Polski Rejestr Statków

RULES
FOR CLASSIFICATION AND CONSTRUCTION OF SMALL SEA-GOING SHIPS

PART III
HULL EQUIPMENT

2019
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GDAŃSK

RULES FOR CLASSIFICATION AND CONSTRUCTION OF SMALL SEA-GOING SHIPS
developed and edited by Polski Rejestr Statków, hereinafter referred to as PRS, consist of the following Parts:

Part I – Classification Regulations
Part II – Hull
Part III – Hull Equipment
Part IV – Stability and Freeboard
Part V – Fire Protection
Part VI – Machinery and Piping Systems
Part VII – Electrical Installations and Control Systems.

whereas the materials and welding shall fulfil the requirements specified in *Part IX – Materials and Welding*, of the *Rules for Classification and Construction of Sea-going Ships*.

Part III – Hull Equipment – March 2019 was approved by PRS Executive Board on 19 March 2019 and comes into force on 20 March 2019.

Upon its entry into force, the requirements of *Part III – Hull Equipment* apply in the full scope to new ships.

With respect to the existing ships, the requirements of *Part III* apply in the scope as provided in *Part I – Classification Regulations*.

The requirements of *Part III – Hull Equipment* are extended and supplemented by the following:
Publication No. 76/P – Stability and Freeboard of Passenger Ships Engaged on Domestic Voyages.

PRS/OP, 03/2019

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1 GENERAL

1.1 Application

Part III – Hull Equipment applies to small sea-going ships as specified in paragraph 1.1.1 of *Part I – Classification Regulations.*

1.2 Definitions and Explanations

Definitions of general terminology used in the *Rules for Classification and Construction of Small Sea-going Ships* (hereinafter referred to as the *Rules*) are contained in *Part I – Classification Regulations*. Where any terms explained in other parts of the *Rules* are used in the text of *Part III*, reference is made to the relevant parts.

For the purpose of this part of *Part III*, the following definitions and explanations have been adopted additionally:

1.2.1 Main Dimensions

.1 Length of ship, *L*, [m] – 96% of the total length on a waterline at 85% of the moulded depth, measured from the base plane, or the length from the fore side of the stem to the axis of the rudder stock on that waterline, if that be greater. In ships designed with a rake of keel, the waterline on which this length is measured shall be parallel to the design waterline. In ships designed with a rake of keel, the waterline on which this length is measured shall be parallel to the design waterline.

.2 Breadth of ship, *B*, [m]– the greatest breadth of the ship measured amidships between the outer edges of frames – in a ship with metal shell plating or between the outer surface of the hull – in ship with shell plating of any other material.

.3 Moulded depth, *H*, [m] – vertical distance measured at the side amidships from the base plane to the lowermost edge of the upper deck.

In ships having a rounded gunwale, the moulded depth is measured to the point of intersection of the moulded lines of the deck and side. If the uppermost continuous deck is stepped 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.

.4 Moulded draught, *T*, [m] – vertical distance measured amidships from the base plane to the summer load waterline.

1.2.2 Decks

.1 Upper deck – the uppermost continuous deck extending over the full length of the ship.

.2 Bulkhead deck – the uppermost continuous deck extending throughout the ship up to which transverse watertight bulkheads are led.

.3 Superstructure deck – the superstructure deckhead situated at the level not less than 1.8 m above the upper deck; where that height is less than 1.8 m above the upper deck, such a superstructure deckhead shall be considered as the ship deck.

.4 Deckhouse deck – the deck forming the top of a deckhouse.

.5 Freeboard deck – deck to which freeboard is measured and calculated taking account of the requirements of hull strength as well as ship stability and subdivision.

1.2.3 Deck Erections

.1 Superstructure – decked structure on the freeboard deck, extending from side to side of the ship or with one side or both sides being inboard of the ship sides not more than 0.04*B*.

.2 Deckhouse – decked structure on the freeboard deck (or on the superstructure deck) with the sides (one or both) being inboard of the ship sides more than 0.04*B*.

.3 Trunk – decked structure on a deck with at least one side being inboard of a ship side more than 0.04*B* and having no door, window or another opening in its vertical boundaries.

.4 Height of superstructure – the minimum distance measured vertically on the outside boundary from the uppermost edge of the superstructure beam to the uppermost edge of the deck beam.

1.2.4 Steering gear – complex mechanical arrangement which consists of an actuator enabling the rudder, a steering gear power unit, if any, means of applying torque to the rudder stock and additional equipment.

1.2.5 Main steering gear – steering gear intended for the ship steering under normal service conditions.

1.2.6 Auxiliary steering gear – steering gear intended for the ship steering in case of the main steering gear failure.

1.2.7 Steering gear power unit:
– in the case of electric drive – electric motor together with its equipment,
– in the case of hydraulic drive – electric motor together with its equipment including a hydraulic pump,
– in the case of other than hydraulic drive – motor/engine together with a hydraulic pump.

1.2.8 Watertightness – the term pertaining to closing of openings, which means that water will not penetrate through these openings in any direction under a design head. The design head shall be determined by reference to the bulkhead deck or freeboard deck, as applicable, or to the most unfavourable equilibrium/intermediate waterline, in accordance with the applicable subdivision and damage stability requirements, whichever is greater.

1.2.9 Weathertightness – the property of opening closures indicating that water will not penetrate into the ship in any sea conditions.

Such closing appliances shall withstand a hose test in which the nozzle outlet is at least 16 mm in diameter and the pressure ensures to eject water upwards for at least 10 m in height; the distance from the nozzle to the tested member shall not be more than 3 metres.

1.2.10 Equipment number – prescribed non-dimensional index which is the base for the selection, from relevant tables, the dimensions of anchors, anchor chains or anchor lines, mooring ropes and tow lines taking account of the specific requirements of chapters 3, 4 and 5.

1.2.11 Positions of openings

As far as hull openings are concerned, the following two positions are distinguished in the present Part:

position 1:

1. on exposed parts of:
   – freeboard deck,
   – raised quarterdeck,
   – superstructure and deckhouse deck of the first tier situated forward of a point located 0.25 of the ship's length, *L*, from the forward perpendicular;
2. on the same parts within the superstructures and deckhouses which are not enclosed;

position 2:

1. on exposed parts of superstructure and deckhouse deck of the first tier situated abaft 0.25 of the ship's length, *L*, from the forward perpendicular;
2. on the same parts within the superstructures and deckhouses of the second tier which are not enclosed and are situated within 0.25*L* from the forward perpendicular.

Definition of enclosed superstructures and deckhouses – see 7.4.1.2.

1.3 Scope of Survey

1.3.1 The requirements regarding the classification procedure and survey as well as survey of construction are specified in *Part I – Classification Regulations*.

1.3.2 The following are subject to PRS survey during manufacture:

.1 Rudder stocks with their flanges,
.2 rudder blade components,
.3 rudder pintles,
.4 parts of the rudder stock and rudder blade coupling,
.5 tillers and quadrants,
.6 anchors of 75 kg in mass or more,
.7 anchor chains and anchor lines,
.8 mooring ropes,
.9 towing hooks for a pull of 10 kN and over,
.10 watertight and weathertight doors and their means of closing,
.11 hatch covers,
.12 side and flush scuttles,
.13 anchor and mooring stoppers,
.14 mooring and towing bollards, hawsepipes, chocks, etc.

The above mentioned products whose dimensions, weight or pull are smaller than those specified above and products not mentioned above which are subject to the requirements specified in this part of the *Rules* shall be made taking account of the above mentioned requirements.

1.3.3 PRS survey of the manufacture of the products mentioned in 1.3.2.13 and 1.3.2.14 is confined to the approval of the technical documentation.

1.3.4 Prior to commencement of the manufacture of the products mentioned in 1.3.2, the following documentation shall be submitted to PRS:

.1 assembly drawing,
.2 calculations (for reference),
.3 drawings of assemblies and components, unless they are made in accordance with the standards and specifications agreed on with PRS.

1.3.5 PRS survey covers the applied components of equipment and outfits, during their production, specified in Table 1.3.5 in respect of their compliance with the requirements of *Part IX – Materials and Welding* of the *Rules for Classification and Construction of Sea-going Ships* and with the approved or accepted technical documentation mentioned in 1.4.1.2 and 1.3.4. Materials permitted to be used are specified in Table 1.3.5.

Table 1.3.5
Materials for Hull Equipment and Outfits

Item	Component	Material
1	Rudder stocks with their flanges	steel forging*, cast steel
2	Rudder blade parts	steel forging, cast steel, rolled steel
3	Rudder pintles	steel forging, cast steel
4	Parts intended for joints (bolts and nuts of the flange coupling of rudder stock and rudder blade, bolts and nuts of the coupling of rudder axle and sternframe)	steel forging
5	Towing hooks for pull of 10 kN and over and elements connecting them to the ship hull	steel forging, rolled steel
6	Cargo hatch covers	rolled steel, wrought aluminium alloys
7	Sliding watertight doors and hinged watertight doors	steel forging, cast steel, rolled steel
8	Anchors	steel forging, cast steel
9	Anchor chains and other chains	steel bars, steel forging, cast steel

* Rudder stocks may be made of rolled steel in accordance with the requirements specified in *Part IX – Materials and Welding*, of the *Rules for Classification and Construction of Sea-going Ships.*

1.3.6 Subject to PRS survey during the ship construction is all the hull equipment covered by the requirements of this part of the *Rules* including:

.1 steering gear,
.2 anchoring equipment,
.3 mooring arrangement,
.4 towing arrangement,
.5 masts,
.6 equipment and means of closing of hull openings and openings in superstructures and deckhouses,
.7 outfits and equipment of ship spaces,
.8 guardrails, bulwarks,
.9 freeing ports.

1.4 Technical Documentation

1.4.1 Classification Documentation

1.4.1.1 Prior to beginning the construction of the ship's hull, the documentation specified in 1.4.1.2 shall be submitted to PRS Head Office within the applicable scope depending on the ship type, her equipment and outfits. PRS may extend the scope of classification documentation specified below, if it is considered necessary upon examination of the ship technical specification and general arrangement plan.

1.4.1.2 Documentation of Hull Equipment:

.1 arrangement plan of openings in the ship hull, superstructures and deckhouses indicating the coaming heights as well as the construction of the means of closure;
.2 plan of rudder gear as well as anchoring, mooring and towing arrangements and also rudder and rudder stock drawings;
.3 data for the calculations of rudder gear and anchoring, mooring as well as towing arrangements, and for tugs to be assigned mark "**hol**" in the symbol of class – also the diagram of pull;
.4 drawings of signal masts, including calculations of the signal masts and rigging as well as special-construction masts;
.5 arrangement plan of accommodation and service spaces, including exits, doors, corridors, stairways and ladders, plan of railings, bulwarks and gangways on open decks;
.6 list of the equipment and materials including their basic specifications, manufacturers and approvals granted;
.7 passenger arrangement plan for passenger ships to be assigned additional marks: **pas A**, **pas B**, **pas C** or **pas D** in the symbol of class.

1.4.2 Workshop Documentation

Upon approval of classification documentation by PRS Head Office, the following workshop documentation shall be submitted to the relevant PRS Branch Office or Survey Station for consideration and agreement:

– program of mooring and sea trials,
– drawings of local strengthenings under gear and machinery not shown in the classification documentation,
– list of spare parts.

1.4.3 Classification Documentation of Ship under Alteration or Reconstruction

Prior to the commencement of ship alteration or reconstruction, the documentation of ship equipment, in the ship part to be changed, shall be submitted to PRS Head Office for consideration and approval.

Where new equipment, covered by the requirements of the *Rules*, are installed, or the equipment installed differ substantially from those initially fitted, supplementary documentation of new systems related to such equipment, within the scope required for ship under construction, shall be submitted to PRS Head Office.

When introducing structural changes resulting in the change of visibility from the bridge, the visibility may not be decreased. The assessment of the bridge visibility may be performed using EN ISO 11591 Standard

1.5 Actual Stress and Allowable Stress

1.5.1 Wherever the term actual stress appears in this part of the *Rules*, it means the equivalent stress determined in accordance with the following formula:

$$\sigma_{zr} = \sqrt{\sigma^2 + 3\tau^2} \text{ [MPa]} \qquad (1.5.1\text{-}1)$$

σ – normal stress in the respective section, MPa;
τ – shear stress in the respective section, MPa.

Strength criteria shall be verified against the equivalent stress, σ_{zr}.

The equivalent stress may also be determined using another method subject to PRS consent in each particular case.

1.5.2 In this part of the *Rules*, allowable stress forming a benchmark for the equivalent stress to verify the fulfilment of the strength criteria are, determined as a fraction of the applied material yield point.

1.5.3 Unless otherwise specified, the yield point shall not be assumed less than 0,7 of the applied material tensile strength.

1.6 Equipment Number

1.6.1 The equipment number shall be determined from the following formula:

$$N_c = D^{\frac{2}{3}} + 2Bh + 0{,}1A \qquad (1.6.1)$$

N_c – equipment number;
D – displacement of ship at draught to the summer load waterline, [t];
B – breadth of ship, [m];
h – effective height measured from the summer load waterline to the top of the uppermost erection, [m];
A – lateral projection area of the hull above the summer load waterline, as well as of superstructures and deckhouses having a breadth greater than $0.25B$, within length L,[m^2].

When calculating h, sheer and trim shall be neglected.

For ships with a greater number of hulls the equipment number will be considered on the case by case base.

When determining A and h, measurement cargoes carried on the deck and hatch covers shall be considered as superstructures, and so shall be all enclosures, gunwales and coamings of a height 1.5 m and above.

2 STEERING GEAR

2.1 General

2.1.1 The requirements of this Chapter apply only to arrangements with ordinary rudders. Special arrangements and the arrangements with steering nozzles are subject to PRS consideration in each particular case.

2.1.2 Every ship shall be provided with an appropriate arrangement ensuring her manoeuvrability and course-keeping ability. Such arrangement may be: arrangement with a rudder blade, arrangement with a steering nozzle or other arrangement agreed with PRS.

Steering gear construction shall be such as to ensure the transition from the main steering gear operation to the auxiliary steering gear operation within 2 minutes.

2.1.3 Steering gears, except for hydraulic steering gears, shall be fitted with effective wave shock absorbers.

2.1.4 Where tiller ropes are applied, they shall be led to the rudder by the route as short as practicable and protected against mechanical damage.

2.1.5 Steering gears as well as their electric motors and electric equipment shall fulfil the requirements specified in *Part VI – Machinery and Piping Systems* and in *Part VII – Electrical Installations and Control Systems.*

2.1.6 Individual machinery components of steering gear shall be so fixed to their foundations as to preclude misalignment of the components working in tandem. Rudder angle limiters shall be fitted to prevent the rudder from being put over either side to an angle greater by more than about 1.5° above the setting of the steering gear limit switches δ_{max} (see *Part VI – Machinery and Piping Systems*). Angle δ_{max} shall generally be 35° unless theoretical calculations or model tank tests prove that an increase in that angle results in a considerable improvement in the ship manoeuvrability.

2.1.7 Where suitable rudder angle limiters are fitted on the steering gear, such limiters need not be fitted on the hull. Steering gear shall be located in an enclosed space.

2.1.8 The connection of the steering gear or its gear box to parts fixed to the rudder stock shall preclude the possibility of the steering gear drive damage at the rudder stock vertical movement.

2.2 Main Steering Gear

2.2.1 On all ships the main steering gear shall be capable of putting the rudder over from 35° on one side to 35° on the other side.

2.2.2 The main steering gear shall be capable of putting the rudder over from 35° on either side to 30° on the other side in not more than 28 seconds at rated parameters of the ship power system with the ship at a draught to the summer load waterline while running ahead with the maximum speed.

2.2.3 The main steering gear may be manually operated provided that the requirements specified in 2.2.2 are fulfilled by one person with a force not exceeding 120 N applied to the steering wheel handles and with the number of revolutions not greater than g/R and such a steering gear shall be of a self-locking type (R – radius to the steering wheel handle measured from the wheel axis of rotation to the mid-length of the regular handle or to broken handle axis, [m]).

2.3 Auxiliary Steering Gear

2.3.1 Auxiliary steering gear shall be capable of steering the ship at the ship speed reduced to 5 knots.

2.3.2 Auxiliary steering gear shall be capable of putting the rudder or steering nozzle over from 15° on one side to 15° on the other side in not more than 60 seconds with the ship at a draught to the summer load waterline while running ahead at one half of the maximum speed.

2.3.3 Auxiliary steering gear may be manually operated. Changing the rudder position from port to starboard and vice versa shall be possible when handled by not more than two men with a force not exceeding 120 N per person.

2.3.4 Auxiliary steering gear is not required on ships where the power main steering gear employs two independent power units provided that each of them fulfils the requirements specified in 2.3.1, and both of them fulfil the requirements specified in 2.2.2 while working simultaneously.

2.3.5 Auxiliary steering gear shall be independent of the main steering gear and, if practicable, shall act on the rudder stock directly.

2.3.6 Manually operated auxiliary steering shall be of self-locking type or may be fitted with a device locking the gear in a desired position, provided that there is a possibility for reliable control of the gear directly from the steering position.

2.4 Steering Positions

2.4.1 The system for remote control of the main steering gear from the main and emergency steering position shall be such that the ship retains adequate manoeuvrability in the event of failure of one of the power units. Means shall be provided for steering command transfer from the steering post in the wheelhouse to the emergency steering position.

2.4.2 Main and emergency steering positions for the control of the main steering gear shall be located in the ship centre plane, or in another reasonable position – depending on the ship type – ensuring effective communication with the wheelhouse and the ship course reading.

2.4.3 Steering post to control of the main steering gear shall be located in the wheelhouse.

2.4.4 Rudder position indicators shall be installed at each steering position to ensure indication with the following accuracy: ±0.5° for the rudder position 0°, ±1° for ruder positions 0° ÷ 5° and ±2° for rudder positions 5° ÷ 35°.

2.4.5 Wheelhouse shall be so designed that the wheelman has an unobstructed view forwards and, as far as practicable, of the ship sides and aftwards.

2.5 Design Parameters for Calculations

2.5.1 Design parameters for calculations which are specified in this sub-chapter are applicable to the structural elements of regular rudders only and shall not be used for the calculations of steering gear drive characteristics.

The above mentioned steering gear drive characteristics are subject to the verification by PRS during sea trials for compliance with the requirements specified in paragraphs 2.1.4, 2.2.1, 2.2.2, 2.2.3, 2.3.1, 2.3.2 and 2.4.4.

2.5.2 Design pressure, F, on the rudder blade shall not be assumed less than the value obtained in accordance with the following formula:

$$F = 147\ \varphi A\ v^2 \quad [\mathrm{N}] \tag{2.5.2}$$

φ = 1.0 for rudders situated just behind the screw propeller,

φ = 0.9 for rudders not situated just behind the screw propeller,

A – rudder blade area, [m^2];

V – maximum ship speed forwards, in knots, at the draught to the summer load waterline.

2.5.3 The design load application point shall be assumed at the height of the centre of the rudder blade side area and at the distance from the fore edge of the rudder blade not less than the value obtained in accordance with the following formula:

$$r = l\left[K + \frac{3}{2}\left(\frac{A_1}{A}\right)^2\right] \quad [\mathrm{m}] \tag{2.5.3}$$

r – distance between the design load application point and the fore edge of the rudder blade at the height of the centre of the rudder blade side area, [m];

l – rudder blade width at the height of the centre of the rudder blade side area, [m];

K – coefficient to be taken:
0.33 – for regular streamlined rudders,
0.37 – for single-plate rudders

A_1 – part of rudder blade surface fore of rudder blade revolution axis, [m^2].

2.5.4 Design torque acting on the steering gear shall not be taken less than the value determined in accordance with the following formula:

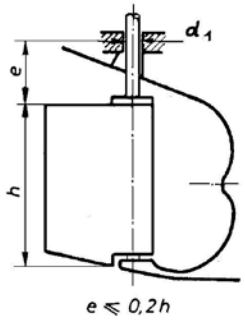
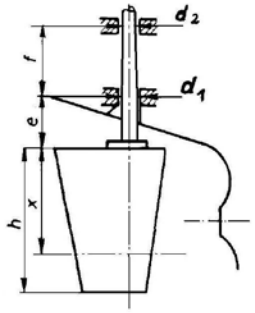
$$M_1 = F\,(r - a) \quad [\text{Nm}] \qquad (2.5.4)$$

a – distance between the revolution axis and the rudder blade fore edge at the height of the centre of the rudder blade side area[1], [m];

r – see paragraph 2.5.3.

2.5.5 Design bending moment acting on the steering gear and the design bearing reactions shall not, generally, be less than the values specified in Table 2.5.5 for the particular type of rudder. All the linear dimension such as h, x, e and f used in the formulae shall be expressed in [m], whereas the design loads in [N]. Lesser values than those specified in Table 2.5.5 may be taken provided that more detailed calculations to check the moments and bearing reactions have been submitted to PRS.

Table 2.5.5
Moments and bearing reactions in the steering gear

Load type	Rudder type	
		
Rudder stock design bending moment, [Nm]	$M_2 = 0.170\,Fh$	$M_2 = F\,(0.500\,h + e)$
Design bending moment in the coupling of rudder stock and rudder blade, [Nm]	$M_3 = 0.085\,Fh$	$M_3 = 0.500\,Fh$
Design bending moment in rudder blade, [Nm]	$M_4 = 0.170\,Fh$	$M_{4(x)} = 0.500\,F\,\frac{(h-x)^2}{h}$
Design reaction in rudder stock bearing, [N]	$H_1 = 0.550\,F$	$R_1 = F\,\frac{0{,}500h + e + f}{f}$
Design reaction in stern frame sole piece bearing, [N]	$R_2 = 0.580\,F$	–

x – distance of the relevant section.

2.5.6 Wherever R_e (applied material yield point) appears in this sub-chapter, it shall be taken as the minimum value assured in the material specification – not less, however, than 0.7 of its specified tensile strength. In no case shall the tensile strength be taken greater than 390 MPa.

2.5.7 When checking, by calculations, the rudder pintles and rudder stock bearings for contact stress, the calculation results shall not exceed the values specified in Table 2.5.7.

[1] The distance takes a positive value if the revolution axis is aft of the rudder blade fore edge, and a negative value if the revolution axis is forwards of the rudder blade fore edge.

Table 2.5.7

Materials of intermating parts	Contact stress p, [MPa]	
	water lubrication	oil lubrication
Stainless steel or bronze and lignum vitae	2.4	–
Stainless steel or bronze and textolite or other synthetic materials	subject to PRS consent in each particular case	–
Stainless steel and bronze	6.9	–
Steel and white metal	–	4.4*

* – for rudder stock upper bearing, grease lubrication is permitted.

2.5.8 In the underwater portions of ruder stock and rudder pintle, stainless steel bushes shall be applied. The bushes may be welded, and then shrink-fitted.

2.6 Rudder Stock

2.6.1 Rudder stock upper portion diameter above the lower bearing, d_0, shall not be less than the value determined in accordance with the following formula:

$$d_0 = 4.03 \cdot \sqrt[3]{\frac{M_1}{471 + R_e}} \quad \text{[cm]} \tag{2.6.1}$$

M_1 – design torque determined in accordance with 2.5.4, [Nm];
R_e – rudder stock material yield point, [MPa].

2.6.2 Rudder stock diameter at the height of the lower bearing, d_1, shall not be less than the value determined in accordance with the following formula:

$$d_1 = 4.24 \sqrt[3]{\frac{\sqrt{0.75M_1^2 + M_2^2}}{471 + R_e}} \quad \text{[cm]} \tag{2.6.2-1}$$

M_2 – design bending moment determined in accordance with Table 2.5.5, [Nm];

This diameter shall continue as far as to the flange. The rudder stock diameter at the height of the upper bearing shall not be less than the value determined in accordance with the following formula:

$$d_2 = 4.24 \cdot \sqrt[3]{\frac{\sqrt{0.75M_5^2 + M_6^2}}{471 + R_e}} \quad \text{[cm]} \tag{2.6.2-2}$$

M_5 – nominal torque induced by the rudder drive, [Nm];
M_6 – bending moment at the height of the upper bearing induced by the rudder drive to be determined in accordance with the following formula:

$$M_6 = M_5 \frac{h_1}{r_1} \quad \text{[Nm]} \tag{2.6.2-3}$$

h_1 – distance between the upper bearing centre and the quadrant centre or tiller fixing centre measured on the rudder stock axis, [m];
r_1 – distance between the rudder stock axis to the line of the force induced by the rudder drive and acting on the quadrant or tiller, [m].

2.6.3 The transition from diameter d_0 to diameter d_1 shall gradual and smooth. In the case of stepped transition of diameter, the steps shall be effected by rounding with the radius as great as practicable. The rudder stock transition into the flange shall be effected by rounding with the radius not less than 0.12 of the rudder stock diameter in way of the flange.

2.7 Rudder Blade

2.7.1 Streamlined rudder blade plating thickness, *s*, shall not be less than the value determined in accordance with the following formula:

$$s = 2.5 + 0.12v\sqrt{A} \quad [\text{mm}] \tag{2.7.1}$$

A – rudder blade total area, [m^2];
v – ship speed (see 2.5.2), [knots].

2.7.2 In no case the rudder blade plating thickness shall be less than 3 mm.

2.7.3 The thickness of extreme plates closing the rudder blade top and bottom shall be at least 1.2 the rudder blade plating thickness determined in accordance with 2.7.1.

2.7.4 Rudder blade plating shall be stiffened inside with horizontal and vertical stiffening arms or partitions whose spacing shall not exceed 0.4 m.

The thickness of such horizontal or vertical stiffening arms and partitions shall not be less than the rudder blade plating thickness determined in accordance with 2.7.1.

One or two such vertical partitions shall be positioned in line with the rudder axis or on both sides of the axis to ensure adequate strength of the rudder blade.

Sectional modulus of the vertical partitions situated in line with the rudder axis together with the effective strakes of rudder blade plating shall not be less than the value determined in accordance with the following formula:

$$W = \frac{2.5M_4}{R_e} \quad [\text{cm}^3] \tag{2.7.4}$$

M_4 – design bending moment in the rudder blade determined in accordance with 2.5.5, [Nm].

The effective strake width shall not be taken less than 1/6 of the blade span in the rudder axis.

In the horizontal and vertical stiffening arms and partitions sufficient number of holes shall be made to provide for the flow of water and preserving materials. In the extreme plates stainless steel plugs shall be fitted and secured against loosening.

2.7.5 Particular care shall be given to the connection of the rudder blade to the rudder stock coupling flange and the bearings of rudder pintles.

2.7.6 Single-plated rudder blade thickness shall not be less than the value determined in accordance with the following formula:

$$s = 6\,(1 + 0.01d) \quad [\text{mm}] \tag{2.7.6}$$

d – single-plated rudder stock diameter where the rudder stock material yield point equal to that of the rudder blade, [cm].

2.7.7 Single-plated rudders shall be provided with the rudder stock extending throughout the rudder blade.

Rudder stock sectional modulus in its upper portion shall not be less than the value determined in accordance with the following formula:

$$W = \frac{7.5\sqrt{0.75M_1^2 + M_4^2}}{471 + R_e} \quad [\text{cm}^3] \tag{2.7.7}$$

M_1 and M_4 – see paragraph 2.5.4 and Table 2.5.5, [Nm].

In the lower portion of the rudder stock, its sectional modulus may be reduced gradually downwards so that its value is not less than 75% of the value determined above.

2.7.8 Single-plated rudder blade shall be strengthened at its lower and upper edges with horizontal stiffening arms. If the spacing of such arms exceeds 0.5 m, intermediate stiffeners shall be fitted on both sides.

Stiffening arm sectional modulus at the rudder stock shall not be less than the value determined in accordance with the following formula:

$$W = 0.01d^3 \quad [\text{cm}^3] \tag{2.7.8}$$

d – rudder stock diameter in way of stiffener, [cm].

2.8 Rudder Stock and Rudder Blade Coupling

2.8.1 Where rudder stock and rudder blade coupling is effected with horizontal flanges, the diameter of connecting bolts shall not be less than the value determined in accordance with the following formula:

$$d_4 = 5.54\sqrt{\frac{\sqrt{0.75M_1^2 + M_3^2}}{Z\rho(471 + R_e)}} \quad [\text{cm}] \tag{2.8.1}$$

M_1 – design torque determined in accordance with 2.5.4, [Nm];

M_3 – design bending moment determined in accordance with 2.5.5, [Nm];

Z – number of connecting bolts (pins);

ρ – average distance between bolt centre and flange centre, [cm];

R_e – bolt material yield point, [MPa].

The number of bolts, Z, shall not be less than 4. The distance between any bolt centre and flange centre shall not be less than 0.7 the rudder stock diameter, d_0, determined in accordance with 2.6.1. For rudders whose stocks are subjected to bending in addition to torsion, it is also required that the distance between any bolt centre and the rudder blade centre plane be not less than 0.6 the rudder stock diameter, d_1, determined in accordance with 2.6.2.

2.8.2 All bolts shall be fitted ones, except that a key is applied when only two fitted bolts suffice. Nuts shall have standard dimensions and shall be effectively protected against loosening by split pins or welded washers.

2.8.3 Flange thickness shall not be less than the bolt diameter. Bolt hole centres shall be situated in the distance not less than 1.15 the bolt diameter from the outer edges of flange.

2.9 Rudder Pintle

2.9.1 Diameter, d_3, of rudder pintle not provided with bush and diameter of rudder pintle provided with bush (without its wall thickness however) shall not be less than the value determined in accordance with the following formula:

$$d_3 = \sqrt{\frac{R_2}{471 + R_e}} \quad [\text{cm}] \tag{2.9.1}$$

R_2 – design reactive force determined in accordance with 2.5.5, [N];

R_e – rudder pintle material yield point, [MPa].

2.9.2 Length of the rudder pintle conical portion which serves the purpose to fix it in the sole piece shall not be less than the rudder stock diameter determined in accordance with 2.9.1, the cone taper, however, shall not exceed 1:6. Transition of the conical portion into the cylindrical one shall not be stepped.

2.9.3 Length of the rudder pintle cylindrical portion shall not be less than the rudder pintle diameter with the bush (if any), not less, however, than 1.3 of that diameter.

2.9.4 Rudder pintle bearing hub wall thickness shall not be less than 0.5 the rudder pintle diameter. Any deviation from this requirement is subject to PRS consent in each particular case.

2.9.5 Rudder pintle nut (if applied) shall be reliably protected against loosening by at least two welded protective washers, and the pintle shall be pressed carefully to the rudder gudgeon.

2.9.6 Rudder pintle dimensions shall be checked by calculation for contact stress in accordance with the following formula:

$$p = \frac{R_2}{d_3' h} 10^{-2} \quad \text{[MPa]} \tag{2.9.6}$$

R – design reactive force in sternframe bearing, determined in accordance with 2.5.5, [N];

d_3' – diameter of rudder pintle together with its bush, if any, [cm];

h – height of rudder pintle bush, [cm].

The determined contact stress value shall not exceed the respective values specified in Table 2.5.7. In the case of application of other intermating materials than those listed in Table 2.5.7 – contact stress values are subject to PRS consideration in each particular case.

2.10 Rudder Stock Bearings

2.10.1 Rudder stock carrier bearings subjected to transverse loads shall fulfil the requirements specified in 2.9.6 for pintles.

2.10.2 To balance the force due to the weight of rudder and rudder stock, rudder stock carrier bearing shall be applied. The deck shall be effectively strengthened in way of the bearing. Means shall be provided to protect a rudder blade and rudder stock against their axial displacement upward by a value greater than is provided in the steering gear design.

2.10.3 Stuffing box shall be fitted in way of passage of the nozzle stock through the ship's plating to prevent water from entering the ship's space. Stuffing box shall be so located as to be accessible for inspection and maintenance and shall be located above the maximum load waterline. The bearing shall be supplied with grease.

2.11 Tillers and Quadrants

2.11.1 Materials for tillers to be made of cast steel or steel forgings shall be approved in accordance with the requirements specified in *Part VIII – Materials and Welding.*

2.11.2 Quadrant or tiller boss may either be connected with the stock by means of shrink fit or be of split type and put together by means of screws. Such connections shall additionally be key-secured.

2.11.3 Tiller arm sectional modulus at the distance *2d* from the rudder stock axis shall not be less than the value obtained in accordance with the following formula:

$$W = 0.15\, d^3 \quad \text{[cm}^3\text{]} \tag{2.11.3}$$

d – rudder stock diameter in way of quadrant bush, [cm];

Tiller arm width shall not be less than its double thickness. Tiller arm cross-sectional area may be reduced by 40% at its end.

2.11.4 Boss of the quadrant or tiller freely fitted on the rudder stock shall have an outside diameter not less than 1.6*d* and height – not less than 0.8*d*, where *d* – stock diameter in way of the connection.

2.11.5 Split bosses shall be connected with at least two bolts at each side and shall be provided with key.

2.11.6 The method of connection of the boss of quadrant or tiller to the rudder stock, if they are freely connected to the rudder stock, is subject to PRS consideration in each particular case.

('Free connection' is understood as such a connection where torque is transmitted by friction between the boss and rudder stock).

2.12 Steering Gear with Tiller Rods and Tiller Chains

2.12.1 Tiller rods and tiller chains may be used in steering gears. When selecting the tiller rods, tiller chains and other load transmitting elements, their strength and design rudder stock torque M_1 determined in accordance with 2.5.4 shall be taken into account.

2.12.2 Short-link chains shall fulfil the requirements specified in *Part VIII – Materials and Welding.*

2.12.3 Chains shall be guided in a way as simple as possible. Significant variations of direction shall be avoided.

Roller guides shall be co-planar with the chain. Roller guide diameter shall be more than 12 times the chain nominal diameter. Roller pin diameter shall be at least twice as large as the chain diameter.

2.12.4 Tiller chains and tiller rods shall be effectively shielded and protected against damage.

2.12.5 Galvanized steel ropes may be used instead of tiller chains and tiller rods. The rope tensile strength shall be twice as much as that of chain. The rope diameter shall not be less than 8 mm. The diameter of roller guides shall be adjusted to the rope flexibility. The radius of grove in the roller guide shall be larger by 0.8 mm than the rope radius. Ropes shall be prestressed before splicing their ends.

2.12.6 Bevel gears, shafts, articulations, etc. may be applied instead of ropes, chains and roller guides. In manual steering equipment, Gall chains may be applied in way of steering gear.

2.13 Rudder Angle Limiters

All parts of limiters, including those which are at the same time the parts of the steering gear, shall be so calculated as to withstand overloading by the rudder stock design torque not less than the value determined in accordance with the following formula:

$$M_{skr} = 1.135\, R_e\, d^3\, 10^{-1} \quad \text{[kNm]} \tag{2.13}$$

M_{skr} – rudder stock torque, [kNm];
d – actual diameter of rudder stock upper portion, [cm],
R_e – rudder stock material yield point, [MPa].

The stresses in these parts due to the above mentioned torque shall not exceed 0.95 of the yield point of such a part material. Rudder angle limiters may be fixed either to the sternframe or deck or platform or other hull structural elements.

2.14 Spare Parts

2.14.1 Where tiller chains and rods are used in the steering gear, the following spare parts shall be available on board the ship:
– l item of the longest segment of chain used to pull the rudder,
– 2 items of each size of the lanyards, shackles, links and pins.

2.14.2 Where ropes are used in the steering gear, the following spare parts shall be available on board the ship:
– l segment of rope for the entire length of the pulling element,
– 2 pieces of each size of the lanyards, shackles, links and pins.

3 ANCHORING EQUIPMENT

3.1 General

3.1.1 Each ship shall be provided with anchoring equipment consisting of anchors, chain cables, stoppers for securing the anchor in its voyage position, devices for securing and releasing the inboard ends of the anchor chains and machinery for dropping and hoisting the anchors, as well as for holding the ship at the anchors dropped.

3.1.2 Anchoring equipment for all ships shall be selected taking account of the equipment number determined in accordance with 1.6.1 using the data from Table 3.1.2. Where N_C is beyond the maximum value specified in Table 3.1.2, the anchoring equipment is subject to PRS consideration in each particular case.

Table 3.1.2
Anchoring equipment

Equipment number, *Nc*, not exceeding	Bower anchor		Bower anchor chains		
	number	mass of each anchor, [kg]	Total length of both chains, [m]	grade 1 (normal strength) [mm]	grade 2 (higher strength), [mm]
				chain diameter [mm]	
15	1	25	55	*	–
20	1	30	55	*	–
25	1	40	55	*	–
30	1	50	82	*	–
40	1	60	82	*	–
50	1	80	82	11.0	–
60	2	100	192	11.0	–
70	2	120	192	12.5	–
80	2	140	192	12.5	–
90	2	160	220	14	12.5
100	2	180	220	14	12.5
110	2	210	220	16	14
120	2	240	247	16	14
130	2	270	247	17.5	16
140	2	300	247	17.5	16
150	2	340	275	19	17.5
175	2	420	275	19	17.5
205	2	500	275	22	19

* Chains and steel ropes are permitted provided that the breaking load of chain or steel rope is not less than 47 kN.

Note: If the equipment number determined in accordance with 1.6 takes an intermediate value with respect to those specified in Table 3.2.1, the equipment corresponding to the greater value of N_c shall be chosen, except for anchor masses and mooring rope breaking loads which may be determined by interpolation.

3.1.3 Natural fibre rope or synthetic fibre rope may be substituted for anchor chain unless the determined equipment number exceeds 80. In that case the following conditions shall be fulfilled:

.1 on ships of a length, *L*, more than 20 m, a 10-metre-long chain segment of the diameter determined in accordance with Table 3.2.1 for the calculated equipment number shall be used for making the anchor length. On ships of a length, *L*, 16 m and more, but not exceeding 20 m, a 5-metre-long chain segment shall be used. On ships of a length, *L*, less than 16 m, anchor chain need not be used;

.2 a swivel may be fitted on the chain length;

.3 natural fibre rope or synthetic fibre rope shall have the same length as that required for the chain – in accordance with Table 3.1.2 and shall be connected to the chain segment of the anchor length chain.

.4 the rope breaking load shall not be less than that required for the replaced chain;

.5 the rope end connected to chain shall be ended with thimble;
.6 in no case shall the minimum braking load of rope be less than 47 kN, and shall the rope have a diameter less than 20 mm;
.7 the rope shall be provided with a test certificate issued by PRS.

3.1.4 Anchoring appliances shall be situated on longitudinals, beams and/or members which are a part of the deck structure so that an efficient distribution of load induced by the anchor on the hull structure. If necessary, additional stiffeners and/or brackets shall be fitted, to make possible direct transfer of loads from the machinery foundations to the stiffener system under the deck plating. The size of stiffeners and brackets shall be adapted to the value of anchor chain breaking force, to prevent structure stresses exceeding allowable stresses.

3.2 Bower Anchois

3.2.1 If the number of bower anchors selected in accordance with 3.1.2 is 2, then one of the anchors may be a spare one, provided that it is capable of being quickly prepared to be used.

3.2.2 The required anchors may be of the following types:
.1 approved stockless anchors;
.2 stocked anchors;
.3 high holding power (HHP) anchors.

Mass of stockless anchor arms, together with the bolt and connecting elements, shall be at least 60% of the total anchor mass.

Anchor stock mass of shall be 20% of the total stocked anchor mass together with the anchor shackle.

High holding power anchors shall be capable of being used without additional ship preparation and without restrictions on the anchoring location.

High holding power anchors may be permitted provided that the requirements specified in *Part IX – Materials and Welding* of the *Rules for Classification and Construction of Sea-going Ships* are fulfilled.

3.3 Bower Anchor Chains

3.3.1 Testing of anchor chains of different categories shall be performed in accordance with the requirements specified in *Part IX – Materials and Welding* of the *Rules for Classification and Construction of Sea-going Ships.*

For high holding power anchors, normal strength chains shall not be used.

3.3.2 Anchor chain diameters specified in Table 3.1.2 apply to stud link anchor chains. Studless link chains of increased diameter or higher strength may be used subject to PRS consent in each particular case.

3.3.3 Anchor chains shall be composed of separate spans, except for chains having less than 15 mm in diameter which need not be composed of separate spans.

Chain spans shall be interconnected with connecting links. Subject to PRS consent in each particular case, chain spans may be interconnected with shackles.

The following chain spans can be distinguished in respect of their position in the chain:
– anchor spans (fastened to the anchor),
– intermediate spans,
– chain locker spans (secured in a chain locker to a chain releasing device).

3.3.4 Anchor span shall be composed of a swivel, end link and the minimum number of ordinary links and long end links necessary to form a separate chain span. Unless dimensional proportions of the chain components preclude it, the anchor span may consist of a swivel, end link and connecting link. In chains not divided into spans, the swivel shall be included in each chain set as close to the anchor as practicable. In any case shackle bolt shall be turned towards the chain. The anchor chain span shall be connected to the anchor shackle by means of end shackle, and the end shackle bolt shall be inside the anchor shackle.

3.3.5 Intermediate spans shall be neither less than 25 m nor more than 27.5 m in length and shall be composed of an odd number of links. The total length, specified in tables, of two chains is the sum of lengths of intermediate spans only and includes neither the anchor spans nor the chain locker spans. If the number of intermediate spans is odd, then the right chain shall have one intermediate span more than the left one.

3.3.6 Chain locker span shall be composed of a special link of larger dimensions (and that link shall freely run on the anchor winch chain wheel) connecting the chain releasing device and the minimum number or ordinary and enlarged links necessary to form a separate span. Unless dimensional proportions of the components of the chain and chain releasing device preclude it, only one end link may form the chain locker span.

3.3.7 Each steel wire rope end shall be fitted with a thimble, clamp or grip. To increase the anchor holding power, the anchor shall be connected to the anchor line by means of chain span of the breaking load as the line and at least 10 m in length. The chain segment shall be connected to the anchor shackle and the steel wire rope end with a shackle of the same strength as the rope.

3.3.8 Anchor steel wire ropes shall have at least 114 wires and at least one natural fibre core. The wires used for anchor ropes shall have a thin zinc coat. All other properties of anchor steel wire ropes shall fulfil the requirements specified in *Part IX – Materials and Welding* of the *Rules for Classification and Construction of Sea-going Ships.*

3.3.9 In special cases, where one bower anchor is used instead of two ones, one anchor chain of a length not less than half the required total length of chains may be used subject to PRS consent in each particular case (see Table 3.1.2).

3.4 Anchor Appliances

3.4.1 Stoppers

3.4.1.1 For ships laying at anchor, a possibility for stopping each anchor chain or bower anchor rope shall be provided. The anchor chain or rope may be stopped by means of stopper or windlass brake in accordance with the requirements specified in paragraph 3.5.1.3.

Stoppers shall be fitted in ships whose windlasses do not fulfil the requirements specified in *Part VII – Machinery, Boilers and Pressure Vessels* of the *Rules for Classification and Construction of Sea-going Ships* and also in ships not fitted with windlasses.

3.4.1.2 If the stopper is designed only for securing the anchor in its voyage position, its parts shall be calculated for anchor chain force equivalent to double weight of the anchor and the stresses in the stopper parts shall not exceed 0.4 times the yield stress of the material used. If the stopper includes a chain or rope, then – under the load equivalent to double weight of the anchor – the strength shall be five times greater than the anchor chain breaking force or anchor wire rope ultimate strength.

3.4.1.3 Stopper used when the ship is laying at anchor shall be designed for load equal to 0.8 times the breaking load of the anchor chain or wire rope. The stress in the stopper parts, as well as in their connections with the deck shall not exceed 0.95 times the yield stress of the material used. If the stopper includes a chain or rope, their strength shall be equal to the anchor chain breaking force.

3.4.2 Anchor Chain Release Device

3.4.2.1 The last span of the anchor chain (chain locker length) shall be so fixed in the chain locker, or another location accepted by PRS, as to permit, in case of emergency, quick anchor chain release and its easy passage on the anchor winch chain wheel.

Anchor chain release device components shall be checked for strength by calculations at the assumption that they are subjected to a force equal to 0.20 times the chain breaking force.

The stress in the device components shall not exceed 0.95 the yield stress of the material used.

3.4.2.2 Anchor chain release device shall be operable from a position on the deck on which the windlass is installed or from another constantly readily accessible position. The thread of anchor chain release device shall be self-locking.

3.4.2.3 Anchor chain release device shall be so designed as to ensure its reliable operation when the chain is loaded with the force mentioned in 3.4.2.1 and also when this load ceases.

3.4.3 Anchor Chain Guide

3.4.3.1 Anchor chains shall be so guided as to ensure their free run while dropping and raising the anchor.

3.4.3.2 Anchor shank shall enter easily hawse pipe under the chain tension and shall take off hawse pipe readily when the chain is released.

3.4.3.3 Hawse pipe thickness shall not be less than 0.4 times the diameter of the used chain.

3.5 Chain Lockers

3.5.1 Chain lockers shall be fitted for stowing each chain of the bower anchor.

Where only one chain locker is intended for two chains, a division shall be provided for a separate stowage of each chain.

3.5.2 Chain locker shape, capacity and depth shall be such as to ensure easy passage of the chains through the hawse pipe, their self-laying in the chain locker and free run-out of the chain when dropping the anchor.

3.5.3 Chain locker construction as well as its closure shall be watertight.

3.5.4 Chain locker construction shall fulfil the requirements specified in *Part II – Hull*, *Part VI – Machinery and Piping Systems* as well as *Part VII – Electrical Installations and Control Systems.*

Existing stiffeners of the chain locker shall not obstruct easy run of the anchor chain.

3.6 Windlasses

Windlasses shall be fitted on the deck in the fore part of the ship for dropping and hoisting bower anchors, as well as for holding the ship with the bower anchors dropped.

Hand-operated windlasses or other deck arrangements for dropping and hoisting anchors such as anchor davits, slides, etc. are permitted.

Requirements for the construction and capacity of windlasses are specified in *Part VII – Machinery, Boilers and Pressure Vessels* of the *Rules for Classification and Construction of Sea-going Ships.*

3.7 Spare Parts

On each ship where anchor chains are used, three connecting links, one swivel and one end shackle shall be provided as anchors chain spare parts.

4 MOORING EQUIPMENT

4.1 General

4.1.1 Each ship shall be provided with mooring equipment to ensure the possibility for the ship to be pulled to the berth or floating landing stage and berthed properly.

4.1.2 The number, length and the breaking strength of the mooring ropes shall be determined in accordance with Table 4.1.2 with respect to the equipment number. Ships whose equipment number exceeds the maximum value specified in Table 4.1.2 are subject to PRS consideration in each particular case.

Table 4.1.2
Ship mooring equipment

Equipment number, N_c, not more than	Mooring ropes		
	number	rope length, l, [m]	breaking load, [kN]
15	2	30	29
20	2	30	29
25	2	40	29
30	2	50	29
40	2	50	29
50	2	60	29
60	2	60	29
70	2	80	29
80	2	100	34
90	2	100	37
100	2	110	37
110	2	110	39
120	2	110	39
130	2	110	44
140	2	120	44
150	2	120	49
175	2	120	54
205	2	120	59

Note: Where the equipment number determined in accordance with 1.6.1 takes an intermediate value in relation to those specified in the table, linear interpolation can be applied for the selection of mooring equipment.

4.1.3 The length of individual mooring ropes may be reduced by 7% as compared with that specified in the above Table 4.1.2, provided the total length of mooring ropes is not less than that resulting from the table.

4.1.4 Where synthetic fibre ropes are used, its breaking load shall not be less than the value determined in accordance with the following formula:

$$F_s = c_s F_n \quad [[kN] \tag{4.1.4}$$

F_n – fibre rope breaking load determined in accordance with Table 4.1.2, [kN];
c_s – coefficient taking the following values:
1.3 – for propylene ropes
1.2 for other synthetic fibre ropes.

4.1.5 Mooring equipment shall be situated on longitudinals, beams and/or members which are a part of the deck structure so that an efficient distribution of the mooring loads induced on the hull structure. If necessary, additional stiffeners and/or brackets shall be fitted, to make possible direct transfer of loads from the machinery/bollards foundations to the stiffener system under the deck plating. The size of stiffeners and brackets shall be adapted to the value of mooring ropes breaking force, to prevent structure stresses exceeding allowable stresses.

4.2 Mooring Ropes

4.2.1 For the mooring purposes, steel wire ropes, as well as natural or synthetic fibre ropes may be used. The diameter of natural and synthetic fibre ropes, irrespective of their breaking load resulting from Table 4.1.2, shall not be less than 20 mm and their breaking load shall not be less than 29 kN. For lesser breaking load values, the diameter shall not be less than 12 mm..

4.2.2 Steel wire ropes shall be of flexible construction. Wire ropes intended to be wound on powered winch drums may have a wire core instead of fibre core, but the number of wires in such ropes shall not be less than 216.

In all other respects steel wire ropes shall meet the requirements specified in *Part IX – Materials and Welding*, of the *Rules for Classification and Construction of Sea-going Ships.*

4.2.3 Natural fibre ropes shall be either manila or sisal ones. Hemp ropes are also permitted.

In all other respects natural fibre wire ropes shall meet the requirements specified in *Part IX – Materials and Welding*, of the *Rules for Classification and Construction of Sea-going Ships.*

4.2.4 Synthetic fibre ropes shall be made of homogeneous approved synthetic materials (e.g. nylon, polypropylene, capron). Combinations of different approved synthetic fibres in one rope are subject to PRS consideration in each particular case. In all other respects synthetic fibre ropes shall fulfil the requirements specified in *Part IX – Materials and Welding*, of the *Rules for Classification and Construction of Sea-going Ships.*

4.3 Mooring Fittings

4.3.1 The number and position of mooring bollards, open and closed fairleads and other mooring fittings shall be determined taking account of the construction particulars, intended service and general arrangement of the ship.

4.3.2 Bollards shall be made of steel or cast iron. On small ships equipped with natural or synthetic fibre ropes, bollards made of light alloys are permitted. The bollards may be welded or cast.

4.3.3 Outside diameter of the bollard columns shall not be less than 10 diameters of the steel wire rope or 1 circumference of a natural fibre rope according to the designation of the bollard. The spacing of axes of those parts of bollard shall not be less than 25 times the diameter of the steel wire rope or 3 times the circumference of a natural fibre rope.

4.3.4 Bollards, bitts, fairleads, chocks and other mooring fittings – except for the bitt stoppers – and their foundations shall be so designed that when they are subjected to the load corresponding to the mooring rope breaking force the stresses occurring in their components do not exceed 0.95 of the yield stress of their material.

Bitt stopper breaking load shall not be less than 0.15 of the breaking force of rope for which the stopper is intended.

4.3.5 It is recommended that mooring winches be used for mooring the ship.

4.4 Mooring Winches

4.4.1 Special mooring machinery (e.g. capstans, winches,), as well as other deck machinery (e.g. windlasses, cargo winches) fitted with mooring drums may be used for warping the mooring ropes.

4.4.2 The number and type of mooring winches shall be determined considering that their rated pull is not less than 1/3 of the mooring rope breaking load and that the winches fulfil the requirements specified in sub-chapter 6.4 of *Part VII – Machinery and Piping Systems*.

5 TOWING EQUIPMENT

5.1 General

5.1.1 Each ship shall be provided with towing arrangements, equipment and fittings necessary for her towing operations in accordance with the requirements specified in sub-chapter 5.2.

5.1.2 Towing equipment shall be situated on longitudinals, beams and/or members which are a part of the deck structure so that an efficient distribution of the load induced by the towing line on the hull structure. If necessary, additional stiffeners and/or brackets shall be fitted, to make possible direct transfer of loads from bollards or other towing machinery foundations to the stiffener system under the

deck plating. The size of stiffeners and brackets shall be adapted to the value of towing rope breaking force, to prevent structure stresses exceeding allowable stresses.

5.2 Towing Fittings

5.2.1 The number and position of towing bollards and fairleads shall be determined taking account of the construction particulars, intended service and general arrangement of the ship.

5.2.2 The requirements for mooring bollards and fairleads specified in paragraphs 4.3.2, 4.3.3 and 4.3.4 also apply to bollards and fairleads intended for towing operations.

5.2.3 The requirements for mooring bollards and fairleads specified in paragraphs 4.3.2, 4.3.3 and 4.3.4 also apply to bollards and fairleads intended for towing operations.

6 SIGNAL MASTS

6.1 General

6.1.1 The requirements specified in this Chapter apply only to signal masts, i.e. masts intended solely for carrying signal means, e.g. lights, day signals, aerials, etc.

Where the masts or their parts carry derricks or other cargo handling gear in addition to the signal means, such masts or their parts shall fulfil the requirements of *Part VI – Lifting Appliances* of the *Rules for Statutory Survey of Sea-Going Ships.*

6.1.2 The arrangement and height of signal masts, as well as the number of signal means fitted on such masts shall fulfil the requirements of *Part III – Signal Means* of the *Rules for Statutory Survey of Sea-Going Ships.*

6.2 Unstayed Masts

6.2.1 Outside diameter d and wall thickness t at the heel of masts made of steel with yield stress ranging from 216 up to 225 MPa shall not be less than the value determined in accordance with the following formula:

$$d = 3l^2(0.674l + a + 13) \times \left(1 + \sqrt{1 + \frac{51.5 \cdot 10^4}{l^2(0.674l + a + 13)^2}}\right) 10^{-2} \quad \text{[mm]} \qquad (6.2.1\text{-}1)$$

$$t = \frac{l}{70} d \quad \text{[mm]} \qquad (6.2.1\text{-}2)$$

where:

d – outside diameter at the mast heel, [mm];
t – wall thickness at the mast heel, [mm];
l – mast length form its heel to the top, [m];
a – mast heel elevation above the ship centre of mass, [m].

The diameter of the mast may gradually decrease upwards to the value of $0.5d$ at a height of $0.75l$ from the heel.

In no case shall the mast wall thickness be less than 4 mm.

The mast heel shall be effectively supported to meet the stiffness criterion in all directions.

6.2.2 Where:

.1 the mast is made of higher-strength steel, light alloys or wood (the wood shall be of grade I);

.2 in addition to a yard, lights and day signals, the mast is fitted with other equipment of considerable weight (e.g. radar scanners with platforms for their servicing, "crow's-nests", etc.);

the requirements specified in sub-chapter 6.4 shall be fulfilled.

6.3 Masts of Special Construction

6.3.1 In the case specified in 6.2.2, as well as where bipod and other similar masts are installed, detailed strength analysis of these masts shall be performed and submitted to PRS for reference.

6.3.2 In the calculations it shall be assumed that each component of the mast is subjected to a horizontal force determined in accordance with the following formula:

$$F_1 = G_1 \frac{4\pi^2}{gT^2}(\theta Z_1 + r\sin\theta) + G_1 \sin\theta + pA_i \cos\theta \quad [\mathrm{N}] \tag{6.3.2}$$

where:
F_i – horizontal force acting on the relevant component, [N];
G_i – load induced by the relevant components, [N];
Z_i – elevation of the relevant component centre of mass above the ship centre of mass, [m];
A_i – windage area of the relevant component, [m^2];
T – ship roll/pitch period, [s];
Θ – ship roll/pitch angle, [rad];
r – half the wave height, [m];
g = 9.81[m/s^2];
p – wind pressure, to be taken as 1960 Pa.

Calculations shall be performed for both rolling and pitching with r taken as L/40 (L – ship length, [m]) and Θ corresponding to the roll angle equal to 40° and to the pitch angle equal to 5°.

6.3.3 Under the loads specified in 6.3.2, the stresses in the parts of masts shall not exceed 0.7 times the yield stress of the material where they are made of steel, and 12 MPa – where they are made of wood.

7 OPENINGS IN HULL AND SUPERSTRUCTURES

7.1 General

7.1.1 On ships engaged on domestic voyages as well as cargo ships[1] of restricted service I and II, the openings in question and their means of closure shall, above all, fulfil the requirements of the *International Convention on Load Lines, 1966*, as amended, (regulations 12÷24).

7.1.2 On passenger ships engaged on domestic voyages, the openings in question and their means of closure shall, above all, fulfil the requirements specified in chapter 1, part B-2 of *Directive 2010/36/UC*.

7.1.3 On cargo ships of restricted service III, the openings in question and their means of closure shall, above all, fulfil the requirements specified in this Chapter.

7.1.4 During the process of design of openings in the ship hull and superstructures as well as their closing appliances, the relevant requirements contained in *Part V – Fire Protection* and *Part VII – Electrical Installations and Control Systems* shall be taken into account.

7.1.5 Door sill height shall be measured under the door opening from the upper surface of deck steel plating (or wood sheathing, if applied).

7.2 Side Scuttles and Windows

7.2.1 The number of side scuttles in the shell plating shall be reduced to a minimum compatible with the design and proper operation of the ship.

7.2.2 In no case shall the lowermost edges of side scuttles be positioned below a line drawn parallel to the freeboard deck. The lowermost point of this line shall be located above the waterline at the distance of:

[1] Cargo ship – in this *Part* of the *Rules*: a ship who is not a passenger ship.

.1 not less than 500 mm or 2.5%*B* – whichever is greater – on ships mentioned in 7.1.1 and 7.1.2 (in justified cases PRS may permit 300 mm for ships of restricted service II);
.2 not less than 150 mm on ships mentioned in 7.1.3.

7.2.3 Side scuttles in spaces located below the freeboard deck shall be of normal (i.e. non-opening) or heavy type. They may be non-opening or opening provided with hinged inside steel deadlight. In enclosed superstructures and deckhouses side scuttles of light type may be applied. Where opening key-locked side scuttles are applied, the key shall be located in a conspicuous position in the wheelhouse.

7.2.4 In ships intended to be assigned a subdivision mark in their symbol of class, side scuttles located outside a floodable compartment (or a group of such compartments) whose lowermost edges are located at the distance less then 300 mm above the respective damage condition waterline shall be non-opening. All side scuttles shall be fitted with hinged inside deadlights.

7.2.5 All windows in the wheelhouse exposed to weather shall be fitted with panes of thermally toughened glass or other durable transparent material of equivalent strength properties. Window protective means and the pane width shall be determined taking account of the materials used for the window construction. Openings of the boundaries between the wheelhouse – whose windows are not fitted with the protective means in accordance with 7.2.6 – and spaces located below the deck shall be provided with weathertight closing appliances. At least one of the wheelhouse windows shall be provided with an arrangement ensuring good visibility during precipitation.

7.2.6 Side scuttles and windows including their panes and closing appliances shall be robust and fulfil the requirements of ISO and national standards recognized by PRS as well as those specified in sub-chapter 7.2 of *Part III – Hull Equipment*, of the *Rules for Classification and Construction of Sea-going Ships*.

7.2.7 Compliance with the requirements of EN ISO 11591 Standard related to ensuring visibility from the bridge is recommended.

7.3 Flush Scuttles

7.3.1 Flush scuttles shall be provided with a deadlight hinged or otherwise attached (e.g. by means of chain) and capable of being easily and effectively closed and secured.

7.3.2 The greater dimension of the flush scuttle clear opening shall not exceed 200 mm and the glass thickness shall not be less than 10 mm.

7.3.3 When secured, the deadlights of flush scuttles shall be weathertight. The tightness of deadlights, as well as the tightness of glasses along their contour shall be ensured by gaskets made of rubber or other suitable material.

7.3.4 The strength and materials of the flush scuttle components shall fulfil the requirements specified in sub-chapter 7.2 of *Part III – Hull Equipment*, of the *Rules for Classification and Construction of Sea-going Ships*.

7.4 Doors in Superstructures and Deckhouses

7.4.1 Construction and Means of Closure

7.4.1.1 All deck openings, except those mentioned in 7.3, 7.5, 7.6, 7.7, 7.8, 7.9, and 7.10 shall be protected by an enclosed superstructure or enclosed deckhouse.

7.4.1.2 Superstructures and deckhouses are considered as enclosed if:
.1 their construction fulfils the requirements specified in *Part II – Hull;*
.2 their openings fulfil the requirements specified in 7.4.2 and 7.6;
.3 all other openings in their outer plating fulfil the requirements specified in 7.2, 7.3, 7.6, 7.7, 7.8 and 7.9.

7.4.2 Access Doors of Enclosed Superstructures and Deckhouses

7.4.2.1 Any access openings in fore and after bulkheads and other boundaries of enclosed superstructures and deckhouses shall be fitted with weathertight doors and shall have framing and strength equivalent to that of such a boundary and capable of being open/closed from both sides.

7.4.2.2 The height of sills of access openings mentioned in 7.4.2.1 shall generally (see also paragraph 7.4.2.3) be at least 380 mm on ships mentioned in 7.11 and 7.12. The height of such sills of doors on the freeboard/bulkhead deck shall be increased to at least 600 mm where:

.1 companionway door is located in position 1[1];

.2 no access door is provided from the higher deck as an alternative to access door from the freeboard deck.

On ships mentioned in 7.1.3 the height of such sills on all open decks may be reduced to 230 mm.

Where midship superstructure or poop cannot be considered as enclosed (see paragraph 7.4.1.2), the height of sills of door openings in such a superstructure or poop shall not be less than 600 mm in position 1, and shall not be less than 380 mm in l position 2, whereas on ships mentioned in paragraph 7.1.3 the height shall not be less than 450 mm in position 1, and shall not be less than 230 mm in position 2.

7.4.2.3 The minimum height of sills of access openings on the third and higher tiers of superstructure and deckhouse decks shall not be less than 150 mm.

7.4.2.4 Doors shall be made of steel or other material approved by PRS.

7.4.2.5 Steel door plate thickness shall be not be less than that required for the poop wall thickness in accordance with 2.14.2 in *Part II – Hull*. For extruded doors, their minimum required thickness may be reduced by 1 mm.

The minimum thickness of doors made of other materials is subject to PRS consideration in each particular case.

7.4.2.6 The requirements on whether doors shall open outwards or inwards are specified in 8.4.2.4.

7.4.2.7 Doors shall be weathertight when closed. The tightness shall be ensured by gaskets made of rubber or other suitable material.

7.5 Doors in Watertight Divisions Forming Subdivision

7.5.1 On ships intended to be assigned an additional mark [1] in the symbol of class, watertight doors shall fulfil the requirements of Chapter 21 in *Part III – Hull Equipment* of the *Rules for Classification and Construction of Sea-going Ships*.

7.5.2 On cargo ships who are not subject to subdivision and damaged stability requirements, hinged doors fitted with devices for their quick and tight closing are permitted. On both sides of such doors the following notice shall be displayed:

When at sea, the door shall be closed

7.6 Machinery Casings

7.6.1 Deck openings above machinery spaces shall be protected with robust casings raised above decks to the suitable height. The casings shall be covered with decks or skylights shall be installed above them. The casing construction shall fulfil the requirements specified in paragraph 2.14.6 of *Part II – Hull.*

7.6.2 Casings shall be weathertight.

7.6.3 Openings in casings leading to machinery spaces shall be provided with permanently attached doors in accordance with the requirements specified in paragraphs 7.4.2.4 ÷ 7.4.2.7. On ships mentioned

[1] See definitions in 1.2.11.

in paragraphs 7.1.1 and 7.1.2 the height of sills in door openings on open decks shall be at least 600 mm in position 1 and at least 380 mm in position 2, whereas on ships mentioned in 7.1.3 at least 450 mm in position 1 and at least 230 mm in position 2.

7.6.4 Other openings than access openings shall be provided with robust covers having strength equivalent to that of such a boundary without the opening and with permanently fixed weathertight means of closure.

7.7 Companion Hatches, Skylights and Ventilating Trunks

7.7.1 Deck openings intended for stairways leading to the spaces located below, as well as light and air openings to these spaces shall be protected by robust companion hatches, skylights or ventilating trunks. Where the openings leading to the spaces located below are protected by superstructures or deckhouses instead of the means of protection mentioned above, these superstructures or deckhouses shall fulfil the requirements specified in sub-chapter 7.5.

7.7.2 The height of coamings of companion hatches, skylights and ventilating trunks shall be at least 600 mm on ships mentioned in paragraphs 7.1.1 and 7.1.2 in position 1, and at least 380 mm in position 2, whereas for ships mentioned in 7.1.3 at least 380 mm in position 1, and at least 300 outside that region.

7.7.3 It is recommended that companion hatches be situated as close to the ship centre plane as practicable.

7.7.4 Skylights of the spaces below the deck shall be of robust construction as well as provided with safe and weathertight means of closure and also capable of being secured with equivalent means of closure in case of their damage. Skylights above machinery spaces shall be avoided.

7.7.5 All companion hatches, skylights and ventilating trunks shall be provided with covers permanently attached to the coamings by means of hinges and made of steel or other material as agreed with PRS.

Where the covers are made of steel, the thickness of their plating shall be equal to at least 0.01 times the spacing of stiffeners, however not less than 4 mm.

7.7.6 Covers of companion hatches, skylights and ventilating trunks shall be fitted with closing/opening devices. Such devices shall be operable at least from the outside. If the hatches are also intended as an emergency exit in addition to their normal use, the closing/opening devices shall be operable from both sides of the cover. The covers shall be weathertight when closed.

The weathertightness shall be provided by means of seals made of rubber or another suitable material.

7.7.7 The glass of scuttles in the skylight covers shall be hardened and its thickness shall be at least 6 mm if the inner diameter is 150 mm and less and at least 10 mm if the inner diameter is 450 mm. For intermediate inner diameters, the glass thickness shall be determined by linear interpolation. Where steel-wire reinforced glass is used, its thickness may be 5 mm. Such glass need not be hardened.

The glass shall be reliably fixed to the cover by means of a frame and shall have a weathertight gasket of rubber or another suitable material on its contour.

The glasses of skylights fitted in machinery spaces shall fulfil the requirements specified in *Part V – Fire Protection.*

7.7.8 Each scuttle or a group of scuttles arranged in one row shall be provided with portable shields of the same material as the cover, at least 3 mm in thickness and capable of being effectively fastened outside of the cover by means of earnuts. Such portable shields shall be stowed in the immediate vicinity of the skylights.

7.8 Manholes

7.8.1 PRS *Rules* do not cover the height of coamings of manholes for deep tanks and other tanks, void spaces, cofferdams, etc.

7.8.2 Manhole covers of shall be made of steel or another material as agreed with PRS. The cover thickness of shall generally not be less than that of the plating on which they are fitted. The manholes shall be watertight in positions 1 and 2 as well as in way of superstructures other than enclosed ones.

In justified cases, PRS may permit to reduce the cover thickness. In locations where they are at risk of mechanical damage, however, effective protection of such covers shall be provided.

7.8.3 Manhole covers of shall be reliably fixed to the coaming or doubling ring by means of bolts or stud-bolts with nuts.

7.8.4 When closed, manhole covers shall be tight under inner pressure of water or other liquids for which the tanks are intended, in accordance with the requirements specified in *PRS Publication No. 21/P – Testing of Hull Structures*. The tightness shall be provided by means of gaskets made of rubber or another suitable material resistant to the liquid for which the tank is intended.

7.9 Cargo Hatches and Hatch Covers

7.9.1 General

Deck openings for loading and unloading of cargo or stores shall be protected by robust hatches. Hatch means of closure shall be weathertight. The weathertightness shall be provided by either of the following:

.1 tarpaulin hoods and devices for their securing;
.2 gaskets of rubber or other suitable material and closing devices.

7.9.2 Hatch Coamings

7.9.2.1 Cargo hatch coaming height shall be as follows:

– at least 600 mm in position 1 and at least 450 mm in position 2a on ships mentioned in paragraphs 7.1.1 and 7.1.2;
– at least 450 mm in position 1 and at least 380 mm in position 2a on ships mentioned in paragraphs 7.1.3.

Hatch coaming construction shall fulfil the requirements specified in *Part II – Hull*.

7.9.2.2 Cargo hatch coaming height for hatches subject to the requirements of 7.10.1.2 may be reduced compared to that required in 7.10.2.1 or hatch coamings may even be waived if PRS accepts the tightness of the hatch covers and finds their means of closure to be reliable.

7.9.3 Materials

7.9.3.1 Steel and light alloys used for hatch covers shall fulfil the requirements specified in 1.3.5.

7.9.3.2 Rubber used for hatch cover gaskets shall be flexible and weatherproof. It shall also be hard enough.

7.9.3.3 The adhesive used for fitting the rubber in the hatch cover grooves shall be approved by PRS.

7.9.4 Hatch Covers

7.9.4.1 Hatch covers made of either other materials than normal strength steel, or timber, shall have the minimum strength corresponding to that of hatch covers made of normal strength steel and their construction shall be rigid enough to ensure weathertightness.

7.9.4.2 Generally, wooden covers are not recommended for cargo hatches due to the difficulty in ensuring their weathertightness.

Where hatch covers are made of timber, their minimum thickness shall be determined as 4 mm per each 100 mm of unsupported span, however not less than 65 mm. The width of planks shall not be less than 65 mm. Wooden hatch cover width shall also include the allowance for abrasive wear.

7.9.4.3 The construction of hatch covers sealed in accordance with paragraph 7.9.1 shall be such as to preclude their accidental opening in the sea and weather conditions. The construction hatch covers and their equipment shall be in accordance with the requirements specified in *Part III* of the *Rules for Classification and Construction of Sea-going Ships.*

7.9.5 Design Loads

7.9.5.1 Cargo hatch covers shall be designed to withstand the load induced by the expected deck cargo to be placed on those covers. It is also required that the design load induced on the deck be not less than the product of the hatch cover area and load of 6.87 kPa.

On ships mentioned in paragraphs 7.1.1 and 7.1.2, the load induced on hatch covers and the resulting stress shall be determined in accordance with regulation 16 of the *International Convention on Load Lines, 1966*, as amended.

7.9.5.2 For ships with cargo hatches without coamings or with lower coamings (see paragraph 7.9.2.2) on exposed deck in the portion 0.25*L* aft of the forward perpendicular, the design load of such covers shall be determined as follows:

– for hatches without coamings – the value required in 7.9.5.1 shall be increased by 15%;
– for hatches with coamings with a height lower than required in 7.9.2.1 – the value required in 7.9.5.1 shall be increased proportionally by 0÷15%.

7.9.5.3 Hatch cover mass shall not be taken into account in the strength and rigidity calculations.

7.9.6 Strength Reference Values

7.9.6.1 Under the design load determined in accordance with 7.10.5 induced on the hatch cover, the allowable stress in the structure components shall be taken as follows:

.1 for hatches situated on the main deck:
0.35 the yield stress of the hatch cover material or 0.2 the tensile strength (whichever is lesser) – in the case of removable hatch beams and pontoon hatch covers;
0.4 the yield stress of the hatch cover material or 0.235 the tensile strength (whichever is lesser) – in the case of hatches of different construction;

.2 for hatches situated on the superstructure deck or deckhouse deck,
0.54 the hatch cover material yield stress.

7.9.6.2 Under the design load induced on the hatch cover by the cargo, the allowable stress in the structure components shall not exceed 0.7 the yield stress of the hatch cover material.

7.10 Air Pipes

7.10.1 Air pipes of tanks and other enclosed spaces below the deck penetrating that deck or superstructure deck shall be of sturdy construction and shall be protected against mechanical damage. Air pipe outlets on open decks shall be permanently fitted with self-acting closing devices precluding sea water ingress into the tanks.

The closing devices may be waived if PRS finds that the air pipes are sufficiently protected against the sea water ingress from the deck.

The dimensions of air pipes shall be in accordance with the requirements specified in *Part VI – Machinery and Piping Systems*.

7.11 Ventilation Ducts and Ventilator Heads

7.11.1 Ventilations ducts from the spaces located under the main deck and from enclosed superstructures shall be provided with coamings robustly fixed to the deck. On ships mentioned in 7.1.1 and 7.1.2 the height of ventilation duct coamings on open decks shall be at least 900 mm in positions 2 and at least 760 mm in position 2, whereas on ships mentioned in 7.1.3 – 760 mm and 600 mm respectively. The coaming construction shall fulfil the requirements specified in sub-chapter 7.6.3 of *Part II – Hull*.

7.11.2 In the closed position, ventilation duct covers shall be weathertight. This weathertightness shall be provided by means of seals made of rubber or another suitable material.

7.11.3 Ventilators shall be situated as close to the ship centre plane as practicable in the upper parts of superstructures and companionways.

8 GENERAL ARRANGEMENT AND EQUIPMENT OF SHIP SPACES AND DECK EQUIPMENT

8.1 General

The requirements specified in Chapter 8 apply to general arrangement and equipment of spaces other than machinery spaces The respective requirements for machinery spaces are specified in *Part VI – Machinery and Piping Systems*.

8.2 General Arrangement

8.2.1 Accommodation spaces shall be located neither forward of the collision bulkhead nor aft of the after peak bulkhead below the bulkhead deck (for 'accommodation spaces' – see sub-chapter 1.2 in *Part V – Fire Protection*).

8.3 Equipment of Cargo Holds and other Spaces Below Deck

8.3.1 On floors, tight wooden ceiling shall be laid to extend to the ship's sides. It is recommended that the ceiling be made of portable sections of such dimensions and so constructed as to allow their easy removal at any place.

The pine wood ceiling thickness shall not be less than 40 mm, and below the cargo hatches – 70 mm.

PRS may waive the requirement for battens being fitted considering the ship intended service and cargo to be carried. In fishing vessels, the cargo hold equipment shall be adjusted to the fish storage conditions.

8.3.2 Application of ceiling made of synthetic materials is subject to PRS consideration in each particular case.

8.3.3 All parts of the cargo hold construction and equipment which are liable to damage by cargo or loading gear (stiffeners, manholes, air pipes, sounding pipes, etc.) shall be effectively protected (with screens, covers, grids, crates, etc).

The requirements for piping arrangement in cargo holds are specified in sub-chapter 5.5.3 of *Part VI – Machinery and Piping Systems*.

8.4 Exits, Doors, Corridors, Stairways and Ladders

8.4.1 General

The arrangement and equipment of exits, doors, corridors as well as stairways and ladders shall be such as to provide ready passage for the crew from the ship spaces to the control stations and work-stations.

8.4.2 Exits

8.4.2.1 Main exit from the spaces located below the open deck, including exits from the machinery compartment shall open to the stairway, whereas other exits which may be regarded as emergency exits may provide an escape by ladders to casings or skylights.

Exit from the spaces located above the open deck may be provided by doors, stairways or their combination.

8.4.2.2 Wheelhouse shall be provided with exits to each wing of the bridge ensuring the passage through the wheelhouse from one ship side to the other. Unless wings are arranged on the bridge, one exit aftwards may be accepted on condition that good visibility to both sides is provided.

8.4.2.3 Exist from accommodation and service spaces shall be at least 0.6 m in width. Exit ports from cargo holds to the open deck shall not have dimensions less than 0.6 × 0.6 m.

8.4.2.4 Closing appliances of doors and exit ports shall be operable from both sides. Doors shall open as follows:

.1 doors of accommodation and service spaces leading to corridor – shall open inwards;

.2 doors of public spaces shall open outwards or to either side;

.3 external doors in the outer bulkheads of superstructures and in external transverse bulkheads of deckhouses – outwards in the direction of the nearest ship side;

.4 external doors in the outer longitudinal bulkheads of deckhouses – outwards in the forward direction.

In special cases, the doors, mentioned in .3 and .4, may open inwards subject to PRS consent in each particular case.

Sliding doors shall not be fitted at emergency exits and on escape routes.

8.4.2.5 Doors of accommodation spaces shall be provided in their lower part with detachable panels 0.4×0.5 m in size, which may be easily knocked out.

Detachable panels need not be fitted where the spaces are provided with opening side scuttles of at least 400 mm in inner diameter or opening deckhouse windows, the smaller side of which is at least 400 mm, and on condition that persons are capable of reaching the corridor or exposed deck through the side scuttles or windows.

8.4.3 Corridors and Passageways

8.4.3.1 All corridors and passageways shall provide clear passage.

8.4.3.2 Corridors forming the means of escape shall not be less than 0.7 m in width.

8.4.3.3 Passageways on the bridge shall be at least 0.6 m in width.

Where the steering post and navigation post are located in separate but adjacent rooms, an interconnecting passageway provided with a door, screen or curtain shall be arranged.

8.4.4 Stairways and Ladders

8.4.4.1 All stairways connecting decks or providing access to compartments below the deck shall be made of steel so as to form a framework. They can be made of another equivalent material subject to PRS consent in each particular case. Special requirements concerning stairway division and protection of the means of escape are specified in sub-chapters 2.3 and 2.4 of *Part V – Fire Protection.*

8.4.4.2 The construction of stairways and ladders shall be in accordance with the relevant occupational health and safety regulations.

8.5 Guard Rails, Bulwark and Gangways

8.5.1 All exposed parts of the freeboard deck, as well as those of the superstructure and deckhouse decks shall be provided with suitable guard rails or bulwarks.

8.5.2 The height of the bulwark or guard rail above the deck shall not be less than 1 m. If, however, this height would disturb the normal operation of the ship, a lesser height may be approved subject to PRS acceptance of the means provided for the crew protection (see paragraph 8.5.3).

The bulwark or guard rail can be interrupted in way of the foundations of mooring arrangements.

8.5.3 Each ship with a permanent bulwark less than 1.0 m in height shall have bulwarks with removable struts or another similar construction ensuring the total required height of 1.0 m together with the bulwark.

Such a solution shall be arranged where the bulwark might obstruct fishing or other operations resulting with the ship intended service.

Another alternative solution is subject to PRS consent in each particular case.

8.5.4 The gap below the lowest rail of the guard railing shall not exceed 230 mm and the spacing between the other rails shall not exceed 380 mm. The spacing of struts shall not exceed 1.5 m.

In ships with rounded gunwale, bulwark struts shall be positioned on the flat part of deck.

8.5.5 Effective means in the form of guard rails, ropes, passages under the deck etc, shall be provided to secure the crew during their passage to and from their cabins, machinery spaces and other work-stations. Storm rails shall be fitted at the outer side of all deckhouses and funnels.

8.5.6 Where bulwark is applied, it shall be in accordance with the requirements specified in sub-chapter 2.15 of *Part II – Hull*.

8.6 Freeing Ports

8.6.1 Where bulwarks on the weather portions of the upper deck form wells, the minimum freeing port area A [m^2] on each side of the ship for each well shall be determined in accordance with the following formula:

$$A = Kl \quad [\mathrm{m}^2] \tag{8.6.1}$$

where:

K – dimensionless factor:
K = 0.07 for a ship of 24 m in length
K = 0.05 for a ship of 12 m in length
(for intermediate lengths, K shall be determined by linear interpolation);

l – length of well; l may be taken as 70% of the ship length, if it is actually greater.

For ships of the length L less than 12 m, area A shall be determined taking K = 0.04.

For ships without deck sheer, the value of A determined in accordance with formula 8.6.1 shall be increased by 50%.

8.6.2 If the bulwark is more than 1200 mm in average height h_s [mm], the area determined in accordance with paragraph 9.3.6.1 shall be increased in accordance with the following formula:

$$\Delta A = 0.004 \frac{\Delta h}{100} l \quad [\mathrm{m}^2] \tag{8.6.2 -1}$$

where:

l [m] – see paragraph 8.6.1;

ΔA – freeing port area increase;

$\Delta h = h_s - 1200$ [mm]

Where average height of bulwark h_s [mm] in way of well is less than 900 mm, the freeing port area may be reduced by the value determined in accordance with the following formula:

$$\Delta A = 0.004 \frac{\Delta h}{100} l \quad [\mathrm{m}^2] \tag{8.6.2 -2}$$

where:

l [m] – see paragraph 8.6.1;

ΔA – freeing port area reduction;

$\Delta h = 900 - h_s$, [mm]

In some cases PRS may allow the area of freeing ports to be reduced independently by not more, however, than 50% of the value determined in accordance with paragraph 8.6.1.

8.6.3 Openings of freeing ports more than 300 mm in height shall be provided with protective horizontal round or flat bars arranged not more than 300 mm and not less than 150 mm apart or shall be provided with another suitable means of protection.

9 ADDITIONAL REQUIREMENTS

9.1 General

9.1.1 Passenger Ships

9.1.1.1 The requirements specified in sub-chapter 9.1 apply to ships engaged on domestic voyages to be assigned one of the following additional marks: **pas A**, **pas B**, **pas C** or **pas D.**

9.1.1.2 Passenger ships to be assigned one of the following additional marks: **pas B**, **pas C** or **pas D** in the symbol of class shall fulfil the relevant requirements specified in chapters 13, 14, 15, 16, 17, 20, 21 and 23 of Part B of Annex 1 to *Publication 76/P – Stability, Subdivision and Freeboard of Passenger Ships engaged on Domestic Voyages Publication No. 76/P – Stability, Subdivision and Freeboard.*

9.1.1.3 It is recommended, as far as practicable, that guidelines contained in IMO circular *MSC/Circ.735* regarding the conditions of the carriage of passengers with disabilities (including reduced mobility).

9.1.2 Passenger Seats

9.1.2.1 Seats shall be provided for all passengers on board the ship.

9.1.2.2 On passenger ships to be assigned additional mark **pas A**, **pas B** or **pas C** in the symbol of class, seats shall be provided for all passengers irrespective of the seats on exposed weather decks.

9.1.2.3 Sufficient deck area shall be provided for passengers. Assembly stations shall be located close to the survival craft embarkation areas which shall be readily accessible from accommodation and service spaces. Assembly stations shall be large enough to accommodate all passengers and enable them to be instructed. Each assembly station shall not be less than 0.35 m^2 of free deck area per person.

9.1.2.4 The required width of passenger seat shall be taken at least 0.45 m and the minimum length – 75 m.

9.1.2.5 *Passenger Arrangement Plan* confirming fulfilment of the requirements specified in paragraphs from 9.1.2.1 to 9.1.2.4 shall be submitted to PRS. The plan shall cover all the variations of passenger arrangement accepted by PRS as a result of the sip stability analysis (see paragraph 3.7.1.1 of *Part IV – Stability and Freeboard*). *Passenger Arrangement Plan* shall be available on board the ship.

9.1.2.6 Benches and seats shall be effectively fixed to the hull structure.

9.1.3 Bulwarks and Guard Rails

9.1.3.1 Bulwark or guard rail height on passenger decks shall not be less than 1.1 m. The construction of guard rails shall preclude their climbing up or accidental fall off the deck.

Stairs, including landings, in way of such decks shall also be provided with such guard rails.

9.1.4 Gangways, Access Means and Appliances

9.1.4.1 Gangways in bulwark and in guard rails for shore communication shall be secured against self-opening.

9.1.4.2 Gangboards for shore communication, if they are a part of ship equipment, shall not be less than 0.6 m in width and shall be fitted with guard rails on both sides. The construction of gangboards shall comply with the relevant standards.

9.1.4.3 Width of communication gangways forming means of escape, communication corridors and stairways shall not be less than 0.8 m. If access to a passenger part of ship or passenger spaces is provided through one stairway or one corridor, their width shall not be less than 1.0 m.

9.1.4.4 Width of exits from spaces or groups of spaces available to not more than 80 passengers shall not be less than 0.8 m. For a greater number of passengers the width of exits shall not be less than that determined by multiplying the number of passengers and the index of 0.01 m per person.

9.1.4.5 If a space intended for 30 to 50 passengers is provided with only one regular exit, it shall also be provided with an emergency exit.

9.1.4.6 Spaces intended for 50 or more passengers or overnight cabins with 12 or more beds shall be provided with two exits. Replacement of one of those exits by two emergency exits is permitted. Such emergency exits shall have the same width and shall be located as far from each other as practicable and reasonable.

9.1.4.7 Each passenger space below the bulkhead deck shall be provided with one direct exit or one direct emergency exit to the bulkhead deck or open deck.

9.1.4.8 Emergency exits shall provide clear passage not less than 0.60 × 0.60 m.

9.1.4.9 Stairways under the bulkhead deck shall be located at the distance from the ship side not less than 20% of breadth of ship in way of the stairway measured at the maximum draft level.

This requirement does not apply if two stairways are provided on both ship sides.

9.1.4.10 Stairways shall be fitted with handrails on both sides.

9.1.4.11 Doors of public spaces shall open outwards and means shall be taken provided to prevent their unauthorised closing or locking.

9.1.4.12 If a ship is provided with lifeboat or liferaft embarked from the deck, then assembly stations and embarkation areas shall be readily accessible from accommodation spaces and service spaces.

Assembly stations shall be located close to the survival craft embarkation areas. Each assembly station shall be large enough to accommodate all the persons assigned to the particular assembly station. Assembly station area shall not be less than 0.35 m^2 per person

9.1.5 Carriage of Passengers on Open Decks

9.1.5.1 In the case of ships without enclosed passenger spaces which are intended to be assigned additional mark **pas D** in the symbol of class with the entry: „carriage of passengers on open decks only" in the *Certificate of Class*, the requirements regarding the enclosed spaces specified in paragraph 9.1.1 do not apply.

9.1.6 Additional ruder angle indicator

9.1.6.1 Onboard ships assigned mark **pas B**, **pas C** or **pas D**, a rudder angle indicator shall be installed in the steering gear room (see also 2.1 in *Supplement*).

9.2 Tugs

9.2.1 Application

9.2.1.1 The requirements specified in sub-chapter 9.2 apply to ships to be assigned additional mark **hol** in the symbol of class:

9.2.2 Towing Equipment

9.2.2.1 Tugs intended for navigation in operating areas I and II shall be provided with at least the following:

.1 one slip-type towing hook operable from a remote position;
.2 towing bollards; it is recommended that they are towing bitts for towing on both long and short towing rope and for belaying the towing rope stopper;
.3 towing arches or similar arrangements protecting the towing rope;
.4 one towing rope;
.5 one towing rope stopper;
.6 arrangement protecting the towing hook against overloading.

9.2.2.2 Tugs intended for navigation in operating area III shall be provided with at least the following:
.1 one slip-type towing hook operable from a remote position;
.2 towing bollards or towing bitts for towing on a long towing rope and for belaying the towing rope stopper (it is recommended);
.3 towing arches or similar arrangements protecting the towing rope;
.4 towing rope one towing rope complying with the requirements 9.2.3;
.5 towing rope stopper;
.6 device protecting the towing hook against overloading.

9.2.3 Towing Hooks

9.2.3.1 Special towing equipment and outfit of tugs mentioned in paragraphs 9.2.2.1 and 9.2.2.2 shall be established depending on the rated towing force determined by calculations or during the prototype tests. Unless such calculations are performed and the prototype tests results are unavailable, the towing force shall not be taken less than the value obtained in accordance with the following formula:

$$F = 133\, CP_e \quad [\mathrm{N}] \qquad (9.2.3.1)$$

where:
F – towing force, [N];
P_e – total rated output of tug's main engines (at propeller cone), [kW];
C = 1.25 for tugs with fixed pitch propellers;
C = 1.65 for tugs with controllable pitch propellers;

For other types of propulsion, the value of coefficient C is subject to PRS consideration in each particular case.

If during mooring and sea trials the towing force is found greater than that determined by calculations or the prototype tests, PRS may require strengthening of the towing equipment components or power reduction during towing operations.

Breaking force of the rope for towing on the hook shall not be less than $3F$ and the rope length shall not be less than 150 m. In justified cases that length may be reduced subject to PRS consent in each particular case.

9.2.3.2 All the towing equipment components carrying loads (such as the towing hook, towing rail, etc.), as well as their fixing to the ship's hull shall be checked by calculations for transmitting the towing rope breaking force. Equivalent stresses in these components shall not exceed 0.95 times the yield stress of the material used.

9.2.3.3 It is recommended that the towing hook be calculated as a curvilinear bar. Where formulae for rectilinear bars are used, the permissible stresses shall be reduced by 35%.

9.2.3.4 No part of the towing equipment subjected to tension or bending due to the pull of the towing rope shall be made of cast iron.

9.2.3.5 The towing hook shall be made as a solid wholly forged piece or rolled steel subsequently forged. The material for the hook shall be selected in accordance with the requirements specified in *Part IX – Materials and Welding*, of the *Rules for Classification and Construction of Sea-going Ships*, and its yield stress R_e shall not be less than 530 MPa.

9.2.3.6 Towing hooks shall be of a slip-type and are to have a device releasing the towing rope, operating efficiently within the range of loads on the towing hook from zero to three times the rated towing force and at any possible deflection of the towing rope from the centre plane of the ship. The device shall be controlled both from a place located in the vicinity of the towing hook and from the navigation bridge. Where the ship is fitted with a redundant towing hook, the above mentioned requirements do not apply to the redundant towing hook.

9.2.3.7 Towing hook shall be provided with shock absorbers effective up to the ultimate load not less than 1.3 times the rated towing force. On tugs intended for navigation in operating area III which are fitted with main engines having total rated output less than 221 kW, towing hooks need not be provided with shock absorbers.

9.2.3.8 The arrangement protecting the towing hook against overloading shall be calculated for a breaking load not exceeding three times the rated towing force.

9.2.3.9 Prior to installation on board the ship, the towing hook shall be tested with a proof load equal to twice the rated towing force.

9.2.4 Towing Arches

9.2.4.1 In the after part of tug, towing arches shall be fitted. Their shape shall be similar to a parabola. The towing arches shall be made of tubes or another suitable sections.

9.2.4.2 Sectional modulus of the towing arch shall not be less than the value determined in accordance with the following formula:

$$W = 0.00343\frac{d^2 Ll}{R_e} \quad [\text{cm}^3] \tag{9.2.4.2}$$

where:
d – diameter of the towing wire rope, [mm];
L – length of the towing rope used with towing hook, [m], not less however than 150 m;
l – maximum distance between struts or between a strut and the bulwark;
R_e – yield stress of the arch material, [MPa].

9.2.4.3 Cross-sectional area of each branch of trestle type strut shall not be less than the value determined in accordance with the following formula:

$$f = 0.00294\frac{d^2 L}{R_e} \quad [\text{cm}^2] \tag{9.2.4.3}$$

where:
R_e – yield stress of the arch material, [MPa].
d, l – see paragraph 9.2.4.2.

9.2.4.4 Towing rope stopper and its fixing elements shall be so selected that their breaking force be at least twice the rated towing force.

9.2.4.5 While determining the fixing location of both towing hook and towing winch, the requirements specified in *Part IV – Stability and Freeboard* shall be taken into account.

9.3 Fishing Boats

9.3.1 Anchoring Equipment

9.3.1.1 Anchoring equipment for all ships shall be selected taking account of the equipment number determined in accordance with 1.6.1 using the data from Table 9.3.1.1.

Table 9.3.1.1

Equipment number, *Nc*, not exceeding	Bower anchor		Bower anchor chains (studless, grade 2)	
	number	mass of anchor, [kg]	total length of both chains, [m]	nominal size [mm]
15	2	30	55	10 × 28
20	2	40	55	10 × 28
25	2	50	82	10 × 28
30	2	70	137	10 × 28
40	2	80	165	10 × 28
50	2	100	192	10 x 28
*				

* for greater values of the equipment number Table 3.1.2 shall be used after N_C index determined for a fishing boat has been increased by 10.

Note: If the equipment number takes an intermediate value with respect to those specified in the table, the equipment shall be selected for the greater value of N_C, except for the anchor masses possible to be determined by linear interpolation.

9.3.1.2 Fishing boats less than 17 m in length may be provided with one anchor only on condition that the mass of such an anchor is not less than double mass of anchor determined in accordance with 9.3.1.1. In that case the anchor shall be fitted in the forebody on the uppermost deck together with the anchor dropping device.

9.3.1.3 Anchors of a mass 150 kg and above shall be provided with hawse pipes, slides or similar arrangements for immediate and safe anchoring operations.

Where a fishing boat is provided with two anchors each of a mass more than 150 kg but less than 300 kg, one of those anchors need not be provided with such an arrangement. In the voyage position anchors shall be secured by means of locks or stays.

9.3.1.4 Steel wire ropes may be substituted for anchor chains provided that:

.1 on fishing boats less than 17 m in length steel wire ropes may be substituted for both anchor chains unless the breaking force of each rope is less than that of a corresponding chain;

.2 on fishing boats not less than 17 m in length a steel wire rope may be substituted for one anchor chain unless the breaking force of such a rope is less than that of a corresponding chain if the other anchor is provided with a chain in accordance with the requirements specified in 9.3.1.1;

.3 the length of such a steel wire rope shall not be less than 1.5 times the length of chain required in paragraph 9.3.1.1. The length of such a steel wire rope may be reduced by the length of segment mentioned in .4 below;

.4 a chain segment shall be connected to the steel wire rope by means of shackle to forms an anchor span of minimum 12.5 m in length and diameter in accordance with the requirements for anchor chains specified in paragraph 9.3.1.1. The shackle shall have the same strength as the respective steel wire rope.

9.3.1.5 On fishing boats whose equipment number does not exceed 80, natural fibre or synthetic fibre ropes complying with the requirements specified in 9.3.1.4, exclusive of sub-paragraphs .1 and .3, may be substituted for steel wire ropes mentioned in 9.3.1.4.

The natural fibre or synthetic fibre rope shall have a length equal to that of chain determined in accordance with 9.3.1.1 and shall be connected to the chain segment of the anchor span as specified in 9.3.1.4.4.

9.3.1.6 If the fishing boat is provided with a warp complying with all the *Rules* requirements in respect of the structure, strength and length of steel wire ropes, such a warp may be permitted to be used as and

anchor line. The use of warp for that purpose shall not have an adverse effect on the time and safety of anchoring operation and on the boat holding at anchor in all predictable navigating conditions.

9.3.1.7 Anchor chain shall not be led forewords to the hawse pipe, slide or similar arrangement without the use of cable lifter. Where steel wire rope is used, it shall pass on the guide roller situated in way of the above mentioned arrangements to avoid the rope chafing.

9.3.1.8 Fishing boats having anchors more than 150 kg in mass each shall be fitted with powered windlasses with cable lifter and/or mooring drum for each anchor.

9.3.1.9 PRS may permit the use of trawl winch serving the rope mentioned in paragraph 9.3.1.6 as a windlass provided that:

.1 trawl winch is fitted with cable lifter and/or mooring drum for each anchor as well as arrangements to disengage each cable lifter and mooring drum;

.2 trawl line may be reeled on the drum fitted with a brake which is not serving trawl lines being used for fishing at the particular time;

.3 fishing boat is fitted with such arrangements as pulley blocks and guide rollers to protect the trawl line from chafing against superstructures, deck plating and deck equipment.

9.3.2 Mooring Equipment

9.3.2.1 Mooring ropes for fishing boats shall be selected in accordance with Table 9.3.2.1 depending on the equipment number determined in accordance with formula 1.6.2.

Each fishing boat shall be provided with at least three mooring ropes. The cases where N_C exceeds the greatest value specified in Table 9.3.1.2 are subject to special consideration by PRS.

Table 9.3.2.1

Equipment number, N_C, not more than	Rope length l , [m]	Breaking load, kN]
15	30	25
20	30	25
25	40	25
30	40	25
40	50	30
50	60	30
60	60	34
70	80	34
80	100	37
90	100	37
100	110	39
110	110	39
120	110	44
130	110	44
140	120	49
150	120	49
175	120	54
205	120	59
240	120	64
280	120	69
320	140	74

Note: Where the equipment number determined in accordance with 1.6.1 takes an intermediate value in relation to those specified in the table, linear interpolation can be applied for the selection of mooring equipment.

9.3.2.2 At least one mooring bollard shall be fitted in the forebody and at least two ones in the afterbody.

9.3.2.3 Mooring bollard vertical dimension shall allow for 4 coils of rope being put below the bollard cap plate.

9.3.3 Towing Equipment

9.3.3.1 It is recommended that each fishing boat of a length $L \geq 17$m be provided with at least towing rope for the boat towage if its equipment number determined in accordance with formula 1.6.1 is greater than 50. The rope may be selected in accordance with Table 9.3.3.1. The cases where N_C exceeds the greatest value specified in Table 9.3.1.1 are subject to special consideration by PRS.

Table 9.3.3.1

Equipment number N_c ,	Rope length l , [m]	Breaking load, [kN]
$50 < N_c \leq 175$	180	98
$175 < N_c \leq 205$	180	112
$205 < N_c \leq 240$	180	129
$240 < N_c \leq 280$	180	150
$280 < N_c \leq 320$	180	174

9.3.3.2 One of the trawl lines available on board may be substituted for the towing rope provided that the trawl line has a similar length and breaking load. In that case a segment of rope at least 12.5 m in length and breaking load corresponding to the value specified in Table 9.3.3.1 for the fishing boat equipment number shall be connected to the trawl line.

9.3.4 Height of Cargo Hatch Coamings

Coaming height of cargo hatches situated on the open deck shall not be less than 300 mm.

9.3.5 Sidescuttles

9.3.5.1 Sidescuttles situated less than 1000 mm above the line mentioned in 7.2.2 shall be of the non-opening type.

9.3.5.2 Lower edge of the sidescuttle opening shall be situated at least 500 mm above the line mentioned in 7.2.2.

9.3.6 Portable Partitions in Fish Holds

9.3.6.1 For the components of typical partitions oriented fore-and-aft[1], it is recommended that the following formulae be used:

.1 construction with vertical steel studs and horizontal timber panels:
minimum sectional modulus of vertical steel studs

$$W_1 = 4\rho sbh^2 \quad [\text{cm}^3] \qquad (9.3.6.1.1\text{-}1)$$

minimum thickness of horizontal timber panels

$$t = \sqrt{8\rho sb^2} \quad [\text{cm}] \qquad (9.3.6.1.1\text{-}2)$$

.2 construction with horizontal steel beams and vertical timber panels:
minimum sectional modulus of horizontal steel beams

$$W_2 = 4\rho sHS^2 \quad [\text{cm}^3] \qquad (9.3.6.1.2\text{-}1)$$

minimum thickness of vertical timber panels

$$t = \sqrt{3.6\rho sh^2} \quad [\text{cm}] \qquad (9.3.6.1.2\text{-}2)$$

[1] For divisions oriented athwartships in formulae 9.3.6.1.1-2, 9.3.6.1.2-1 and 9.3.6.1.2-2, *b* shall be substituted for *s* and *s* shall be substituted for *b*. See also Fig. 9.3.6.1-1 and Fig. 9.3.6.1-2.

where:

ρ – mass density of cargo (fish crop), [t/ m^3];
s – maximum distance between any adjacent longitudinal partitions measured athwartships, [m];
h – maximum vertical span of stud taken as the fish hold depth, [m];
b – maximum distance between any adjacent transverse partitions or stud rows, [m];
H – vertical span of partition supported by horizontal beam, [m];
S – horizontal distance between adjacent supports of horizontal beam, [m].

9.3.6.2 Partition dimensions determined in accordance with the formula specified in paragraph 9.3.6.1 may be reduced in the following cases:

.1 where it is expected that the partition is always subjected to loads on both sides (the above mentioned formulae are based on the assumption that the load is exerted on one side only);
.2 where steel studs are permanently fixed to the hull construction;
.3 where unsupported span in formula 9.3.6.1.2-2 is lesser than the whole depth of hold, the reduced span may be taken for calculations;
.4 for panels made of good quality hard timber their thickness may be reduced by 12.5%.

9.3.6.3 Partitions made of other materials than steel or timber shall have equivalent strength and stiffness characteristics.

9.3.6.4 Grooves in studs for panel shall not have depth less than 4 cm and their width shall be greater than the panel thickness by 0.5 cm.

9.3.6.5 Each panel shall have such a length that the sum of clearances in the stud grooves does not exceed 1 cm.

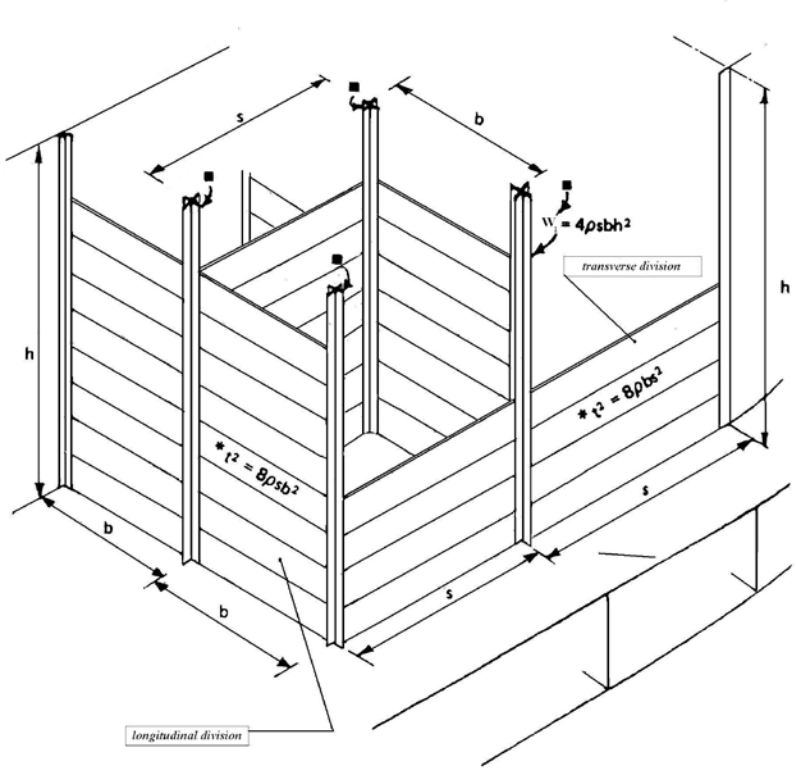


Fig. 9.3.6.1-1

* Where longitudinal panels may be substituted for transverse ones and vice versa, *b* is equal to *s* and the thickness determined in accordance with any formula contained in sub-chapter 9.3.6 will be the same. If, for any reason, it is required that the panels have the same thickness but variable span, the greater thickness shall be taken for all the panels. Sectional modulus of all the studs shall remain unchanged.

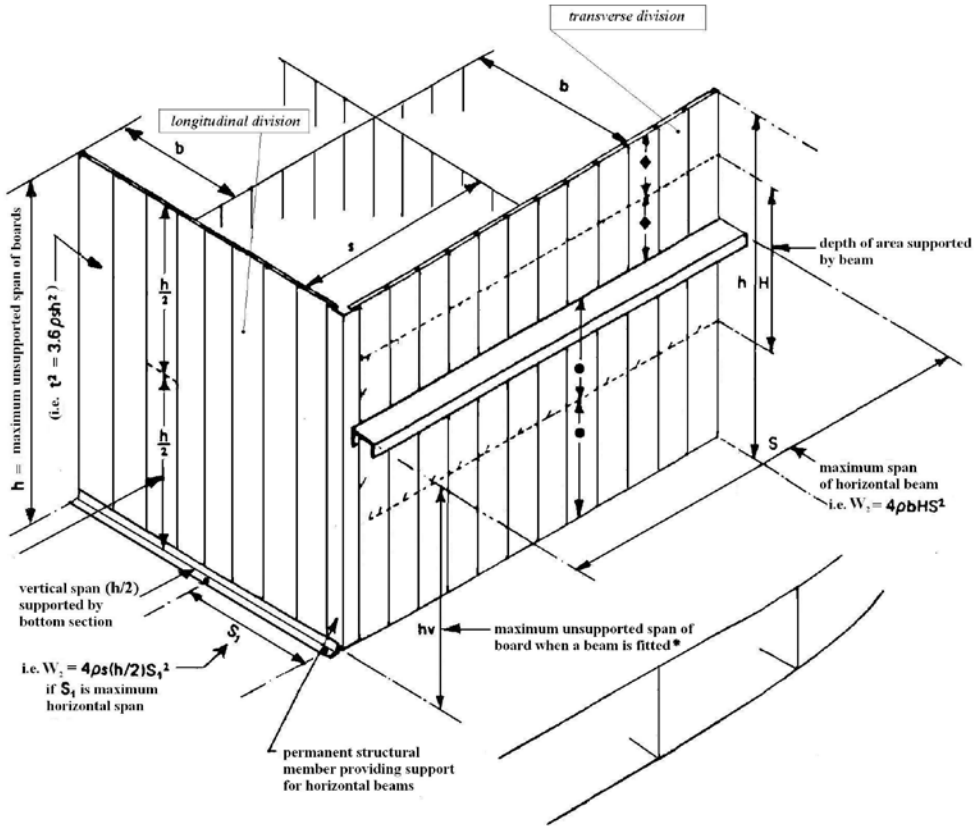


Fig. 9.3.6.1-2

* Unless a horizontal beam is used, the thickness of vertical timber panels shall be determined in accordance with the following formula: $t^2 = 3{,}6\rho bh^2$. The maximum span of beam is reduced to h_v, and the panel thickness shall be determined in accordance with the following formula: $t_1^2 = 3{,}6\rho bh_v^2$ or $t_1 = t\left(\frac{h_v}{h}\right)$

SUPPLEMENT – RETROACTIVE REQUIREMENTS

1 GENERAL REQUIREMENTS

1.1 The requirements of this Supplement apply to existing ships, irrespective of their date of construction, unless any paragraph of the Supplement states otherwise.

1.2 Fulfilling applicable retroactive requirements is confirmed by the PRS Surveyor in the report of the next ship survey, falling after the required date of the requirement fulfilling.

2 SPECIFICATION OF REQUIREMENTS

2.1 Exemptions to existing passenger ships

The existing passenger ships constructed or converted before 31 December 2005, and engaged only in domestic voyages consisting in short excursion cruises during the day, are exempted from the requirement of fitting an additional ruder angle indicator in the steering gear room, on the assumption that a standard indicator is installed on the rudder stock or its quadrant and that the emergency tiller is properly marked in its fitting place.

List of amendments effective as of 20 March 2019

Item	*Title/Subject*	*Source*
1.4.3	Paragraph 1.4.3 has been supplemented	PRS
7.2	Paragraph 7.2.7 has been added	PRS