommodated in the washing or fresh water bottom tanks only in special cases.

1.4.3 The width of enclosures in a fish hold or fish containers on the deck and in the hold shall not exceed 1 m. In case of greater width, the fish is considered as a liquid cargo.

1.4.4 Ships' inclining test shall be carried out in compliance with the requirements of 1.5, Part IV "Stability" of the RS Rules.

2 GENERAL REQUIREMENTS FOR STABILITY

2.1 GENERAL

2.1.1 For the purpose of this Section, ships are divided into two groups:

group I — trawlers. Namely, ships engaged in fishing with seine net, purse seine, trawl, drag, as well as ships engaged in fishing with drift net;

group II — other ships. Namely, ships engaged in fishing or sea product catching with traps, long-line, electric light or with the aid of divers and scuba divers servicing fixed nets.

2.1.2 Restrictions on the area of operation, distance to the port of refuge and sea state shall be set down and included in the Stability Booklet:

.1 for ships of less than 15 m in length restricted area of navigation R3 may be prescribed;

for ships 15 — 20 m in length, an area of navigation not higher than R2 may be prescribed;

for ships 20 — 24 m in length, an area of navigation not higher than R1 may be prescribed;

.2 ships of less than 15 m in length may proceed to sea and be en route at sea state not more than 4, ships 15 — 20 m in length — not more than 5, ships 20 — 24 m — not more than 6;

.3 having regard to stability and seaworthiness of ships and depending on the reliable provision of the area of operation concerned with forecasts, as well as on the operating experience for ships of similar type and the same or approximately the same dimensions, the Register may change the restrictions on the area of navigation and permissible sea state specified in 2.1.2.1 — 2.1.2.2;

.4 when determining the maximum permissible sea state for small craft carried on depot ships (for example, small fishing boats carried on mother ships), in addition to the provisions of 2.1.2.2 and 2.1.2.3, the maximum sea state, at which the craft can be safely lifted on board the depot ship shall be taken into account;

.5 additional restrictions may be introduced in zones of special sea conditions.

Referred to such zones are:

zones of surf (breaking) waves;

zones of local abrupt increase in wave height and steepness (bars in estuaries, tossing, etc.).

Zones of special sea conditions are set on the basis of the data of local hydro meteorological and hydrographic offices.

2.2 REQUIREMENTS FOR STABILITY

2.2.1 The area under the righting lever curve shall not be less than 0,055 m·rad up to the heeling angle of 30° and not less than 0,090 m·rad up to the heeling angle of 40°. Besides, the area under the righting lever curve between the heeling angles of 30° and 40° shall not be less than 0,030 m·rad.

2.2.2 For group I ships the maximum righting lever l_{max} shall be not less than 0,23 m at the heeling angle $\theta_{max} > 30°$. The value of righting lever at 60° heel shall not be less than 0,1 m. For the ship in the fishery $l_{max} > 0{,}2$ m at $\theta_{max} > 30°$.

For group II ships the maximum righting lever l_{max} shall be not less than 0,22 at the heeling angle $\theta_{max} > 30°$. The value of righting lever at 60° heel shall not be less than 0,05 m. For the ship in the fishery $l_{max} > 0{,}2$ m at $\theta_{max} > 30°$.

Where sufficiently technically justified, the angle corresponding to the maximum of righting lever curve may be reduced to 25°.

2.2.3 The angle of flooding shall not be less than 40°.

2.2.4 The stability of fishing vessels hauling in the nets and catch with cargo booms shall be sufficient to ensure that the static heel angle of the ship when handling the nets and operating the cargo boom at its maximum outreach would not exceed 10° or the angle at which the deck is immersed, whichever is less.

2.3 METACENTRIC HEIGHT

2.3.1 Under all loading conditions, except for the light-ship condition and the ship in the fishery, the value of corrected initial metacentric height shall be not less than 0,5 m.

2.3.2 The corrected initial metacentric height of a ship in the fishery shall be not less than 0,35 m.

2.4 ICING CONSIDERATIONS

2.4.1 Icing considerations shall be made in accordance with 2.4, Part IV "Stability" of the RS Rules, however, the mass of ice per 1 m^2 of the total area of horizontal projection of exposed weather decks shall be assumed to be 40 kg.

3 LOADING CONDITIONS

3.1 Stability shall be checked for the following loading conditions:

.1 departure for fishing grounds with full stores;

.2 arrival at a port from fishing grounds with full catch in holds and on deck, if provision is made for the deck cargo in the design, and stores are nearly exhausted;

.3 arrival at a port from fishing grounds with 20 % of catch in holds or on deck, if provision is made in the design for stowage of cargo on deck, 70 % of ice and salt rating and stores are nearly exhausted;

.4 departure from fishing grounds with full catch and amount of stores ensuring the ship's draught up to the load line.

3.2 Stores nearly exhausted — fuel is held only in the service tank for 4 h of operation. Other stores — 10 %.

3.3 For net fishing vessels, allowance shall be made for wet fishing nets on deck loading conditions as in 3.1.2 — 3.1.4.

3.4 The amount of full catch is determined depending on the ship's type, capacity of cargo spaces and stability characteristics. It shall correspond to the load line position and shall be specified in stability calculations, as well as in the Booklet.

The amount of catch allowed to be stowed on deck shall be specified both in stability calculations, as well as in the Booklet.

For ships with stern ramp engaged in trawling, amount of the maximum catch in the trawl belly end shall be specified in the stability calculations, as well as in the Booklet.

3.5 Stability of the ship, while being on fishing grounds, shall be checked for the following loading conditions:

.1 ship engaged in fishing, with no catch in holds, catch and wet nets stowed on deck, the hatches of the holds open, stores are nearly exhausted, with no ice and salt;

.2 ship engaged in fishing, with no catch in holds, catch is hauled to the deck by means of fishing gear (boom, power block, winch), the hatches of the holds open, stores are nearly exhausted, with no ice and salt.

Cargo hoisted on the boom or power block shall be equal to their safe working load and the winch pulling force shall be taken equal to this value stated in the certificate.

4 FREEBOARD

4.1 GENERAL

4.1.1 Assignment of the minimum freeboard and load line marking shall be performed in compliance with Section 8 of the Load Line Rules for Sea-Going Ships.

4.1.2 Conditions of assignment of freeboards shall be provided according to 4.2.

4.2 CONDITIONS OF ASSIGNMENT OF FREEBOARDS

4.2.1 Watertightness of the hull, superstructures and deckhouses shall comply with the requirements of Section 5, Part II "Hull", and deck railing shall comply with the requirements of Section 9, Part III "Equipment, Arrangements and Outfit".

PART V. SUBDIVISION

Requirements of the RS Rules for subdivision do not apply to small sea fishing vessels.

PART VI. FIRE PROTECTION

1 GENERAL

1.1 APPLICATION

1.1.1 The requirements of the present Part apply to ship's structural fire protection, fire extinguishing systems and fire detection and alarm systems, as well as fire-fighting equipment and outfit.

1.1.2 The fire protection requirements relating to the structural items of the ship hull, machinery and parts thereof, electrical equipment, pumping and piping, ship's arrangements, fuel oil and lubricating oil tanks, construction and location of boilers, refrigerating plants, ship's spaces, etc. are set out in the relevant parts of the present Rules.

1.2 DEFINITIONS AND EXPLANATIONS

1.2.1 The definitions and explanations relating to the general terminology are given in Section 1, Part I "Classification" of the present Rules and in Part VI "Fire Protection" of the RS Rules.

2 STRUCTURAL FIRE PROTECTION

2.1 GENERAL

2.1.1 Every ship shall be so constructed and equipped that its structural fire protection shall provide prevention of fire, containment of flame and smoke spreading throughout the ship by dividing the hull, superstructures and deckhouses with steel or aluminum alloy bulkheads and application of thermal insulation made from non-combustible materials, as well as shall create conditions for safe evacuation of people from the ship's spaces and from the ship.

2.1.2 Requirements for materials.

2.1.2.1 The below requirements for materials apply to all the ships irrespective of hull construction materials.

2.1.2.2 The insulating materials used in accommodation spaces, service spaces, control stations and machinery spaces shall be non-combustible. The insulation surface in machinery spaces shall be impervious to oil products and their vapours.

2.1.2.3 In refrigerated cargo spaces and refrigerated storerooms of service spaces, combustible insulation may be used, provided it is protected by close fitting linings.

As a lining material steel plates or moisture-resistant plywood with low flame spread characteristics may be used as specified in FTP Code. For plastic laminated moisture-resistant plywood, both composing materials (plywood and laminate) shall have low flame-spread characteristics.

2.1.2.4 Primary deck coverings within accommodation and service spaces and control stations shall have low flame spread characteristics, shall not produce smoke or give rise to toxic or explosive hazards at elevated temperatures, vapours, this being determined in accordance with FTP Code.

2.1.2.5 Exposed surfaces within accommodation spaces, service spaces, control stations, corridor and stairway enclosures and the concealed surfaces behind bulkheads, suspended ceilings, panelling and linings fitted within those spaces shall have low flame spread characteristics.

2.1.2.6 Linings, ceilings, draught stops and their associated grounds shall be made of non-combustible materials.

2.1.2.7 Air spaces enclosed behind suspended ceilings, panelling or linings in accommodation spaces, service spaces and control stations shall be divided by close fitting draught stops spaced not more than 7 m apart.

2.1.2.8 Paints, varnishes and other finishes used on exposed surfaces inside accommodation and service spaces, control stations and stairway enclosures shall not produce excessive quantities of smoke and toxic vapours, this being determined in accordance with FTP Code.

This requirement applies to the finish materials of bulkheads, decks, floor coverings, linings and ceilings, but is not applicable to cables insulation, plastic piping and furniture.

2.1.2.9 Plastic pipes shall be applied in compliance with Section 3, Part VIII "Systems and Piping" of the RS Rules.

2.1.3 Additional requirements to spaces of separate categories.

In addition to the requirements of Section 2, the below requirements to structural fire protection shall be complied with.

2.1.3.1 Galleys shall comply with the following requirements:

.1 wherever practicable, electrically powered cooking equipment shall be provided in preference to open flame types;

.2 galleys where deep-fat cooking equipment is installed shall comply with 3.1.2.14, Part VI "Fire Protection" of the RS Rules;

.3 materials that are in the vicinity of any cooking appliance shall be non-combustible, except that combustible materials may be employed when these are faced with stainless steel or a similar non-combustible material;

.4 galley decks shall be covered with ceramic tiles or similar non-combustible covering;

.5 exhaust ventilation ducts from galley ranges shall meet the requirements of 12.2.4, 12.2.7 or 12.3.6, Part VIII "Systems and Piping" of the RS Rules and shall be protected by the fixed fire extinguishing system according to Table 3.1.2.1, Part VI "Fire Protection" of the RS Rules.

2.1.3.2 Storerooms for flammable materials and substances shall comply with the following requirements:

.1 cylinders containing flammable or other dangerous gases shall be clearly marked as to their contents and properly stowed and secured on open decks. All valves, pressure regulators and pipes leading from such cylinders shall be protected against damage.

Flammable liquids shall always be carried in suitably sealed containers and stowed in a safe position on open decks. Such cylinders and containers may be stowed in the storerooms that meet the requirements set out in 2.1.3.2.2;

.2 cylinders and bottles containing flammable liquids and combustible gases shall be stored in the storerooms having direct access from open deck. Such storerooms shall have boundary bulkheads constructed from steel or similar non-combustible materials; where boundary bulkheads of such compartments adjoin other enclosed spaces they shall be gas-tight. Pressure adjusting devices and relief valves, if any, shall be installed outside the storerooms. The storerooms shall be equipped with independent exhaust and input ventilation system arranged at high and low levels and the inlets and outlets of ventilators shall be positioned in safe areas and fitted with spark arresters;

.3 electrical equipment shall not be installed within the storerooms containing flammable liquids or combustible gases, except where necessary for service within the storeroom. Where such electrical equipment is installed, it shall be of safe type according to 2.9, Part XI "Electrical Equipment" of the RS Rules;

.4 storerooms containing compressed and/or combustible gas cylinders shall not be used for stowage of other combustible products or for tools or objects not belonging to the gas distribution system.

2.1.3.3 Gas welding and cutting equipment, if carried, shall be stowed in a secure manner on the open deck at a safe distance from any potential source of fire and shall have the capability of being readily jettisoned overboard, if necessary.

2.1.3.4 Any enclosed hazardous compartment that contains a gas consuming appliance or any compartment into which flammable gas may leak or accumulate, shall be provided with a gas detector and alarm.

2.2 STRUCTURAL FIRE PROTECTION FOR SHIPS WITH HULLS CONSTRUCTED OF STEEL OR OTHER EQUIVALENT MATERIAL

2.2.1 In every ship the superstructure, structural bulkheads, decks, deckhouses and pillars shall be constructed of steel or other equivalent material, having due regard to the risk of fire.

2.2.2 Bulkheads and decks bounding machinery spaces of category A shall be of "A-0" class, except those specified in 2.2.3 — 2.2.5.

2.2.3 Where fishrooms are fitted with combustible insulation, bulkheads and decks separating such spaces from machinery spaces of category A shall be of "A-30" class.

2.2.4 Bulkheads and decks, which separate the machinery spaces of category A from the accommodation spaces, service spaces and control stations, shall be of "A-30" class.

2.2.5 Deck sections with the associated access routes located above a machinery space of category A or galley and intended for stowage of liferafts or EPIRB shall be of "A-30" class.

2.2.6 Bulkheads and decks, which separate galleys (or combined galley/mess rooms) from accommodation spaces, service spaces and control stations, shall be of "A-30" class.

2.2.7 The bulkheads and decks, which separate the accommodation and service spaces from control stations, shall be of "A-30" class.

2.2.8 Bulkheads of corridors serving accommodation spaces, service spaces and control stations, other than bulkheads required to meet the provisions of 2.2.2, 2.2.4, 2.2.6 and 2.2.7, shall be of "B-15" class and extend from deck to deck and to the shell plating or other boundaries.

2.2.9 Interior stairways serving accommodation spaces, service spaces or control stations shall be constructed of steel. The enclosures to such stairways shall be of steel "B-15" class and be fitted with a "B-15" class closing arrangement at one end of each stairway (refer to Fig. 2.1.4.3.1-3, Part VI "Fire Protection" of the RS Rules).

2.2.10 The number of openings in the bulkheads and decks referred to in 2.2.2 and 2.2.6 shall be the minimum practicable. Such openings shall be fitted with closing arrangements that provide fire protection equivalent to the surrounding structure. Any access doors provided in the casing of machinery spaces of category A and galleys shall be self-closing, except when such a door is required to be of weathertight construction.

2.2.11 Where bulkheads or decks, that are required to be of "A" or "B" class divisions, are penetrated by pipes, cables, trunks, ducts etc., arrangements shall be made to ensure that the fire integrity of the division is not impaired.

2.3 STRUCTURAL FIRE PROTECTION FOR SHIPS WITH HULLS PARTIALLY OR ENTIRELY CONSTRUCTED OF COMBUSTIBLE MATERIALS

2.3.1 For ships constructed of wood where the superstructure, structural bulkheads and decks over machinery spaces are constructed of steel or other equivalent material, fire protection arrangements shall be fitted as for steel ships (refer to 2.2).

2.3.2 On the ship, which hull is constructed of combustible materials, the decks and bulkheads of machinery spaces of category A and galleys shall provide fire integrity equal to "B-30" due to non-combustible insulation, and such boundaries shall, as far as practicable, prevent the passage of smoke.

2.3.3 Decks and bulkheads separating control stations from accommodation spaces, service spaces and machinery spaces of category A shall provide fire integrity equal to "B-30".

2.3.4 Bulkheads of corridors serving accommodation spaces, service spaces and control stations shall be of "B-15" class and extend from deck to deck and to the shell plating or other boundaries.

2.3.5 Interior stairways serving accommodation spaces, service spaces or control stations shall be constructed of steel, the enclosures to such stairways shall be of "B-30" class divisions and be protected by "B-30" or "B-15" class self-closing doors at one end of each stairway (refer to Fig. 2.1.4.3.1-3, Part VI "Fire Protection" of the RS Rules).

2.3.6 The number of openings in the bulkheads and decks referred to in 2.3.2 and 2.3.3 shall be the minimum practicable. Such openings shall be fitted with closing arrangements that provide fire integrity equivalent to the surrounding structure. Any doors provided in the bulkheads bounding machinery spaces of category A shall be of "B-30" or "B-15" class and be self-closing, except when such a door is required to be of weathertight construction.

2.3.7 Where bulkheads or decks, that are required to be of "B-30" or "B-15" class divisions, are penetrated by pipes, cables, trunks, ducts etc., arrangements shall be made to ensure that the fire integrity of the division is not impaired.

2.3.8 All exposed surfaces of glass reinforced plastic constructions or constructions made of fire-restricting materials (refer to the definition in 1.3, Part VI "Fire Protection" of the Rules for the Classification and Construction of High-Speed Craft) within accommodation and service spaces, control stations, machinery spaces of category A and other machinery spaces of similar fire risk shall be protected by non-combustible materials or the final lay-up layer of resin having inherent fire retarding properties or be coated with a suitable fire retardant paint not producing excessive quantities of smoke and toxic vapours, this being determined in accordance with FTP Code.

3 FIRE DETECTION AND ALARM SYSTEM

3.1 GENERAL

3.1.1 All electrical equipment, devices, alerts and indicators, feeders and wiring of fire detection and alarm systems shall comply with the requirements of 7.5 and 7.6, Part XI "Electrical Equipment" of the RS Rules, the Code on Alerts and Indicators and FSS Code.

All fire detection and alarm equipment and systems shall be designed to withstand ambient temperature changes, vibration, humidity, shock, impact and corrosion normally encountered in ships.

3.2 FIRE DETECTION AND FIRE ALARM SYSTEMS

3.2.1 The fire detection and fire alarm system shall meet the following requirements:

.1 the activation of any detector or manually operated call point shall initiate a visual and audible signals at the control panel and indicating units. If the signals have not received attention within 2 min, an audible alarm shall be automatically sounded throughout the crew accommodation and service spaces, control stations and machinery spaces of category A. This alarm sounder need not be an integral part of the fire detection and fire alarm system;

.2 the control panel shall be located on the navigation bridge or in the main fire control room. One indicating unit shall be located on the navigation bridge if the control panel is located in the main fire control station;

.3 indicating units shall, as a minimum, denote the section, in which a detector has activated or manually operated call point has operated;

.4 clear information shall be displayed on or adjacent to each indicating unit about the spaces covered and the location of the sections.

3.2.2 The fixed fire detection and fire alarm system shall be installed to protect:

machinery spaces;

galley;

accommodation and service spaces;

control stations;

spaces containing heaters, open flames devices;

areas of concentrated electrical equipment;

and other areas of fire.

3.2.3 A fixed fire detection and fire alarm system with manually operated call points shall be capable of immediate operation at all times.

3.2.4 Sections of automatic detectors and manually operated call points shall meet the following requirements:

.1 automatic detectors and manually operated call points shall be grouped into sections;

.2 a section of automatic detectors which covers a control station, a service or an accommodation space shall not include a machinery space of category A.

3.2.5 The automatic detectors shall be located in compliance with 4.2.1.4, Part VI "Fire Protection" of the RS Rules.

3.2.6 Fire detection and fire alarm system for periodically unattended machinery spaces of category A shall be designed and the automatic detectors so positioned as to quickly detect the fire in any part of those spaces and under any normal operation conditions of machinery and variations of ventilation. Except in spaces of restricted height and where their use is especially appropriate, fire detection and fire alarm systems using only thermal detectors shall not be permitted.

The possibility of using automatic detectors operated by other factors indicative of incipient fires may be considered by the Register, provided they are no less sensitive than the heat or smoke detectors. Flame detectors shall only be used in addition to heat and smoke detectors.

The detection system shall be self-monitoring for faults, and on being activated shall initiate audible and visual alarms, distinct from those of any other system not indicating fire, in sufficient number of places to ensure that the alarms are heard and observed on the navigation bridge and by a responsible engineer officer.

When the bridge is unmanned, the alarm shall sound in place where a responsible officer will be on duty.

3.2.7 There shall be not less than two sources of power supply for the electrical equipment used in the operation of the fixed fire detection and fire alarm system, one of which shall be an emergency source.

3.3 FIRE WARNING ALARMS

3.3.1 Means shall be provided for automatically giving audible and visual warning of the release of fire-extinguishing medium into spaces accessible by doors or hatches in which personnel normally work or to which they have access.

Conventional cargo spaces and spaces with only a local release need not be provided with such an alarm.

3.3.2 The audible alarms shall be located so as to be audible throughout the protected space with all machinery operating, and the alarms shall be distinguished from other audible alarms by adjustment of sound pressure or sound patterns.

3.3.3 The signal shall be clear, distinct and readily audible in a noisy space, and shall be of a tone distinct from all other signals. In addition to the audible signal, there shall be a visible signal: "Gas! Go away!" and for the spaces protected by the aerosol fire extinguishing systems, "Aerosol! Go away!".

4 FIRE-FIGHTING EQUIPMENT AND SYSTEMS

4.1 The ship shall be equipped with the fixed water fire main system. The diameters of the fire main and water service pipes shall be sufficient for the effective distribution of the maximum required discharge from the fire pump.

4.2 The water fire main system shall be provided with a pump, generally, with an independent power source, delivering a minimum of 15 m^3/h at a pressure of not less than 2 MPa.

The fire pump driven by the main engine may be used, provided that the propulsion unit (engine — shaft — propeller) is so designed as to permit this pump operation when the ship is not under way. V-belt transmission may be used providing the pump operation in case one belt is broken.

4.3 The number and position of the hydrants shall be such that at least one jet of water from a single length of hose, as specified in 5.1.1, may reach any part of the ship normally accessible to the crew, while the ship is being navigated and any part of any cargo space when empty.

Furthermore, such hydrants shall be positioned near the accesses to the protected spaces.

At least two hydrants shall be provided on the ship.

4.4 At least one hydrant shall be provided in each machinery space of category A.

4.5 Each fire hydrant shall have a shut-off valve and a standard quick-acting coupling. Hydrants fitted on open decks shall also have quick-acting plugs, or equivalent device.

4.6 Machinery spaces of category A shall be protected by one of the fixed fire extinguishing systems specified in Table 3.1.2.1, Part VI "Fire Protection" of the RS Rules.

4.7 In ships of less than 150 gross tonnage where arranging a fire extinction station outside the protected spaces is hardly feasible, cylinders containing the fire extinguishing medium may be fitted within the protected space on condition that such stations are provided with efficient remote control for immediately starting the system from outside the protected space. The remote starting control position shall be distinctly indicated and lighted both from the main and emergency sources of electrical power.

4.8 Fire-fighting equipment and systems shall be readily available for operation under all service conditions.

5 FIRE-FIGHTING OUTFIT

5.1 Depending on the size of the ship and general arrangement of spaces, the ship shall be provided with fire-fighting outfit of approved type and be ready for use at any time:

.1 fire hoses in assembly with nozzles having length 10 — 15 m (for each of the hydrants; additionally one spare fire hose shal be provided). On open deck they shall be kept in spray-proof ventilated lockers or enclosures. Manual fire nozzles (not of aluminium construction) shall be of dual-purpose type having 12 mm in diameter with a shut-off device;

.2 at least 2 portable foam fire extinguishers suitable for extinguishing oil fires, at least 4 dry powder fire extinguishers and at least 2 carbon dioxide fire extinguishers based on their location:

one dry powder fire extinguisher — in wheelhouse and navigation room;

two foam fire extinguishers and one carbon dioxide fire extinguisher — in engine room;

three dry powder fire extinguishers — in accommodation and service spaces;

one carbon dioxide fire extinguisher in radio room, if it is enclosed, or in wheelhouse and navigation room.

Additionally, in galley, power plant room, accumulator battery room, if any, or in other enclosed space where the electrical equipment is installed, dry powder fire extinguishers shall be provided, one fire extinguisher at the entrance to each space;

.3 spare charge for every portable fire extinguisher except that for each such fire extinguisher which is of a type that cannot readily be recharged while the vessel is at sea, an additional portable fire extinguisher of the same type shall be provided in lieu of a spare charge;

.4 fire smothering blanket complying with the requirements in 5.1.13, Part VI "Fire Protection" of the RS Rules;

.5 complete set of fire fighting tools (one fire axe, one light-weight fire crowbar);

.6 one firefighter's outfit consisting of a set of personal equipment, breathing apparatus and lifeline complying with the requirements of IMO resolution MSC.98(73) (on ships greater than or equal to 150 gross tonnage).

PART VII. MACHINERY INSTALLATIONS

1 GENERAL

1.1 APPLICATION

1.1.1 The requirements of the present Part are set forth proceeding from the condition that flash point of oil fuel used for internal combustion engines is not below 60 °C.

1.2 DEFINITIONS AND EXPLANATIONS

1.2.1 Definitions and explanations relating to general terminology of the present Rules are given in Part I "Classification". Definitions and explanations applicable for the purpose of the present Part are given in 1.2, Part VII "Machinery Installations" of the RS Rules.

1.3 SCOPE OF SUPERVISION

1.3.1 Subject to supervision by the Register is the assembling of the machinery space equipment and testing of the following components of the machinery installation:

.1 main engines with reduction gears and couplings;

.2 heat exchangers and pressure vessels;

.3 auxiliary machinery;

.4 control, monitoring and alarm systems of the machinery installation;

.5 shafting and propellers.

1.3.2 Machinery, heat exchangers and pressure vessels, shafting parts and assemblies, propellers (including vertical-axis and jet propellers, steerable propellers, pitch control units, oil distribution boxes) and control systems of machinery and propellers, manufactured under the supervision of the Register or other classification society — IACS member in compliance with the approved documentation and having their certificates, may be installed onboard the ship.

1.3.3 After assembling of machinery, equipment, systems and piping arrangements on board the ship, the machinery installation shall be tested in operation under load according to the program approved by the Register.

2 GENERAL REQUIREMENTS

2.1 POWER OF MAIN MACHINERY

2.1.1 The power of main machinery shall provide safe ship operation in all the operation modes under worst allowable conditions without exceeding the maximum permitted loading specified in the documentation. The astern power shall be sufficient to take way off the ship making a full ahead speed on a agreeable length, which shall be confirmed during trials.

2.1.2 Machinery installation shall provide sufficient astern power to maintain manoeuvring of the ship in all normal service conditions.

2.1.3 Machinery installation shall be capable of maintaining in free route astern at least 70 % of rated ahead speed for a period of at least 30 min.

2.1.4 In the case of ships with twin hulls, the failure of machinery installation of one hull shall not put the machinery installation of the other hull out of action.

2.2 ENVIRONMENTAL CONDITIONS

2.2.1 The machinery, equipment and systems installed in the ship shall remain operative under environmental conditions stated in 2.3, Part VII "Machinery Installations" of the RS Rules.

2.3 MATERIALS AND WELDING

2.3.1 Materials for the manufacture of parts of shaftings and propellers shall comply with the requirements of Part XIII "Materials" of the RS Rules.

2.3.2 Intermediate, thrust and propeller shafts shall generally be made of steel with tensile strength R_m between 400 and 800 MPa.

2.3.3 The mechanical properties and chemical composition of materials used for the manufacture of propellers shall comply with the requirements of 3.12 and 4.2, Part XIII "Materials" of the RS Rules.

2.3.4 Where it is intended to make shafting and propellers of alloy steels, including corrosion-resistant and high strength steels, data on chemical composition, mechanical and special properties, confirming suitability of steel for intended application, shall be submitted to the Register.

2.3.5 Intermediate, thrust and propeller shafts, as well as coupling bolts (studs) may be made of rolled steel.

2.3.6 Securing and locking items of propeller blades, hub cones, sterntubes, sternbushes and sealings shall be made of corrosion-resistant materials.

2.3.7 Welding procedure and non-destructive testing of welded joints shall be carried out in compliance with the requirements of Part XIV "Welding" of the RS Rules.

2.4 INDICATING INSTRUMENTS

2.4.1 All the indicating instruments, with the exception of liquid-filled thermometers, shall be checked by competent bodies.

2.4.2 On the scales of pressure gauges and tachometers the restricted pressure and speed ranges shall be marked with bright colour.

3 CONTROL DEVICES AND STATIONS. MEANS OF COMMUNICATION

3.1 CONTROL DEVICES

3.1.1 Machinery installation generally shall be designed and constructed for operation in non-attended service mode.

3.1.2 All control systems essential for the propulsion, control and safety of the ship shall be independent or so designed that failure of one system does not degrade the performance of another.

3.1.3 The starting and reversing arrangements shall be so designed and placed that each engine may be started or reversed by one operator.

3.1.4 Proper working direction of control handles and handwheels shall be indicated by arrows and relevant inscriptions.

3.1.5 Control arrangements shall be so designed as to eliminate the possibility of spontaneously changing the positions prescribed.

3.1.6 The control devices of main engines shall have an interlocking system to preclude starting of the main engine, with a mechanical shaft-turning gear engaged.

3.1.7 When in addition to electric start, manual engine start is also provided, interlocking device excluding the possibility of simultaneous operation of the two drives shall be provided.

3.1.8 Main engines shall be remotely operated from the wheelhouse by means of a single control element per propeller. In installations with reverse reduction gear or CP-propellers, the system with two control elements may be used.

3.1.9 The main engine remote control system (with the exception of system of remote control by means of mechanical links), with control from the bridge, shall be so designed as to provide an alarm in the event of failure. As far as practicable, the present propeller speed and thrust direction shall be remain unchanged until control is transferred to the local station. Among other factors, the loss of power supply (electric, pneumatic, hydraulic power) shall not substantially affect the power of main engines or change the direction of propeller rotation.

3.2 CONTROL STATIONS

3.2.1 For generally used machinery installations with one non-reversion starter-actuated main engine, reverse reduction gear and fixed pitch propeller, the bridge control station of main engine and propeller, with any type of remote control, shall be equipped with:

.1 controls for operation of main engine and reverse reduction gear;

.2 main engine speed indicator;

.3 shaft speed and direction indicator;

.4 main engine starting device;

.5 main engine emergency stop device;

.6 lubricating oil pressure indicators for main engine and reduction gear;

.7 temperature indicator of the main engine coolant;

.8 indicator of sufficient water amount pumped through the sterntube arrangement;

.9 emergency alarm according to 3.2.1.6 — 3.2.1.8;

.10 starting battery charging indicators;

.11 means of communication in compliance with the requirements of 3.3.

3.2.2 The emergency stop devices of main engine and the overrides of automatic controls shall be so constructed that inadvertent operation of such devices is not possible.

3.2.3 With a remote control provision shall be made for local control of main engines and propellers, with the exception of remote control by means of mechanical links.

3.2.4 Control of main machinery and propellers shall be performed only from one control station. The transfer of control between the navigating bridge and the engine room shall be possible only in the engine room. The means of transfer shall be so designed as to prevent the propelling thrust from altering significantly.

3.3 MEANS OF COMMUNICATION

3.3.1 At least two independent means shall be provided for communicating orders from the navigating bridge to the engine room or control station, from which the speed and direction of thrust of the propellers are normally controlled.

One of these shall be an engine-room telegraph, which provides visual indication of the orders and responses both in the machinery spaces and on the navigating bridge and which is fitted with a sound signal clearly audible in any part of the engine room while the machinery is at work, and distinct in tone from all other signals in the machinery space (refer also to 7.1, Part XI "Electrical Equipment" of the RS Rules).

When there is no local control of main machinery in the machinery space, it is allowed to provide only one means of communication; when the distance between the wheelhouse and the machinery space is small, it is allowed not to provide special means of communications.

3.3.2 In the case of ships with twin hulls, provision shall be made for vocal communication between local control stations of the hulls in addition to communication between local control stations and the common control station in the wheelhouse.

4 MACHINERY SPACES. ARRANGEMENT OF MACHINERY AND EQUIPMENT

4.1 GENERAL

4.1.1 Ventilation of machinery spaces shall comply with the requirements of Part VIII "Systems and Piping" of the RS Rules.

4.2 ARRANGEMENT OF MACHINERY AND EQUIPMENT

4.2.1 Machinery, equipment, pipes and fittings shall be so arranged as to provide easy access for servicing and emergency repair; the requirements in 4.5.1 shall also be met.

4.2.2 Air compressors shall be installed in such places where the intaken air is least contaminated by vapours of combustible liquids.

4.2.3 Oil fuel units, as well as hydraulic units containing flammable liquids with working pressure above 1,5 MPa and not being a part of main and auxiliary machinery, shall be placed in separate rooms with self-closing steel doors.

If it is impracticable to locate such units in separate rooms, special consideration shall be given with regard to shielding of the components and containment of possible leakages.

4.2.4 Requirements for the arrangement of equipment of refrigerating plant in the main machinery space are outlined in Part XII "Refrigerating Plants".

4.3 ARRANGEMENT OF OIL FUEL TANKS

4.3.1 In general, oil fuel tanks shall be part of the ship's hull structures and shall be located outside machinery spaces. Where oil fuel tanks, other than double bottom tanks, are necessarily located adjacent to or within machinery spaces, their surfaces in machinery spaces shall be kept to a minimum and shall preferably have a common boundary with the double bottom tanks. Where such tanks are located within the boundaries of machinery spaces, they shall not contain oil fuel having flash point less than 60 °C.

In general, the use of free standing oil fuel tanks shall be avoided.

4.3.2 Where the use of free standing oil fuel tanks is permitted by the Register, they shall be placed in oiltight spill trays.

4.3.3 Oil fuel tanks shall not be located above the machinery, equipment and pipelines with surface temperature under insulation over 220 °C, boilers, internal combustion engines, electrical equipment and ladders and, as far as practicable, shall be arranged far apart therefrom.

4.3.4 The arrangement of fuel and oil tanks in the area of accommodation and service spaces shall comply with the requirements of Part VI "Fire Protection" of the RS Rules.

4.4 INSTALLATION OF MACHINERY AND EQUIPMENT

4.4.1 The machinery and equipment consistuting the machinery installation shall be installed and secured on strong and rigid seatings. The construction of the seatings shall comply with the requirements of Part II "Hull" of the RS Rules.

4.4.2 The main machinery, their gears, thrust bearings of shafts shall be secured to the shipboard seatings with fitted bolts throughout or in part. The bolts may be omitted, if appropriate stops are provided. Where necessary, fitted bolts shall be used to fasten auxiliary machinery to seatings.

4.4.3 The bolts securing the main and auxiliary machinery, shaft bearings to their seatings, end nuts of shafts, as well as bolts connecting the length of shafting shall be fitted with appropriate lockers against spontaneous loosening.

4.4.4 Where the machinery shall be mounted on shock absorbers, the design of the latter shall be approved by the Register. Shock absorbing fastening of the machinery and equipment shall:

maintain vibration-proof insulation when the absorbed machinery and equipment are operated in the environmental conditions as per the requirement of 2.3.1;

be resistant to the corrosive media, temperature and various kinds of radiation;

be equipped with the yielding grounding jumper of sufficient length to prevent radio reception interference and comply with the requirements of safety engineering;

eliminate the interference for operation of other equipment, devices and systems.

4.4.5 Installation procedure for machinery on plastic pads shall be submitted to the Register for review. Polymeric materials used for the pads shall comply with the requirements of 6.5, Part XIII "Materials" of the RS Rules.

4.4.6 The machinery with horizontal arrangement of the shaft shall be installed parallel to the center line of the ship.

4.4.7 The machinery for driving generators shall be mounted on the same seatings as the generators.

4.5 MEANS OF ESCAPE FROM MACHINERY SPACES

4.5.1 The main and auxiliary machinery shall be so arranged in the machinery spaces as to provide passageways from the control stations and servicing flats to the means of escape from the machinery spaces. The width of passageways shall not be less than 500 mm over the whole length. The width of passageways along the switchboards shall comply with the requirements in 4.6.7, Part XI "Electrical Equipment" of the RS Rules.

4.5.2 The width of ladders of means of escape shall not be less than 500 mm, and the width of doors and hatches of means of escape shall not be less than 600 mm.

4.5.3 Means of escape from machinery spaces shall provide safe escape to the rescue means.

4.5.4 All the doors, covers of companionways and skylights, which may serve as means of escape from machinery spaces, shall permit opening and closing both from inside and outside. The covers of companionways and skylights shall be clearly marked with the sign prohibiting from placing any things on them.

4.5.5 When the requirements of 4.5.11 and 4.5.13, Part VII "Machinery Installations" of the RS Rules are met, one means of escape from machinery space to open deck is permitted without being fitted with an enclosure.

4.6 INSULATION OF HEATED SURFACES

4.6.1 Surfaces of machinery, equipment and piping with temperatures above 220 °C shall be insulated. Measures shall be taken to prevent insulation destruction due to vibration and mechanical damage.

4.6.2 The insulating materials and surface of insulation shall comply with the requirements of 2.1.1.1, Part VI "Fire Protection" of the RS Rules.

5 SHAFTING

5.1 GENERAL

5.1.1 Requirements of Section 5, Part VII "Machinery Installations" of the RS Rules shall be met for the ship's design and construction to the applicable extent. In ships with no obstruction for the propeller shaft to slip out of the sterntube, means shall be provided which, in the event of the propeller breaking, will prevent its slipping out of the sterntube; alternative arrangements shall be made to preclude flooding of the engine room, should the propeller shaft be lost.

5.1.2 Shafting parts shall be manufactured from forged or rolled steel (carbon or alloy) with tensile strength of 400 to 800 MPa in compliance with the requirements of 3.7, Part XIII "Materials" of the RS Rules. Connecting bolts, couplings and half-couplings shall be made from steel with tensile strength not less than tensile strength of the shafting material. Dimensions of the joined parts shall comply with the standards in force.

5.1.3 Propeller shafts made from carbon steel shall be reliably protected from contact with sea water. Propeller shaft cone under the propeller shall also be protected from impact of sea water.

5.1.4 Length of the propeller shaft bearing nearest to the propeller shall be taken according to 5.6, Part VII "Machinery Installations" of the RS Rules.

5.1.5 The area between the sterntube and propeller boss shall be protected by a strong casing.

5.1.6 The sea water cooling of sterntube bearings shall be of forced type. The water supply system shall be provided with a flow indicator, pressure gauge and alarms for the minimum flow of water.

5.1.7 The shaftline shall comprise appropriate braking device preventing rotation of the shaft in the event the main engine or reduction gear goes out of action.

5.2 DESIGN AND DIAMETERS OF SHAFTS

5.2.1 The design diameter of the propeller shaft D_d, in mm, (without taking into account allowance for subsequent boring during the operation period) shall not be less than that determined by the formula

$$D_p = 120\sqrt[3]{P/n} \qquad (5.2.1)$$

where P = rated power of the propeller shaft, in kW;
n = rated speed of the propeller shaft, in rpm.

At that it is assumed that additional stresses due to torsional vibrations shall not exceed the permissible stresses stipulated by the requirements of Section 8, Part VII "Machinery Installations" of the RS Rules.

5.2.2 The thickness S of a bronze liner shall not be less than $0{,}03d + 7{,}5$, in mm, where d = diameter of the propeller shaft under the liner. The thickness of the liner between the bearings may be reduced to $0{,}75S$.

5.2.3 Where keys are used to fit the propeller on the propeller shaft cone, the latter shall have a taper not in excess of 1:12 (for shafts with diameter less than 200 mm — not in excess of 1:10); in case of keyless fitting — not in excess of 1:15.

6 PROPELLERS

6.1 GENERAL

6.1.1 The requirements of the present Section apply to metal fixed-pitch propellers, both solid and detachable-blade propellers, as well as to controllable-pitch propellers.

6.1.2 Propellers shall be manufactured from steels, which comply with the requirements of 3.12, Part XIII "Materials" of the RS Rules, or from copper alloys in compliance with the requirements of 4.2, Part XIII "Materials" of the RS Rules in accordance to the approved documentation developed on the basis of the requirements of Section 6, Part VII "Machinery Installations" of the RS Rules.

6.1.3 The completely finished propellers shall be statically balanced.

Mass of test load, in kg, shall not exceed the relation of propeller mass in tons to propeller diameter, in m ($m < M/D$).

6.1.4 The sealings fitted to the cone of the propeller shaft shall be tested to a pressure of at least 0,2 MPa after the propeller fitted in place. Propeller boss design shall provide for carrying out this test.

7 ACTIVE MEANS OF THE SHIP'S STEERING

7.1 GENERAL

7.1.1 Active means of the ship's steering (AMSS) are steerable propellers including retractable units of all types, active rudders, vertical-axis propellers, water-jets, athwartship thrusters and other devices of similar purpose. The requirements for AMSS construction and installation are outlined in Section 7, Part VII "Machinery Installations" of the RS Rules.

8 TORSIONAL VIBRATION

8.1 GENERAL

8.1.1 Requirements of the present Section apply to all propulsion plants, irrespective of their power, and auxiliary machinery driven from internal combustion engines having power of 110 kW and above.

8.1.2 Calculations and measurement of torsional vibration shall be performed in compliance with the requirements of Part VII "Machinery Installations" of the RS Rules.

8.1.3 Restricted speed ranges shall be marked off on the tachometers of the engine and control station.

9 VIBRATION OF MACHINERY AND EQUIPMENT

9.1 GENERAL

9.1.1 Vibration levels of machinery installation units shall not exceed the permissible standards specified in Part VII "Machinery Installations" of the RS Rules.

9.1.2 Vibration measurements of machinery and equipment shall be taken after construction of the ship according to the program approved by the Register in compliance with Appendix 2 to Section 18 of the Guidelines on Technical Supervision of Ships under Construction.

PART VIII. SYSTEMS AND PIPING

1 GENERAL

1.1 APPLICATION

1.1.1 Requirements of the present Part apply to the following systems and piping:
.1 bilge;
.2 air, overflow and sounding;
.3 exhaust gas;
.4 ventilation;
.5 liquid oil fuel;
.6 water cooling;
.7 ballast.

1.2 GENERAL REQUIREMENTS

1.2.1 Depending on the purpose, it is allowed to use pipes and fittings made of steel, copper and copper alloys, plastic.

1.2.2 Plugs and threaded parts of the deck sleeves of sounding pipes shall be made of bronze or brass.

1.2.3 When it is necessary to provide mobility of piping connections with engines or other machinery, flexible joints (hoses) of approved type may be used. Flexible joints shall comply with the requirements of 2.1.8, Part VIII "Systems and Piping" of the RS Rules, and their number and length shall be minimal.

1.3 BOTTOM AND SIDE FITTINGS

1.3.1 Bottom and side fittings below the bulkhead deck, bottom fittings or gaskets shall have no components, the material of which would readily deteriorate in the event of fire.

The spindles and closing parts of bottom and side fittings shall be made of corrosion-resistant materials.

1.3.2 The number of openings in shell plating shall be kept to a minimum.

1.3.3 Inlet openings in shell plating may be done as slots or holes in the ship's hull and shall be fitted with gratings. The net area through the gratings or slots shall not be less than 2,5 times the area of the fitting.

1.3.4 Sea inlets and discharges shall have valves or sluice valves locally controlled. The valve controls shall be located in easily accessible places and shall be fitted with an indicator to show whether the valve is open or closed. Bottom and side fittings, as a rule, shall be attached to welded pads. The stud holes shall not penetrate the shell plating and shall be only within the welded pads. Gaskets made of lead or other materials, which easily deteriorate in the event of fire, are not allowed.

1.4 PIPING LAYING

1.4.1 Where pipelines pass through watertight bulkheads, there shall be used appropriate bulkhead sleeves, welded pads or other details to ensure the integrity of the structure.

1.4.2 Pipelines shall be secured in a way as not to interfere with the stresses from thermal expansion, undue deformation of ship's structure and vibration.

1.4.3 Pressure pipes are not permitted to be carried above and behind the main switchboard, as well as the control panels of essential machinery and equipment. Such pipes may be carried at a distance not less than 0,5 m from the fronts and sides of the main switchboard and control panels, provided that at a distance less than 1,5 m from the main switchboard and control panels no detachable joints are used or the flanged joints have protective casings.

2 BILGE SYSTEM

2.1 PUMPS

2.1.1 Each ship shall be provided with at least two bilge pumps; one of them shall be electrically driven or main engine driven pump, while water ejector or hand pump may be used as the second pump. V-belt drive from the main engine to the pump shall reliably provide torque transmission in case one of the belts is broken.

2.1.2 Independent general service pumps of sufficient capacity may be used as bilge pumps.

2.1.3 The pump for main engine cooling with sea water may be used as the emergency bilge pump.

2.1.4 Centrifugal bilge pumps shall be of self-priming type.

2.1.5 Each electrically driven bilge pump shall have a capacity at least 10 m^3/h; capacity of hand pump shall not be less than 1,2 l per piston stroke.

2.2 PIPING

2.2.1 The internal diameter of the main bilge line and that of bilge suctions shall not be less than 25 mm, while the internal diameter of the pipes directly connected to the pump shall not, in any case, be less than the bilge pump suction diameter.

2.2.2 The bilge lines and their bilge suctions shall be so arranged as to enable any watertight compartment to be drained by any pump, and to enable one of the pumps to be operated in case the rest of pumps are inoperative or are used for other purposes.

2.2.3 Bilge suctions with readily accessible mud boxes shall be installed by both sides of the machinery space in its after end. The pipes between the mud boxes and bilges shall be as straight as practicable. No strum boxes, filters and mud boxes shall be fitted for emergency bilge drainage.

2.2.4 Machinery space bilge system shall comply with the requirements of the Rules for the Prevention of Pollution from Ships Intended for Operation in Sea Areas and Inland Waterways of the Russian Federation.

2.2.5 In all self-propelled ships provision shall be made for emergency drainage of the machinery spaces. The diameter of the emergency bilge suction shall not be less than that of the suction branch of the pump used for this purpose and shall have non-return stop valve with the spindles extended above the machinery space floor plates, having nameplate "For emergency use only".

2.2.6 For each hull of a ship with twin hulls, an independent bilge system shall be provided complying with the requirements of the present Chapter.

2.2.7 Bilge system of the ship's spaces shall comply with the requirements of Section 7, Part VIII "Systems and Piping" of the RS Rules.

3 AIR, OVERFLOW AND SOUNDING PIPES

3.1 AIR PIPES

3.1.1 All tanks intended for storage of liquid shall have air pipes.

3.1.2 The air pipes of the tanks shall be fitted at the highest part of the tanks at a place that is at the maximum distance from the filling pipes. Arrangement of pipes shall be selected depending on the conditions precluding the formation of air pockets. The air pipes shall not be used as filling pipes. The cross-section area of the air pipes of the tanks filled by gravity shall not be less than that of filling pipes; in case the pumps are used, it shall not be less than 1,25 times the cross-section area of filling pipes.

3.1.3 The outlet of each air pipe shall have permanently attached selfclosing covers in compliance with the requirements of 10.1.8, Part VIII "Systems and Piping" of the RS Rules and have another consruction approved by the Register preventing the sea water from getting into the tanks.

3.1.4 The outlets of air pipes of fuel oil tanks shall be led to the open deck. Where in ships the fuel with flash point < 60 ºC is used, the outlets of air pipes of fuel oil tanks shall be protected with flame-arresting fittings; the clear area through the fitting shall not be less than open flow area of the air pipe.

3.1.5 The height of air pipes measured from the deck to the point where water may have access below shall not be less than 600 mm on the freeboard deck and not less than 380 mm on superstructure deck. An inner diameter of the air pipes shall not be less than 50 mm.

3.1.6 Nameplates shall be affixed to the outlets of air pipes.

3.2 OVERFLOW PIPES

3.2.1 Oil fuel tanks shall be provided with overflow pipes directing fuel to an overflow tank or storage tank having the capacity not less than the maximum capacity of the fuelling and fuel transfer system within 10 min.

No overflow pipes may be fitted where the oil fuel system is so designed that no spilling overboard may occur during the loading and transfer of fuel.

3.2.2 The minimum overflow pipe bore shall be 50 mm. Cross-section area of overflow pipes shall be the same as indicated for air pipes in 3.1.2.

3.2.3 Where air pipes are simultaneously used as overflow pipes, they shall not be connected to the air pipes of overflow tanks. In this case, the overflow pipes of a common overflow pipe shall be connected directly to the tank.

3.2.4 The overflow pipes of daily fuel and lube oil tanks shall be led to overflow tanks located below the tanks mentioned above.

3.2.5 A sight glass shall be fitted on vertical overflow pipe at readily visible and accessible location, or an alarm device shall be provided to give warning when the predetermined level is reached in the overflow tank.

3.2.6 An overflow tank shall be provided with audible and visual alarms operating whenever the tank filling reaches 75 %.

3.3 SOUNDING ARRANGEMENTS

3.3.1 Each tank intended for storage of liquid, cofferdams and void spaces with bilge connections, as well as bilges and bilge wells in spaces, which are not accessible at all times, shall be provided with sounding pipes or other approved level indicators.

3.3.2 Level indicators of fuel tanks fitted with transparent insertions shall be protected against the damage. Transparent thermal-resistant insertions shall be made of flat glass or shatterproof plastics, which do not lose transparency during interaction with fuel. Self-closing cocks shall be fitted between the level indicator and the fuel tank.

3.3.3 The internal diameter of the sounding pipes shall not be less than 25 mm.

3.3.4 The upper ends of the sounding pipes led to the open deck shall be fitted with tight threaded plugs complying with the requirements of 1.2.2.

3.3.5 The upper ends of the sounding pipes of fuel and oil tanks, which led to the machinery spaces, shall be fitted with self-closing blanking devices and with a self-closing cocks located below them. Structural measures shall be taken to prevent the spillage of fuel or oil on heated surfaces from the blanking device. The pipes shall terminate at least 0,5 m above the plating.

3.3.6 Provision shall be made under the open ends of the sounding pipes for welded striking plates or other strengthening to protect the bottom plating from damaging by a sounding rod. In case of slotted sounding pipes with close ends, adequately strong closing plugs shall be provided.

3.3.7 Nameplates, made of sea water resistant material, shall be affixed to the sounding pipes.

4 EXHAUST GAS SYSTEM

4.1 EXHAUST GAS PIPING

4.1.1 The exhaust gas pipes shall, as a rule, be led to the open decks.

4.1.2 Where the exhaust gas pipes are led through the shell plating in the vicinity of load waterline or below it, provision shall be made for arrangements precluding the possibility of sea water entering the engine.

4.1.3 Each internal combustion engine shall have an individual exhaust gas pipe with thermal compensators, silencer with fire extinguishing system and spark arrestor of the construction approved by the Register. When necessary, deviations may be allowed according to 11.1.5, Part VIII "Systems and Piping" of the RS Rules.

4.1.4 The exhaust gas pipes of internal combustion engines shall be led at a distance not less than 0,45 m from the oil fuel tanks.

4.1.5 The exhaust gas pipes of internal combustion engines shall be thermally insulated by means of thermal insulating material, double walls or screen. It is allowed not to insulate exhaust gas pipes of internal combustion engines with "wet" exhaust, if the temperature on the pipe surfaces does not exceed 60 °C.

4.1.6 The exhaust gas pipes of internal combustion engines shall have draining devices preventing the entry of water into the engine. Drain pipe bore of draining devices shall not be less than 25 mm.

5 VENTILATION SYSTEM

5.1 VENTILATION DUCTS AND VENTILATOR HEADS, AIR INLETS

5.1.1 As a rule, ventilation ducts shall not be led through the watertight bulkheads.

5.1.2 Where trunkways and vertical ducts of the ventilation system pass through the decks, they shall be watertight and equivalent in strength to the local hull structures.

5.1.3 Ventilation ducts shall be protected against corrosion or constructed of corrosion-resistant materials.

5.1.4 Ventilation ducts leading to machinery spaces and other spaces fitted with smothering facilities shall have gastight closing arrangements actuated outside the serviced spaces.

5.1.5 In places of possible sweating the ventilation ducts shall be insulated and drain plugs shall be provided for the portions of ducts where water is likely to accumulate.

5.1.6 The ventilator heads of supply ducts and the air inlets of the ventilation system shall be so located that the risk of drawing in contaminated air is minimized, and admission of sea water into the ventilation ducts is precluded.

5.2 VENTILATION OF MACHINERY AND SERVICE SPACES

5.2.1 The ventilation of machinery spaces shall be such as to ensure the sufficient supply of air required for operation of machinery and devices at full load in all service conditions.

5.2.2 The ventilation of machinery spaces shall be serviced by separate intake and exhaust ducts.

5.2.3 Cross-section of natural ventilation ducts F, in cm^2, is determined by the formula

$$F = 40V \tag{5.2.3}$$

where V = volume of the ventilated machinery space, in m^3 (excluding the volumes occupied by machinery and equipment).

In all cases F shall not be less than 45 cm^2.

5.2.4 Ventilation of accumulator battery rooms and boxes shall be independent and comply with the requirements of 12.10, Part VIII "Systems and Piping" of the RS Rules. The cross-section area of the natural ventilation duct shall not be less than 40 cm^2.

5.2.5 Store rooms for flammable materials shall be provided with ventilation in compliance with the requirements of 2.1.5, Part VI "Fire Protection" of the RS Rules.

5.2.6 Fire smothering stations shall be equipped with efficient ventilation system. The carbon dioxide fire-extinguishing station shall be provided with an independent exhaust and supply ventilation system. The inlets of exhaust ducts shall be located in the lower parts of the station.

6 LIQUID FUEL SYSTEM

6.1 PIPING LAYING

6.1.1 The fuel pipelines shall be made of steel or other material complying with the Register requirements regarding strength and fire resistance.

6.1.2 The fuel pipelines shall not be led above the engines and exhaust gas pipes. In exceptional cases, it is allowed to lead the fuel pipes above the mentioned equipment, provided that in these positions the pipes have not detachable joints or the provision shall be made for preventing the spillage of fuel on the mentioned equipment.

6.1.3 The bunkering of the ship shall be carried out through a permanent pipeline.

The filling pipeline shall be connected to the tanks near the top and run down to the tank bottom to a minimal gap. After bunkering of the ship the filling pipeline shall be safely closed (with a screw plug). The plug shall be made of copper-based alloy.

6.2 TANKS

6.2.1 The fuel tanks, as a rule, shall represent part of the ship hull structures.

6.2.2 Requirements to fuel tanks arrangement are stated in 4.3, Part VII "Machinery Installations".

6.2.3 The main and auxiliary engines shall be supplied with the prepared fuel from the service tank with the minimum capacity sufficient for 8 h operation of the ship machinery installation at the maximum working load.

6.2.4 When the design fuel store for the specified area of navigation does not exceed the daily consumption of machinery installation at the maximum working load, it is allowed to allocate this store together with an additional 20 % emergency store in one service tank, which shall be generally arranged at the ship center plane. In this case the received fuel shall be cleaned and prepared by the shore station to the extent required for the engines installed.

6.2.5 Service tank shall be fitted with heat-resistant level indicator, closing valve (quick-closing valve is recommended) installed directly on the tank, with remote closing from always accessible position outside the space where the tank is located, self-closing drain valve and the minimum fuel level alarm with signal transmission to the wheelhouse.

6.2.6 Independent tanks, pumps, filters and other equipment in the places of possible fuel leakage shall be fitted with leakproof drip trays with drain pipes led into the drain tank with 80 % filling warning alarm. Drainage of oil fuel into the bilges is not permitted. The internal diameter of drain pipes shall not be less than 25 mm.

6.2.7 Where the drain tank is situated in the double-bottom space, structural measures shall be taken to prevent penetration of water into machinery space through the open ends of the drain pipes in the event of damage to the shell plating.

6.3 PUMPS

6.3.1 Mechanically driven fuel transfer pump and a standby hand pump shall be provided for fuel transfer from the storage tanks to the service tanks. In ships with a daily consumption of fuel less than 1 t, a hand pump is admissible.

Any suitable pump, including the fuel separator pump, may be used for standby purpose.

6.3.2 The fuel transfer pumps and the separator pumps, besides local hand control, shall be provided with stopping means operable from always accessible positions outside the space where the pumps are installed.

7 WATER COOLING SYSTEM

7.1 PUMPS

7.1.1 Water cooling system of main and auxiliary engines, and reduction gears shall be equipped with two pumps, one of which is a standby pump driven independently. The capacity of standby pump shall provide both fresh or sea water cooling of any engine; at that precautions shall be taken to prevent mixing of fresh and sea water.

7.1.2 The general service pumps, driven independently, operated only for clean water may be used as the standby pumps.

7.2 PIPING

7.2.1 A filter shall be fitted on the suction pipelines of water cooling system servicing the main and auxiliary engines; the filter design shall provide its cleaning without having to stop the pumps. The filter shall be provided with a facility that makes it possible to be sure, before the filter is opened up, that there is no pressure.

7.2.2 The arrangement of the sea water discharge pipeline shall be such that the highest cooled spaces of the engines, water coolers and oil coolers are always filled with water and formation of trapped zones is excluded.

7.2.3 In the two-circuit water cooling system of the engine provision shall be made for an expansion tank where the level of water is higher than the maximum level of water in the engine.

7.2.4 The pipes and equipment used in the sea water cooling system shall be protected against corrosion in compliance with 1.4, Part VIII "Systems and Piping" of the RS Rules, or made from corrosion-resistant materials.

8 BALLAST SYSTEM

8.1 PIPING

8.1.1 Requirements for piping and fittings are specified in Section 8, Part VIII "Systems and Piping" of the RS Rules.

8.2 PUMPS

8.2.1 The ballast system shall be serviced by at least one pump. The general service pumps may be used as ballast pumps, including bilge, fire or standby cooling water pumps.

8.2.2 Where the oil fuel tanks are generally used as ballast tanks, then the reliable devices shall be provided for disconnection of the ballast system from the liquid oil fuel system. The standby cooling water pump or the fire pump shall not be used for ballasting, nor shall the ballast pump be used as the standby cooling water pump or fire pump.

9 LUBRICATING OIL SYSTEM

9.1 When it is necessary to equip the ship with a lubricating oil system, the requirements for the manufacture and mounting of the pumps, tanks and piping shall be agreed upon with the Register on the basis of the general requirements of Section 14, Part VIII "Systems and Piping" of the RS Rules.

PART IX. MACHINERY

1 GENERAL

1.1 APPLICATION

1.1.1 Requirements of the present Part apply to the following engines and machinery:

.1 internal combustion engines, main;

.2 gears and couplings;

.3 engines driving electric generators or auxiliary and deck machinery, units in assembly;

.4 pumps included into the systems covered by Parts VI "Fire Protection", VIII "Systems and Piping" and XII "Refrigerating Plants";

.5 air compressors;

.6 fans included into the systems covered by Part VIII "Systems and Piping";

.7 steering gear;

.8 anchoring and mooring machinery;

.9 hydraulic drives;

.10 separators for fuel and oil.

1.2 SCOPE OF SUPERVISION

1.2.1 Engines and machinery indicated in 1.1.1 shall be manufactured under the Register supervision in compliance with the requirements stipulated in Part IX "Machinery" of the RS Rules and have the respective certificates.

1.3 GENERAL REQUIREMENTS

1.3.1 Machinery indicated in 1.1.1 shall remain operative under the conditions specified in 2.2, Part VII "Machinery Installations".

1.3.2 The machinery parts that are in contact with a corrosive medium shall be made of an anticorrosive material or shall have corrosion-resistant coatings.

1.3.3 V-belt drive from the main engine shall provide safe operation of the drive in case one of the belts is broken.

1.3.4 Materials intended for manufacture of the machinery parts shall comply with the requirements of Part XIII "Materials" of the RS Rules.

2 INTERNAL COMBUSTION ENGINES

2.1 GENERAL PROVISIONS

2.1.1 The requirements of the present Section are applicable to the engines of 55 to 375 kW power output. The requirements to the internal combustion engines with power output less than 55 kW apply in the scope agreed with the Register.

2.1.2 The engines intended to be used as main engines shall comply with the requirements of Part VII "Machinery Installations".

2.1.3 Fuel oil, lubricating oil pipes, fittings, flanged connections, filters shall be protected so that in case of their failure petroleum products falling on hot surfaces with the temperature of 220 °C and above is prevented.

2.1.4 The air intake pipes of engines and scavenging-and-supercharging units shall be fitted with safety gauzes.

2.1.5 Electrically started engines shall be equipped with engine-driven generators for automatic charging of starting storage batteries.

2.1.6 Each main engine shall have a speed governor so adjusted that the engine speed cannot exceed the rated speed by more than 15 %.

2.1.7 Protection system of main and auxiliary engines shall provide complete fuel cut-off when the oil pressure in the system drops below the allowable value.

2.1.8 Main and auxiliary engines shall be equipped with the following instruments for measuring:

.1 oil pressure at engine inlet (before and after filter);

.2 oil temperature at the engine inlet and outlet;

.3 air pressure at the starting device inlet;

.4 fresh water pressure at the engine outlet;

.5 scavenging (supercharging) receiver pressure;

.6 exhaust gas temperature in front of turbocharger and behind it;

.7 crankshaft speed, and for main engines and engines with disengaging couplings and reverse-reduction gear, also with indicators of the direction of propeller shaft rotation;

.8 alarm device with audible and visual signals for the failure of lubricating oil system.

N o t e . It is recommended to install the warning alarms on achievement of the maximum limiting coolant temperature at the engine outlet.

3 GEARS, DISENGAGING AND ELASTIC COUPLINGS

3.1 GENERAL

3.1.1 The requirements of the present Section apply to gearing, elastic and disengaging couplings of the main engines and auxiliary machinery drives.

3.1.2 The gearing cases shall be provided with ventilating arrangements. When the ventilating ducts are led to the deck, the possibility of water getting inside shall be prevented.

3.1.3 Where the main thrust bearing is housed in the gearing case, the lower part of the case shall have proper strengthening.

3.1.4 It is recommended to fit the gear drives with throats with easy-dismountable covers for examination of gear teeth and bearings.

3.1.5 Provision shall be made for forced lubrication or lubrication by spraying of the toothing and bearings.

3.1.6 Provision shall be made for a meter of oil level within the reduction gear casing, and for pressure and temperature meters in case of forced lubrication.

3.1.7 Control stations of gearing and disengaging couplings shall comply with the requirements of Part VII "Machinery Installations".

3.1.8 It shall be possible to control the disengaging couplings of main machinery from the stations, from which the main machinery is controlled. It is recommended to provide standby (emergency) control arrangements directly at the disengaging couplings.

3.1.9 The ultimate static moment of the elastic coupling material, i.e. rubber or similar synthetic material, being in shear or tension, shall be at least eight times the torque transmissed by the coupling operating in the ship's shafting.

4 AUXILIARY MACHINERY

4.1 AIR COMPRESSORS

4.1.1 Air compressors shall be so designed that the air temperature at the outlet of the air cooler is not in excess of 90 °C. The compressor cooling water spaces shall be fitted with drain arrangements.

4.1.2 Each compressor stage or directly after it shall be fitted with a safety valve preventing the pressure rise in the stage above 10 % of the rated pressure when the delivery pipe valve is closed. The safety valve design shall prevent any possibility of its adjustment or disconnection after being fitted on the compressor.

4.1.3 The casings of the coolers shall be fitted with safety devices providing for a free escape of air in case the pipe are broken.

4.1.4 A pressure gauge shall be fitted at the air outlet after each stage of the compressor.

4.2 PUMPS

4.2.1 Provision shall be made to prevent the pumped fluid from penetration to the pump bearings, except for the pumps where the pumped fluid is employed for lubrication of bearings.

4.2.2 If the pump design does not preclude the possibility of pressure rising above the rated value, a safety valve shall be fitted on the pump casing or on the pipe before the first stop valve.

4.2.3 In pumps intended for transferring of flammable liquids, the by-pass from safety valves shall be effected into the suction side of the pump or to the suction pipe.

4.2.4 Sealing of shaft of the flammable liquid transfer pump shall prevent leakages or their number shall be minimal and shall not produce the flammable air/gas mixture.

4.3 CENTRIFUGAL SEPARATORS

4.3.1 The requirements of Part IX "Machinery" of the RS Rules shall be observed during installation of centrifugal separators.

5 DECK MACHINERY

5.1 GENERAL

5.1.1 The machinery having both manual and power drives shall be provided with interlocking arrangements preventing their simultaneous operation.

5.1.2 The machinery with the hydraulic drive or control shall also comply with the requirements of Section 6.

5.1.3 Deck machinery may be driven by the main engine via hydraulic or mechanical gear, provided all the safety regulations are observed. V-belt gear from the main engine shall provide safe operation of the drive in case one of the belts is broken.

5.2 STEERING GEAR

5.2.1 Main and auxiliary steering gear shall be so designed that a single failure in one of them will not render the other one inoperative.

5.2.2 Steering gears shall provide a continuous operation under the most severe service conditions. Design of the steering gear shall exclude the possibility of its failure with the ship running astern at the maximum speed.

5.2.3 As a rated torque of the steering gear M_r the torque is taken corresponding to the rudder (steering nozzle) angle equal to 35° for the main steering gear and 15° for the auxiliary steering gear when operating under the nominal parameters.

5.2.4 The main steering gear shall be capable of putting the rudder over from 35° on one side to 30° on the other side in not more than 28 s when the rudder stock is affected by a rated torque of the steering engine.

5.2.5 The main hand-operated steering gear shall comply with the requirements of 2.9.3, Part III "Equipment, Arrangements and Outfit".

5.2.6 The main steering gear shall have protection against overloads of the gear elements and assemblies when the rudder stock torque equal to 1,5 times the corresponding rated value arises. In case of hydraulic steering gear the safety valves may be used set to provide protection against overloads but not in excess of 1,25 times the corresponding maximum working pressure in the inner spaces of the hydraulic steering gear. The maximum capacity of the safety valves shall exceed the total pump capacity by 10 %.

5.2.7 For the main hand-operated steering gear it is sufficient to provide the gear with buffer springs instead of the protection against overload.

5.2.8 Each power-operated steering gear shall be provided with a device discontinuing its operation before the rudder (steering nozzle) reaches the rudder (steering nozzle) stops.

5.2.9 The steering gear segment rack or the element rigidly coupled with the rudder shall be fitted with a dial calibrated in not more than 1° to indicate the actual position of the rudder.

5.2.10 For the strength calculation it is assumed that the reference stresses in the components shall not exceed 0,4 of yield stress for the steel components and 0,18 of yield stress for the components made of spheroidal cast iron; the steering gear elements unprotected from overloads by safety devices shall have the strength corresponding to the rudder stock strength.

5.2.11 The connection of the steering engine or gear with the elements coupled with the rudder stock shall eliminate the possibility of breakdown on the steering gear when the rudder stock is shifted in the axial direction.

5.3 ANCHOR MACHINERY

5.3.1 Installation of hand-operated anchor machinery on ships with Equipment Number 205 and less is allowed in compliance with the requirements of 3.6, Part III "Equipment, Arrangements and Outfit".

5.3.2 Anchor machinery design shall meet the applicable requirements in 6.3, Part IX "Machinery" of the RS Rules.

6 HYDRAULIC DRIVES

6.1 GENERAL

6.1.1 Connecting of hydraulic steering gear pipelines and those of hydraulic power systems of controlled pitch propeller to other hydraulic systems is not permitted.

6.1.2 The hydraulic system failure shall not cause the failure of machinery or arrangement.

6.2 STRENGTH CALCULATION

6.2.1 The hydraulic machinery elements situated in lines of force flow shall be checked under the stresses corresponding to the working pressure. In this case, the reference stresses in elements shall not exceed 0,4 of the element material yield stress.

6.2.2 In cases specified at the maximum loads of steering gear and gear of anchor machinery, the elements shall be checked for strength under the stresses corresponding to the opening pressure of the safety valves. In this case, the reference stresses in elements shall not exceed 0,95 element material yield stress.

6.2.3 The pipes and fittings of the hydraulic systems shall comply with the requirements of Part VIII "Systems and Piping" of the RS Rules.

6.3 SAFETY AND OTHER ARRANGEMENTS

6.3.1 The hydraulic machinery shall be protected by safety valves, while operating pressure shall not exceed 1,1 times of the maximum rated pressure, except for the cases specified in 5.2.6 and 5.3.9.

6.3.2 The working fluid from the safety valves shall be led to the drain pipeline or drain tank.

6.3.3 Arrangements for complete air expulsion when filling the machinery and pipelines with the working fluid and filters of appropriate capacity shall be provided. For continuously operating hydraulic systems (steering gear, hydraulic couplings, etc.) provision shall be made for filter cleaning without interruption of the system operation.

6.3.4 Seals between fixed parts of the mechanism shall be of "metal on metal" type, and seals between moving parts forming a part of external pressure limit shall be doubled in such a way that the failure of one seal would not disable the executive actuator. Application of the alternative arrangements providing the equivalent leakage protection shall be technically justified.

6.3.5 The hydraulic machinery shall be provided with a sufficient amount of the instruments to monitor its operation.

PART X. BOILERS, HEAT EXCHANGERS AND PRESSURE VESSELS

Steam boilers, pressure vessels, heat exchangers used on board the ship shall comply with the requirements of Part X "Boilers, Heat Exchangers and Pressure Vessels" of the RS Rules.

PART XI. ELECTRICAL EQUIPMENT

1 GENERAL

1.1 APPLICATION

1.1.1 The requirements of the present Part apply to electrical installations and individual types of electrical equipment of small sea fishing vessels subject to the Register technical supervision in addition to the applicable requirements of Part XI "Electrical Equipment" of the RS Rules.

1.2 DEFINITIONS AND EXPLANATIONS

1.2.1 Definitions and explanations relating to the general terminology are given in 1.2, Part XI "Electrical Equipment" of the RS Rules.

1.2.2 The following definitions are used in the present Part.

Electrical installation of a small fishing vessel is an electrical installation of a fishing vessel 12 to 24 m in length with the power of main machinery up to 375 kW (refer to 1.1.1, Part I "Classification").

Essential services are services normal operation whereof ensures safe ship operation in compliance with its designation (fishing), safety of human life and safety of the fishing products; such services are those listed in 1.3.2.

1.3 SCOPE OF SUPERVISION

1.3.1 General provisions.

General provisions applicable to the classification procedure, supervision during ship's construction and manufacture of the equipment, and surveys are stated in Part I "Classification".

1.3.2 Supervision of ship's electrical equipment.

Electrical equipment of systems and arrangements listed in 1.3.2, Part XI "Electrical Equipment" of the RS Rules is subject to supervision along with the following items:

electrical equipment of fishing gear;

electrical equipment of process machinery (fishing and catching products processing machinery);

other machinery and arrangements not listed above, as required by the Register.

1.3.3 Supervision during manufacture of electrical equipment.

1.3.3.1 Electrical equipment listed in 1.3.3, Part XI "Electrical Equipment" of the RS Rules is subject to supervision during manufacture, along with the following items:

electrical equipment of fishing gear;

electrical equipment of process machinery.

1.3.3.2 Scope of tests of electrical equipment after manufacture and the requirements for tests are given in the Rules for the Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships.

2 GENERAL REQUIREMENTS

2.1 Electrical equipment (installations and individual types of electrical equipment) is covered by the applicable requirements stated in the respective chapters of Section 2, as well as in Section 19, Part XI "Electrical Equipment" of the RS Rules.

3 MAIN ELECTRICAL POWER SOURCE

3.1 COMPOSITION AND CAPACITY OF MAIN ELECTRICAL POWER SOURCE

3.1.1 When the electrical power is the only source for operation of the auxiliary machinery providing the propulsion, steering and safety of the ship, then the main power source of such ship shall have the capacity sufficient for power supply of all the electrical equipment under the conditions specified in 3.1.2 — 3.1.5. Such power source shall at least consist of the following:

.1 two generators, one of which may be driven by the main engine (shaft generator); or

.2 accumulator batteries.

3.1.2 Capacity of the main electrical power source shall be sufficient to provide power supply of the necessary electrical equipment under all operating conditions of the ship, including the most power-consuming mode. At that start of the most powerful electric motor with the greatest starting current shall be provided.

Capacity of each generator shall be sufficient to make sure that in case of failure of one generator, the other one will provide power supply of the required auxiliary machinery ensuring normal navigation (including the maintenance of normal habitable conditions for the people onboard), except the power supply required for fishing gear and catch processing.

3.1.3 The number and power output of generators forming the main electrical power source shall be determined with regard to the following operating conditions of the ship:

.1 running conditions;

.2 manoeuvring;

.3 fishing (production) conditions;

.4 fire, hole in the ship's hull or other conditions affecting the safety of navigation with the main electrical power source in operation.

3.1.4 Where accumulator batteries are the main electrical power source, their capacity shall be sufficient for power supply of all the required electrical equipment in the most power-consuming mode during 8 h without charging. Charging of accumulator batteries from the electrical power source installed onboard shall be provided.

When no accumulator battery charger is provided on board the ship, capacity of the batteries shall be sufficient for power supply of the required electrical equipment in the most power-consuming mode during all the time determined by the ship designation and endurance.

3.1.5 When the accumulator batteries, being the main power supply, are simultaneously used for start of the main engine, their capacity shall be sufficient to provide power supply of the required electrical equipment, as specified in 3.1.4, including provision of at least 6 starts of the main engine.

3.2 TRANSFORMERS

3.2.1 In ships, where lighting and other circuits of essential services are powered through transformers, only one transformer may be installed.

3.3 POWER SUPPLY FROM AN EXTERNAL SOURCE OF ELECTRICAL POWER

3.3.1 If provision is made for ship's mains to be supplied from an external source of electrical power, an external supply switchboard shall be installed on board the ship.

For ships with the electrical installation of low power (50 kW and below) it is allowed that cables for supply of the ship's mains from an external source of electrical power shall be connected directly to protection-switching device of the main switchboard.

4 DISTRIBUTION OF ELECTRICAL POWER

4.1 DISTRIBUTION SYSTEMS

4.1.1 It is not allowed to use direct and alternating current distribution systems of electrical power in shipboard installations with the ship's hull return for voltage, except the local earthed systems (for instance, starter systems).

4.1.2 Arrangement of distribution gear.

Distribution gear shall be located in closed spaces, where the concentration of flammable and toxic gases, water vapours, dust and acid evaporations is eliminated. Distribution devices (including main switchboard and automatic switchboard) may be located in the spaces on the navigating bridge or wheelhouse deck.

When the main and emergency switchboards are located on the wheelhouse deck, they shall be separated from each other with bulkheads having "A-60" class fire insulation.

5 EMERGENCY ELECTRICAL INSTALLATIONS

5.1 GENERAL

5.1.1 On the ship an autonomous emergency source of electrical power shall be provided. A diesel-generator or an accumulator battery may be used as an emergency source of power.

Separate emergency source of power is not required for ships, in which the main and emergency source of electrical power are accumulator batteries, on condition that at least one of the batteries installed satisfies the capacity and location requirements imposed upon the emergency source of electrical power (refer to 5.2).

5.1.2 When the emergency diesel-generator is used as the emergency source of power, it shall be provided with independent fuel system and other prime mover service systems. When the standby starting system is not provided, the available system shall be protected against full starting power loss by means of restriction (1 — 3) of number of automatic start efforts.

5.2 ARRANGEMENT OF EMERGENCY SOURCES OF ELECTRICAL POWER

5.2.1 The spaces of emergency sources of electrical power and emergency switchboard shall be located above the uppermost continuous deck and outside machinery spaces.

5.2.2 Accumulator batteries may be located in special ventilated cases or cabinets installed on deck or inside the ship's hull; however, they shall be located outside accommodation spaces, except the cases when the accumulator battery is located in a special tight container.

5.2.3 When an unattened accumulator battery is used as the emergency source of electrical power, which does not emit gases during operation and does not affect the surrounding equipment, then this battery and the emergency switchboard shall be located in one space.

5.3 POWER SUPPLY OF SERVICES FROM EMERGENCY SOURCE

5.3.1 The emergency source of electrical power shall supply the following services during 3 h:

.1 emergency lighting for:

all corridors, stairways and exits from machinery and service spaces;

all control stations, as well as the main and emergency switchboards;

wheelhouse;

muster and embarkation stations for boarding life-saving appliances on deck and overboard;

stowage positions for emergency and fireman's outfit, life-saving appliances;

steering gear compartments;

positions at fire and emergency bilge pumps, and starting positions of their motors;

on deck at the fishing gear;

.2 navigation lanterns, lanterns of "Vessel not under command" signal and other lanterns required by Section 8, Part III "Equipment, Arrangements and Outfit";

.3 internal communication means and general alarm signals;

.4 sound signal means (whistles, etc.) and other alarms required in an emergency;

.5 radio and navigational equipment in compliance with the requirements of the respective parts of the present Rules.

5.3.2 The emergency source of power (accumulator battery) shall be automatically connected to busbars of the emergency switchboard upon the failure of the electrical supply from the main source.

5.3.3 On the main switchboard or in the wheelhouse an indicator shall be provided, which shall switch on in case of discharge of the accumulator battery being the emergency source of power.

6 REQUIREMENTS FOR ELECTRICAL EQUIPMENT OF REFRIGERATING PLANTS

6.1 Electrical equipment of refrigerating plants shall comply with Section 20, Part XI "Electrical Equipment" of the RS Rules.

7 SPARE PARTS

7.1 Nomenclature and standards relating to spare parts are determined by the manufacturer.

PART XII. REFRIGERATING PLANTS

1 GENERAL

1.1 Refrigerating plants installed on the Register-classed ships are subject to technical supervision in the following cases:

.1 when the refrigerating plants operate on Group II refrigerant;

.2 when the compressors with theoretical suction volume of 125 m^3/h and above comprise the part of the refrigerating plants operated on Group I refrigerants (refer to Part XII "Refrigerating Plants" of the RS Rules);

.3 when the refrigerating plant provides operation of the systems affecting the ship's safety.

2 GENERAL REQUIREMENTS

2.1 Unclassed refrigerating plants shall comply with the requirements of 1.3.2.1, 1.3.2.5 — 1.3.2.7, 1.3.4.2, 1.3.4.3, 1.3.4.5, 1.3.4.7, 1.3.4.8, 2.2.1, 3.1.1, 3.1.4 — 3.1.7, 7.1.2, 7.2.1, 7.2.2, 7.2.3.2 — 7.2.3.4, 7.2.4.2, 7.2.4.3, 7.2.6, 7.2.7, 8.2.3, 12.2.2, 12.2.3, 12.2.6 of Part XII "Refrigerating Plants" of the RS Rules.

3 ARRANGEMENT OF EQUIPMENT OF REFRIGERATING PLANTS

3.1 Equipment of the refrigerating plants may be installed in the common machinery space in case the following conditions are met:

.1 independent ventilation system shall be provided ensuring 10 air changes per hour;

.2 emergency ventilation shall be provided ensuring 20 air changes per hour when Group I refrigerant is used, or 30 air changes per hour when Group II refrigerant is used;

.3 when Group II refrigerant is used, at the exit from the machinery space the water-screen system shall be provided, which shall be operated outside the space in immediate proximity to the exit;

.4 not less than two breathing apparatus shall be provided corresponding to the type of refrigerant at the exit from the space;

.5 the space shall be fitted with gas detection panel and regrigerant leakage alarm in compliance with 7.2.7, Part XII "Refrigerating Plants" of the RS Rules.

PART XIII. MATERIALS

Materials and products are covered by the requirements of Part XIII "Materials" of the RS Rules, as well as by the requirements of the respective parts of the present Rules.

PART XIV. WELDING

Welding of the ships' hulls, machinery and machinery installations, steam boilers, heat exchangers and pressure vessels, piping, arrangements and equipment are covered by the requirements of Part XIV "Welding" of the RS Rules.

PART XV. AUTOMATION

Automation equipment of the ship's machinery and installations is covered by the requirements of Sections 1 — 3, Part XV "Automation" of the RS Rules.

Under all conditions of the ship operation without permanent attendance of machinery spaces, automation of machinery installation shall comply with the requirements of Section 6, Part XV "Automation" of the RS Rules. The amount of monitored parameters and types of automatic protection of machinery and installations may be reduced.

PART XVI. HULL STRUCTURE AND STRENGTH OF GLASS-REINFORCED PLASTIC SHIPS

Hull structure and strength of fiber-reinforced plastic ships are covered by the requirements of Part XVI "Structure and Strength of Fiber-Reinforced Plastic Ships" of the RS Rules.

PART XVII. RADIO EQUIPMENT

1 GENERAL

1.1 Requirements of the present Part apply to small sea fishing vessels mentioned in Part I "Classification".

1.2 Radio equipment used on small sea fishing vessels, which is not covered by the present Part or is covered partially, is covered by the requirements of Part IV "Radio Equipment" of the Rules for the Equipment of Sea-Going Ships, which do not contradict the requirements of the present Part.

2 LIST OF RADIO EQUIPMENT

2.1 List of radio equipment of a small sea fishing vessel shall comply with the requirements of 2.2.4, Part IV "Radio Equipment" of the Rules for the Equipment of Sea-Going Ships.

2.2 List of radio equipment of the small sea fishing vessels operating in pair or group, may be determined proceeding from the fulfillment of the following conditions:

.1 the ship, under command of which there is another ship or ships in group, shall fully comply with the respective requirements of the Rules for the Equipment of Sea-Going Ships according to the sea area;

.2 other ships in pair or group shall be fitted with radio equipment providing reliable distress alert transmission to the command ship and efficient radio communication with the command ship;

.3 every ship shall be fitted with emergency position indicating radio beacon.

Ships operated in pair or group are considered two or more ships operating or navigating together, at that distance between any of the ships and the command ship shall not exceed 25 miles.

3 SOURCES OF POWER

3.1 The reserve source of electrical power on the small sea fishing vessel shall be capable of simultaneously operating the below listed equipment during 1 h, if the emergency source of power fully comply with all relevant requirements of Part XI "Electrical Equipment" and during 3 h, if it does not comply with the requirements or is not provided:

VHF radio installation in sea area A1;

VHF radio installation and MF or MF/HF radio installation in sea area A2;

VHF radio installation, MF or MF/HF radio installation and/or INMARSAT ship earth station in sea area A3;

electrical lighting of controls of VHF radio installation and radio installation corresponding to the sea area;

radionavigation system receiver, if it provides continuous input of the required data for proper operation of the above mentioned radio installations.

4 MAINTENANCE

4.1 Serviceability of GMDSS equipment shall be ensured by one of the following ways: duplication of equipment, shore-based maintenance and repair or at-sea electronic maintenance and repair capability, or a combination of these.

5 LOCATION OF COSPAS-SARSAT EMERGENCY POSITION INDICATING RADIO BEACON

5.1 Location of COSPAS-SARSAT emergency position indicating radio beacon (EPIRB) shall be designated with distinct and readable inscription "Emergency position indicating radio beacon" and the appropriate safety sign in compliance with IMO resolution A.1116(30).

PART XVIII. NAVIGATIONAL EQUIPMENT

1 GENERAL

1.1 Requirements of the present Part apply to small sea fishing vessels specified in Part I "Classification" and navigational equipment intended for installation onboard these ships.

1.2 Navigational equipment used on small sea fishing vessels not covered by the present Part or covered partially, the requirements of Part V "Navigational Equipment" of the Rules for the Equipment of Sea-Going Ships are applied to, if they do not contradict the requirements of the present Part.

2 NAVIGATIONAL EQUIPMENT OF SMALL SEA FISHING VESSELS

2.1 All small sea fishing vessels shall be fitted with the following equipment, devices and manuals:

.1 magnetic compass (standard or steering);

.2 pelorus or direction-finding arrangement of the compass;

.3 corrective means for obtaining true bearings and ship's heading at any time;

.4 navigational charts or electronic chart display and information system (ECDIS) and navigational manuals;

.5 duplicating means intended for fulfillmet of functional requirements of 2.1.4, if this function is partially or completely executed by electronic means;

.6 hand log, set;

.7 prismatic binocular;

.8 inclinometer;

.9 radar reflector (for ships of less than 150 gross tonnage or non-metal ships).

2.2 Ships of 150 gross tonnage and above, in addition to the above mentioned, shall be fitted with the following:

.1 spare magnetic compass;

.2 daylight signalling lamp;

.3 receiver of global navigation satellite system (GNSS);

.4 telephone or other means of communication for heading data transfer to the emergency steering position, if available.

2.3 Navigational equipment in excess of that required by the present Part may be installed on board the ship as additional equipment, provided its arrangement and operation do not interfere the normal use of required navigational devices and instruments, influence the readings thereof and diminish safety of navigation.

2.4 Navigating bridge shall be so constructed as to ensure, as far as practicable, the fulfillment of the requirements of 3.2.7 and 3.2.8, Part V "Navigational Equipment" of the Rules for the Equipment of Sea-Going Ships.

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