Polski Rejestr Statków

RULES
FOR THE CLASSIFICATION AND CONSTRUCTION OF INLAND WATERWAYS VESSELS

PART III

HULL EQUIPMENT

2017

January

GDAŃSK

RULES FOR THE CLASSIFICATION AND CONSTRUCTION OF INLAND WATERWAYS VESSELS developed and edited by Polski Rejestr Statków S.A., 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 Equipment and Automation.

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

Part III – Hull Equipment – January 2017, was approved by PRS Executive Board on 28 December 2016 and comes into force on 1 January 2017.

Upon the entry into force of this *Part III*, its requirements specified in the Rules apply to new vessels in the full scope.

For the existing vessels, the requirements specified in the *Rules* being in force during their construction remain in force, unless the subsequent editions of the *Rules* or amendments thereto provide otherwise.

The requirements of *Part III – Hull Equipment* are extended and supplemented by the following publications:

Publication No. 27/P – Navigability and Manoeuvrability Tests of Inland Waterway Vessels and Convoys
Publication No. 76/P – Stability, Subdivision and Freeboard of Passenger Ships Engaged on Domestic Voyages
Publication No 91/P – Inland Waterways Passenger Sailing Vessels
Publication No 92/P – Specific Requirements for Inland Waterways High-speed Vessels
Publication No. 15/I – Division of European Inland Waterways into Operating Areas.

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1 GENERAL

1.1 Application

1.1.1 The requirements specified in *Part III – Hull Equipment* apply to the hull equipment of vessels specified in paragraph 1.1.1 of *Part I – Classification Regulations*.

1.1.2 This *Part* of the *Rules for the Classification and Construction of Inland Waterway Vessels* (hereinafter referred to as the *Rules*) contains the basic requirements as well as additional requirements. Fulfilment of the basic requirements (chapters 1 to 13) – in their applicable scope – is necessary for the assignment of the main symbol of class.

To obtain additional marks in the symbol of class – associated with the vessel's intended service – it is necessary to fulfil additional requirements of Chapter 15 – for passenger vessels, and Chapter 16 – for vessels intended for the carriage of dangerous goods. Additionally, specific requirements for pushers are specified in Chapter 6, whereas for tugs – in Chapter 7.

1.1.3 Additional requirements for inland waterways passenger sailing vessels are specified in *Publication No 91/P – Inland Waterways Passenger Sailing Vessels*.

1.1.4 Additional requirements for high-speed vessels are specified in *Publication No 92/P – Specific Requirements for Inland Waterways High-speed Vessels.*

1.1.5 Chapters 2, 3, 8 and 13, and sub-chapters 5.2 and 10.1 are not applicable to lighters without steering system, accommodation, engine or boiler rooms.

1.2 Definitions

General terminology definitions are contained in *Part I – Classification Regulations.*

In sub-chapter 1.2, definitions and symbols used in *Part III* are given. Where terms defined in other *Parts* of the *Rules* are used in the text of *Part III*, reference is made to those *Parts*.

1.2.1 Assemblies of Craft and Types of Craft

Convoy – group of properly assembled craft: vessels[1], floating equipment or floating establishments without their own propulsion and a self-propelled vessel providing power for propelling the group; this may be a towed convoy, pushed convoy or side-by-side formation.

Floating equipment – floating installation carrying working gear such as cranes, dredging equipment, pile drivers or elevators.

Pushed convoy – rigid assembly of craft of which at least one is positioned in front of the craft providing power for propelling the convoy, known as the 'pusher'; a convoy composed of a pusher and at least one pushed craft coupled so as to permit guided articulation is also considered as rigid.

Rigid convoy – pushed convoy or side-by-side formation.

Ship's boat – boat for use in transport, rescue, salvage and work duties.

Side-by-side formation – assembly of craft coupled rigidly side by side, none of which is positioned in front of or behind the craft propelling the assembly.

Towed convoy – assembly of one or more craft connected with tow lines where a tug provides the power for propelling the convoy.

Worksite craft – vessel, appropriately built and equipped for use at worksites, such as a reclamation barge, hopper or pontoon barge, pontoon or stone-dumping vessel.

1.2.2 Areas and Spaces

Accommodation spaces – spaces intended for the use of the crew and spaces intended for the use of passengers, such as overnight cabins for passengers, overnight cabins for the crew, public spaces,

[1] In this sub-chapter, the term „vessel" also includes the idea of „barge".

galleys[1], storage space for provisions, toilets and laundry facilities, including staircases and corridors serving these spaces; the wheelhouse is not included in this category.

Cargo spaces of tankers – see ADN Annex B.2, Part I.

Control centres – wheelhouses, areas which contain emergency electrical power plants (including emergency power supply batteries) as well as compartments containing actuators of fire-extinguishing systems, receiver controls of the fire detection and fire alarm systems, remote controls of doors or fire dampers.

Crew spaces – spaces intended for the use of persons normally living on board, including galleys, storage space for provisions, toilets and washing facilities, laundry facilities, ante-rooms and passageways, but not the wheelhouse.

Enclosed superstructure – watertight, rigid, continuous structure with rigid walls joined to the deck in a permanent and watertight manner.

Evacuation area – part of muster areas of the vessel from which evacuation of persons can be performed.

Galley – room with a stove or a similar cooking appliance.

Hold – part of the vessel, bounded fore and aft by bulkheads, opened or closed by means of hatch covers, intended for the carriage of goods, whether packaged or in bulk, or for housing tanks not forming part of the hull.

Muster areas – areas of the vessel which are specially protected and in which persons muster in the event of danger.

Passenger areas – areas on board (on the open deck) intended for passengers, accommodation spaces and enclosed areas for passengers such as lounges, offices, shops, hairdressing salons, drying rooms, laundries, saunas, toilets, washrooms, passageways, connecting passages and stairs not encapsulated by walls.

Safe area – the area which is externally bounded by a vertical surface running at a distance of 1/5 B_{WL} parallel to the course of the hull in the line of maximum draught.

Service spaces – spaces available during the vessel's service (which are not a part of accommodation spaces, control stations, holds, or machinery spaces) as well as corridors and staircases serving these spaces.[2]

Store room – room for the storage of flammable liquids or a room with a floor area of over 4 m^2 for storing supplies.

Wheelhouse – area which houses all the control and monitoring instruments necessary for manoeuvring the vessel.

Working station – an area where members of the crew carry out their duties, including gangway, derrick and ship's boat.

1.2.3 Marine Engineering Terms

Spray-proofness (or weathertightness) – term pertaining to closing appliances or covers of openings in the deck or superstructures which means that water will not penetrate through these openings in normal weather conditions in the relevant operating area; negligible quantity of water is, however, allowed.

Length, L – maximum length of the hull, excluding rudder, bowsprit and fenders, [m].

Length overall, L_C – maximum length of the craft in m, including all fixed installations such as parts of the steering system or power plant, mechanical or similar devices, [m].

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[1] In passenger vessels, galley is not considered as accommodation space.

[2] Definition of that term in *Part V* of the *Rules* differs from this one for practical reasons.

Length of hull, L_K – dimension equivalent to length L in accordance with sub-chapter 1.2 of *Part II – Hull,* [m].

Length of waterline, L_{WL} – length of hull measured at the maximum draught, [m].

Gastightness – term pertaining to closing appliances of openings which means that gas of the specific pressure will not penetrate through these openings. The space closing appliance is considered gastight if the pressure does not drop by more than 130 Pa within 10 minutes after pressurising the space to 1500 Pa.

Bulkhead – vertical wall of a specific height partitioning the vessel and bounded by the bottom of the vessel, shell plating or other bulkheads.

Transverse bulkhead – bulkhead extending from one side of the vessel to the other.

Margin line – an imaginary line drawn on the side plating not less than 10 cm below the bulkhead deck and not less than 10 cm below the lowest non-watertight point of the side plating. If there is no bulkhead deck, a line drawn not less than 10 cm below the lowest line up to which the outer plating is watertight shall be used.

Displacement, Δ – total weight of the vessel, inclusive of cargo, [t].

Water displacement, ∇ – immersed volume of the vessel, [m^3].

Forward perpendicular – vertical line at the forward point of the intersection of the fore side of the stem with the maximum draught line. For vessels with unconventional stem curvature, the position of the forward perpendicular is subject to PRS consent in each particular case.

Bulkhead deck – the uppermost deck up to which transverse watertight bulkheads are taken.

Windage area, F_w – area of the projection of the above-water part of vessel onto $x – z$ plane; for openwork elements, the windage area is taken as the area of the particular element outline projection onto $x – z$ plane multiplied by the filling factor.

Weathertightness – the term pertaining to closing appliances of openings in the above water part of a vessel, which means that in any weather condition water will not penetrate through these openings. 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.

Moulded breadth, B_K – dimension equivalent of breadth B as defined in sub-chapter 1.2 of *Part II – Hull*, [m].

Breadth, B – maximum breadth of hull, measured to the outer edge of the frames in vessels with metal shell plating or between the outer surfaces of hull in vessels with non-metallic shell plating, [m].

Breadth overall, B_{OA} – maximum breadth of craft including all fixed equipment such as paddle wheels, rub rails, mechanical devices and the like, [m].

Breadth on waterline, B_{WL} – maximum breadth of hull measured from the outside of the steel side shell plating at the maximum draught line, [m].

Wall – dividing surface, usually vertical.

Partition wall – a non-watertight wall.

Plane of maximum draught – water plane corresponding to the maximum draught at which the craft is authorised to navigate.

Watertightness – term pertaining to closing of openings, which means that water will not penetrate through these openings under a design head. Unless expressly provided otherwise, 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.

Freeboard – distance measured vertically between the plane of maximum draught and a parallel plane passing through the lowest point of the upper edge of deck, [mm].

Clearance in width – width of clear opening (manhole, passageway, etc.), [m].

Clear width of side deck – distance between the vertical line passing through the most prominent part of the hatch coaming, superstructure or deckhouse on the side deck side and the vertical line, at the same frame section, passing through the inside edge of the slip guard (guard-rail, foot rail) on the outer side of the side deck, [m].

Clearance in height – height of clear space, [m].

Block coefficient – ratio determined in accordance with the following formula:

$$\delta = \frac{\nabla}{L_{WL} B_{WL} T}$$

Safety clearance – minimum distance, measured vertically, between the plane of maximum draught and the parallel plane passing through the lowest point above which the vessel is no longer deemed to be watertight, [mm].

Moulded depth, H – the shortest vertical distance between the lowest point of the hull or keel and the lowest point of the deck on the side of the vessel, [m].

Moulded depth of hull, H_K – dimension equivalent of moulded depth H as defined in sub-chapter 1.2 of *Part II – Hull*, [m].

Moulded draught, T – the vertical distance between the lowest point of the hull without taking into account the keel or other fixed attachments and the maximum draught line, [m].

Draught, T_K – dimension equivalent of moulded draught T as defined in sub-chapter 1.2 of *Part II – Hull*, [m].

Draught overall, T_{OA} – the vertical distance between the lowest point of the hull including the keel or other fixed attachments and the maximum draught line, [m].

1.2.4 Steering System

Wheelhouse designed for radar navigation by one person – wheelhouse so arranged that, during radar navigation, the vessel can be manoeuvred by one person.

Steering gear – complex self-propelled mechanical steering arrangement for putting the rudder or steering nozzle over. The steering gear consists of an actuator enabling the rudder or the steering nozzle to be put over, a steering gear power unit, if any, means of applying torque to the rudder stock (e.g. tiller or quadrant) and additional equipment.

Rudder manual drive – simple arrangement (tiller, geared steering wheel with ropes, etc.) whose manual operation moves the rudder stock by means of mechanical transmission.

Steering gear drive – arrangement, usually a hydraulic one, which moves the steering gear.

Rudder – blade or nozzle together with the rudder stock, quadrant/rudderpost and connecting elements.

Active rudder – self-propelled device exerting thrust under any angle to the longitudinal centre plane of the ship (as required by PRS), irrespective of the ship speed and main engine operation.

Steering gear power unit – steering gear drive including the power source and control system.

Steering system – all the equipment necessary for steering the vessel to ensure its manoeuvrability as specified in Chapter 2.

Steering control – mechanical component parts and/or installations (electrical, hydraulic) for the operation of power-drive steering control.

Power source – power generating set or battery supplying power to the steering gear drive unit and the steering control.

1.2.5 Other Definitions

Competent authorities – authorities indicated by each EU member state which take decisions about issuing the Community inland navigation certificates and shall notify the EU Commission thereof.

Inspection body – inspection body appointed by the EU member states and consisting of a chairman and experts: an official from the Administration that is responsible for inland navigation, an expert on the design of inland waterways vessels and their engines, a nautical expert in possession of a navigation certificate.

Persons with reduced mobility – anyone who, as a result of physical impairments, cannot move or distinguish their surroundings in the same way as other passengers. This definition includes the handicapped, persons with impaired eyesight or hearing, persons on wheelchairs, pregnant women, persons accompanying children in buggies or being carried, the elderly. However, persons with reduced mobility do not include anyone with mental impairments.

1.3 Scope of Survey

1.3.1 The scope of survey of the hull equipment results from the general survey regulations specified in *Part I – Classification Regulations*.

1.3.2 The following are subject to PRS survey during manufacture:

.1 anchors of 75 kg in mass or more,
.2 chain cables of 13 mm or more in nominal diameter and chain accessories (shackles, joining shackles, swivels etc.),
.3 towing hooks for a pull of 10 kN and over,
.4 steel wire ropes of 6 mm or more in diameter,
.5 natural fibre ropes of 14 mm or more in diameter,
.6 synthetic fibre ropes,
.7 container securing devices,
.8 side and flush scuttles,
.9 anchor and mooring stoppers,
.10 mooring and towing bollards, fairleads and other loaded equipment components attached to the hull structure.

1.3.3 Products whose dimensions, weight or pull are smaller than those above mentioned 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. The documentation concerning such products shall be submitted to PRS on request for reference.

1.3.4 PRS survey of the manufacture of products mentioned in 1.3.2.9 and 1.3.2.10 is limited to the approval of the relevant technical documentation.

1.3.5 Prior to the commencement of the manufacture of products mentioned in paragraph 1.3.2, the following documentation shall be submitted to PRS for approval/consideration:

.1 assembly drawing,
.2 calculations (for reference),
.3 drawings of assemblies and parts if they are not manufactured in accordance with standards and specifications previously agreed with PRS.

1.3.6 Components of the appliances and equipment specified in Table 1.3.6 are subject to PRS inspection during the production for compliance with the requirements as well as the agreed and approved technical documentation.

Table 1.3.6

Item	Specification	Material
1	Stocks of rudders and steering nozzles	steel forgings, steel castings, rolled steel *)
2	Rudder blades and their components	rolled steel, steel forgings, steel castings
3	Rudder and steering nozzle pintles	steel forgings, steel castings, rolled steel
4	Towing hooks for pull of 10 kN and over and elements connecting them to the ship hull	steel forgings, rolled steel
5	Watertight doors	steel forgings, steel castings, rolled steel
6	Anchors	steel forgings, steel castings, rolled steel
7	Anchor chains	rod iron, steel forgings

*) For a rudder stock of rolled steel, procedure for the coupling flange welding to the rudder stock shall be agreed on with PRS.

1.3.7 During the vessel construction, the following appliances and equipment are subject to PRS survey:

.1 steering system,
.2 anchoring arrangements,
.3 mooring arrangements,
.4 coupling arrangements of pushed convoys,
.5 towing arrangements,
.6 equipment and closing appliances in the hull, superstructures and deckhouses,
.7 container securing devices,
.8 guardrails, bulwarks and flying bridges.

1.4 Documentation Required

1.4.1 Classification Documentation of a New Ship

1.4.1.1 Prior to commencement of the construction of a new ship, the following documentation shall be submitted to PRS Head Office, in triplicate, for consideration and approval:

– rudder gear documentation,
– anchor gear documentation,
– documentation of mooring equipment,
– documentation of coupling arrangements for pushed convoys together with the plan showing possible configurations of the convoy,
– documentation of towing equipment,
– documentation of the equipment and closures of openings in hull, superstructures, deckhouses,
– documentation of securing devices for containers and large-size cargoes together with their stowage arrangement plan, their weights, allowable deck load, etc.,
– arrangement plan of accommodation, service spaces and areas fulfilling the specific safety requirements of persons with reduced mobility, including exits, doors, corridors, stairways and ladders, as well as plan of railings, bulwarks and gangways on open decks, including structural details, and plan of wooden hold paneling;
– visibility plan, including all needed information to enable the verification of the requirements of Chapter 8.

1.4.1.2 The documentation mentioned in paragraph 1.4.1.1 shall contain:

– assembly drawing,
– calculations,
– drawings of assemblies and parts if they are not manufactured in accordance with standards,
– test programme.

1.4.2 Classification Documentation of Vessel under Alteration

Prior to the commencement of the vessel's alteration, the documentation of the vessel's equipment subject to alteration as well as the alteration description shall be submitted to PRS Head Office for consideration and approval.

1.4.3 Workshop Documentation of Vessel

After the classification documentation has been approved by PRS Head Office, the following workshop documentation shall be submitted to the relevant PRS Branch Office or Survey Station for consideration and agreement:

– drawings of local strengthening arrangements under gear and machinery not shown in classification documentation,
– specification, drawings and test programme for innovatory engineering processes, design solutions and materials applied.

2 MANOEUVRABILITY CHARACTERISTICS

2.1 General

2.1.1 Vessels and convoys shall fulfill the requirements of paragraphs 2.2 to 2.7 and *Publication No 27/P – Navigability and Manoeuvrability Tests of Inland Waterway Vessels and Convoys*.

2.1.2 Unpowered vessels intended to be towed shall meet the specific requirements laid down by the inspection body.

2.1.3 Navigability and manoeuvrability shall be verified during trials which shall be carried out according to the requirements in *Publication No 27/P – Navigability and Manoeuvrability Tests of Inland Waterway Vessels and Convoys*. The inspection body may waive all or part of the trial where compliance with the navigability and manoeuvrability requirements is proven in another manner.

2.1.4 The navigation tests shall be carried out on areas of inland waterways that have been designed by the competent authority.

Those test areas shall be situated on a stretch of flowing or standing water that is if possible straight, at least 2 km long and sufficiently wide and is equipped with highly-distinctive marks for determining the position of the vessel.

It shall be possible for the inspection body to plot the hydrological data such as depth of water, width of navigable channel and average speed of the current in the navigation area as a function of the various water levels.

2.1.5 During navigation tests, vessels and convoys intended to carry goods shall be loaded to at least 70% of their tonnage and the loads shall be distributed in such a way as to ensure a horizontal attitude as far as possible. If the tests are carried out with a lesser load, the approval for downstream navigation shall be restricted to that loading**.**

2.1.6 During the navigation tests, all of the following equipment which may be actuated from the wheelhouse: main rudders, flanking rudders, bow rudders, bow thrusters and other types of steering gear may be used, but not anchors.

However, during the test involving turning into the current referred to in paragraph 2.6, bow anchors may be used.

2.2 Prescribed Forward Speed

2.2.1 Vessels and convoys shall achieve a speed in relation to the water of at least 13 km/h. That condition is not mandatory where pusher tugs are operating solo.

2.2.2 The inspection body may grant exemptions to vessels and convoys operating solely in estuaries and ports.

2.2.3 The inspection body shall check if the unladed vessel is capable of exceeding a speed of 40 km/h in relation to water. If this can be confirmed, the following entry shall be made in item 52 of the Community Certificate:

The vessel is capable of exceeding a speed of 40 km/h in relation to water.

2.3 Stopping Capacity

2.3.1 Vessels and convoys shall be able to stop facing downstream in good time while remaining adequately manoeuvrable**.**

2.3.2 Where vessels and convoys are not longer than 86 m and not wider than 22.90 m the stopping capacity test may be replaced by turning capacity test.

2.3.3 The stopping capacity shall be proved by means of stopping manoeuvres carried out within a test area as referred to in paragraph 2.1.4 and the turning capacity by turning manoeuvres in accordance with paragraph 2.6.

2.4 Capacity for Going Astern

2.4.1 Where the stopping manoeuvre required by paragraph 2.3 is carried out in standing water, it shall be followed by a navigation test while going astern.

2.5 Capacity for Taking Evasive Action

2.5.1 Vessels and convoys shall be able to take evasive action in good time and that capacity shall be proven by means of evasive manoeuvres carried out within a test area as referred to in paragraph 2.1.4.

2.6 Turning Capacity

2.6.1 Vessels and convoys not exceeding 86 m in length or 22.90 m in breadth shall be able to turn in good time.

2.6.2 Turning capacity test may be replaced by the stopping capacity test referred to in paragraph 2.3.

2.6.3 Turning capacity shall be proven by means of turning manoeuvres against current.

2.7 Rate-of-turn Indicator

2.7.1 A rate-of-turn indicator shall be on board.

2.7.2 The rate-of-turn indicator shall be of a type that has been approved by the compartment authority. The requirements concerning installation and operational testing of rate-of-turn indicator, as laid down in *Annex IX*, part IV to *EU Council Directive 2006/87/EC*, as amended, shall be met.

2.7.3 The rate-of-turn indicator shall be located ahead of the helmsman and within his field of vision.

3 STEERING SYSTEMS

3.1 General Requirements

3.1.1 All vessels, except for pushed barges, floating equipment and floating establishments permanently used at berth or on mooring anchors, shall be fitted with a reliable steering system which provides at least the manoeuvrability required in Chapter 2.

3.1.2 The requirements specified in Chapter 3 apply to underhung rudders and supported rudders with a single rudder blade having a profile typical for such solutions or a steering nozzle and they also apply to the steering gear drive. Steering systems of another construction than specified in this paragraph are subject to special consideration by PRS.

3.1.3 Steering system shall permanently ensure the vessel manoeuvrability under normal service conditions in the intended operating area also in the event of damage to the main propulsion or essential power source.

3.1.4 Steering system as a whole shall be designed for service in the following conditions:
– permanent lists of up to 15°,
– trim of up to 5°,
– ambient temperatures from –20°C to +50°C.

3.1.5 Component parts of the steering system shall be rugged enough to always be able to withstand the stresses to which they may be subjected during normal operation. No external forces applied to the rudder shall impair the operating capacity of the steering apparatus and its drive unit.

Steering system shall incorporate a powered drive unit if so required by the forces needed to actuate the rudder.

3.1.6 Penetrations for the rudder stocks shall be so designed as to prevent the spread of water-polluting lubricants.

3.1.7 Rudders shall be situated above the base plane. Otherwise, rudders shall always be protected from mechanical damage resulting from hitting the bottom of a water body.

3.1.8 Steering system of vessels intended to be assigned additional mark **L1** in the symbol of class require additional ice strengthening in accordance with the requirements specified in *Part II – Hull*.

3.1.9 Steering systems of ice-breakers are subject to PRS consideration in each particular case.

The ice pressure to the ice belt plating in the aft region, acting on the part of the ruder blade area is considered as a load to steering gear.

3.1.10 Steerageway under a vessel's own power is deemed to be sufficient if – when using the bow thruster – the vessel or the formation propelled by the vessel attains a speed of 6.5 km/h in relation to the water and a rate-of-turn of 20°/min can be induced and maintained while under way at a speed of 6.5 km/h in relation to the water.

When verifying the above minimum requirements, paragraphs 2.1.4 and 2.1.5 shall be complied with.

3.2 Steering Gear Design Loads

3.2.1 Rudder Blade Force

Rudder blade force, F, shall be determined in accordance with the following formula:

$$F = k_1 k_2 k_\alpha A v_0^2 \quad [\mathrm{N}] \tag{3.2.1-1}$$

where:
k_1 – factor taken from Table 3.2.1, depending on the rudder blade dimensions represented by index, λ, determined in accordance with the formula below:

$$\lambda = b^2 / A \tag{3.2.1-2}$$

where:
b – mean height of the rudder blade immersed part, see Fig. 3.2.1, [m],
A – rudder blade area, [m^2],

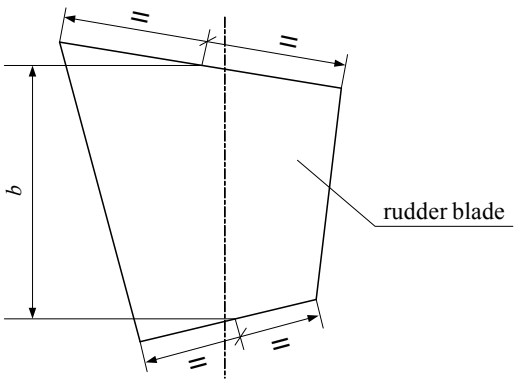


Fig. 3.2.1. Determining of the rudder blade height

Table 3.2.1
Values of factor k_1

λ	0.5	0.75	1	1.25	1.5	1.75	2	2.25	2.5	2.75	3	3.25
k_1	24.0	26.5	28.7	31.0	33.0	35.0	36.7	38.2	39.4	40.2	40.8	41.1

For intermediate values of λ, factor k_1 shall be determined by interpolation.

k_2 – factor depending on the vessel type:

$k_2 = 1.48$ for pushers and tugs with additional mark **L1** in the symbol of class;

$k_2 = 1.23$ for other vessels with additional mark **L1** in the symbol of class;

$k_2 = 1$ for other vessels.

k_α – maximum rudder angle factor:

$k_\alpha = 1$ for $\lambda \geq 1.1$

$$k_\alpha = \frac{\alpha_{\max}}{35^\circ} \text{ for } 0.5 \leq \lambda \leq 0.8 \qquad (3.2.1\text{-}3a)$$

where:

$\alpha_{\max}$ – maximum rudder angle, [°]

The value of factor k_α for $0.80 < \lambda < 1.10$ determined in accordance with the following formula:

$$k_\alpha(\lambda) = 1 + \left(\frac{\alpha_{\max}}{35^\circ} - 1\right)\frac{1.1 - \lambda}{0.3} \qquad (3.2.1\text{-}3b)$$

v_0 – design rudder streamline speed, [km/h]:

– for self-propelled vessels where the rudder blade is located in the screw current just behind the screw without nozzle

$$v_0 = 1.25 v_s \qquad (3.2.1\text{-}4a)$$

– for self-propelled vessels where rudder blade is located in screw current just behind the screw in the nozzle

$$v_0 = 1.44 v_s \qquad (3.2.1\text{-}4b)$$

where:

v_s – maximum speed of vessel, and for pushers, the maximum speed of pusher in the convoy with one typical barge shall be taken even if the pusher is designed for service with more barges, [km/h]:

– for vessels without their own propulsion

$$v_0 = v_s \qquad (3.2.1\text{-}4c)$$

– for vessels without their own propulsion where the rudder blade is in the vessel centre plane, the following formula may be used

$$v_0 = (1 - w)v_s \qquad (3.2.1\text{-}4d)$$

where:

v_s – maximum speed of the vessel towing, [km/h]

w – wake factor, provided that, however, the wake current covers the entire blade area and is considered by PRS as determined reliably.

3.2.2 Rudder Torque

3.2.2.1 Rudder Stock Torque

Rudder stock torque, M_s, for an underhung rudder or supported skegless rudder, resulting from action of rudder force F on the blade shall be determined in accordance with the following formula:

$$M_s = Fr \quad \text{[Nm]} \qquad (3.2.2.1)$$

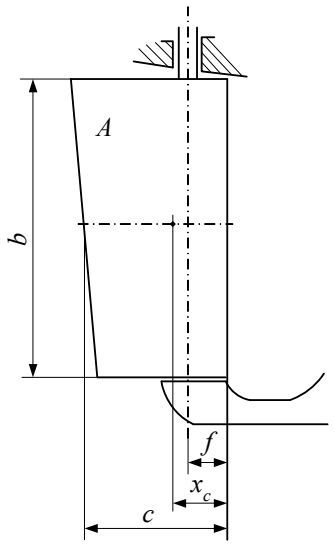
where:

F – rudder blade force determined in accordance with formula 3.2.1-1, [N];

r – rudder blade force lever, [m]:

$r = x_c - f$ where rudder rotation axis is within the blade,
$r = x_c + f$ where rudder rotation axis is ahead of the blade,
where:
x_c – horizontal distance between rudder blade force application and blade front edge in accordance with the value indicated in Fig. 3.2.2.1, [m],
$x_c = 0.3c$ for $f < 0.3c$,
$x_c = 0.25c$ for $f \geq 0.3c$,
f – horizontal distance between rudder blade rotation axis and blade front edge measured at the height of the point of rudder blade force application in accordance with Fig. 3.2.2.1, [m].

If the calculated value of r is smaller than r_{min} indicated in Fig. 3.2.2.1, then $r = r_{min}$ shall be taken for further calculations.



$$c = A / b \tag{3.2.2.1-1}$$

$$x_c = (0.25 \div 0.3)c \tag{3.2.2.1-2}$$

$$r_{min} = 0.1c \tag{3.2.2.1-3}$$

Fig. 3.2.2.1. Determining of entire rudder blade force lever

3.2.2.2 Rudder Blade Torque

Rudder blade torque at any of the rudder blade sections shall be determined in accordance with mechanics principles, depending on the application point of the rudder force and the location of rudder blade section shear centre. If there are no such calculations, the torque shall be determined in accordance with the formula:

$$M_{sp} = F_p r \quad [\text{Nm}] \tag{3.2.2.2-1}$$

where:
F_p – hydrodynamic force acting on area A_p determined in accordance with the formula below:

$$F_p = F \frac{A_p}{A} \quad [\text{N}] \tag{3.2.2.2-2}$$

where:
F, A – see sub-chapter 3.2.1;
A_p – rudder blade area below the section where rudder blade torque is being determined, [m^2],
r – lever of rudder blade force F_p (see Fig. 3.2.2.2)

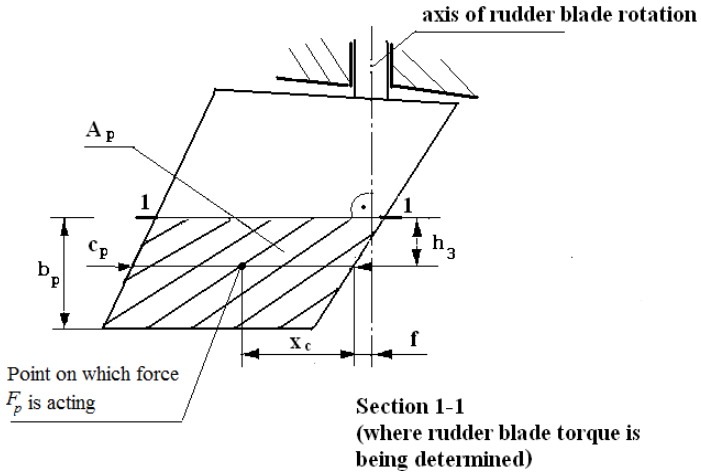


Fig. 3.2.2.2. Determining rudder blade force lever for rudder blade part

$$c_p = A_p / b_p \qquad (3.2.2.2\text{-}3)$$

$$r_{min} = 0.1\ c_p \qquad (3.2.2.2\text{-}4)$$

$$r_{max} = x_c \qquad (3.2.2.2\text{-}5)$$

$$x_c = (0.25 \div 0.3) c_p \qquad (3.2.2.2\text{-}6)$$

Note: For single plate rudders, lever r shall be taken as a distance between the axis of rudder stock and the point on which the hydrodynamic force F_p acts, but not less than r_{min}.

3.2.3 Bending Moment

3.2.3.1 Unless determined by direct calculation, bending moments for underhung and supported rudders may be calculated in accordance with formulae 3.2.3.2-1, 3.2.3.2-2, 3.2.3.3 and 3.2.3.4.

Where the rudder blade is supported by a sole piece or a rudder horn, these structures shall be included in the calculation model to consider the elastic support of rudder blade.

Where the lower support is not rigid enough due to the horizontal force, the calculation model for the underhung rudder shall be used.

3.2.3.2 For a rudder supported in three points where the lower support is of high stiffness (see Fig. 3.2.3.2), bending moments shall be determined in accordance with formulae 3.2.3.2-1 and 3.2.3.2-2, taking account of the requirements specified in paragraph 3.2.3.5.

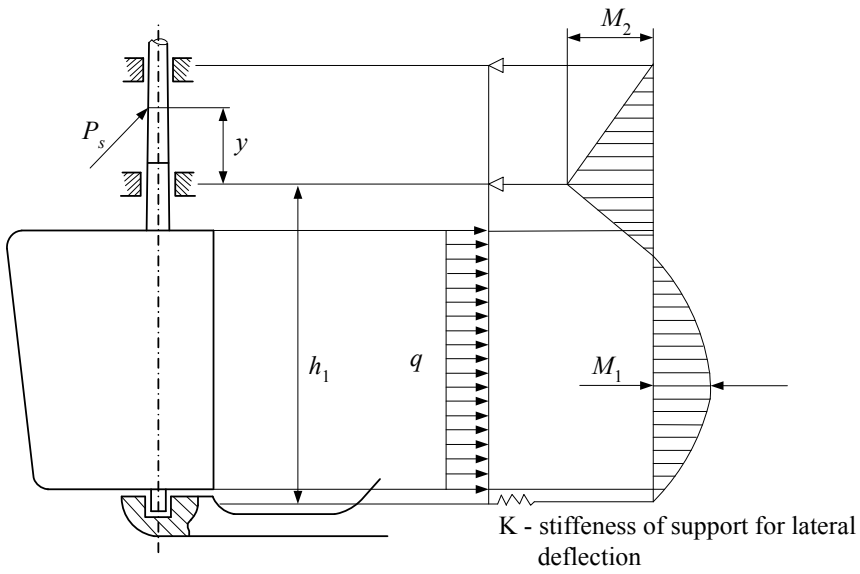


Fig. 3.2.3.2. Supported rudder

P_s – force due to rudder drive described in paragraph 3.2.3.5, neglected in the moment diagram, [N].

The maximum value of the rudder blade bending moment shall be determined in accordance with the following formula:

$$M_1 = 0.125Fh_1 \quad [\text{Nm}] \tag{3.2.3.2-1}$$

where:

F – see formula 3.2.1-1, [N],

h_1 – distance between the height centres of the lower bearing in sole piece and the upper bearing in way of the vessel bottom, [m]

Rudder stock bending moment at the height of upper bearing in way of the vessel bottom shall be determined in accordance with the following formula:

$$M_2 = \frac{Fh_1}{7} \quad [\text{Nm}] \tag{3.2.3.2-2}$$

3.2.3.3 For underhung rudder, the value of rudder stock bending moment at the height of upper bearing in way of the vessel bottom shall be determined in accordance with the following formula:

$$M_2 = Fh_2 \quad [\text{Nm}] \tag{3.2.3.3}$$

where:

h_2 – distance from the geometrical centre of rudder blade lateral projection, along the rudder stock axis, to the lower bearing centre, [m].

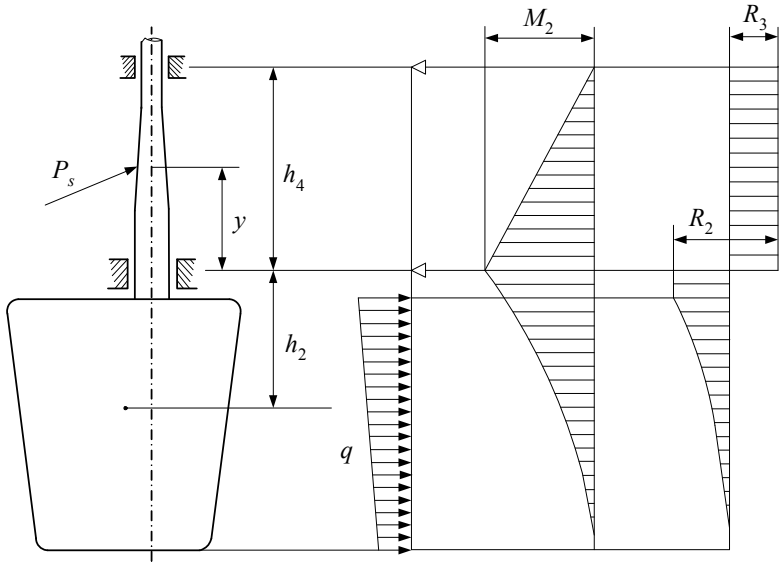


Fig. 3.2.3.3 Underhung rudder

P_s – see Fig. 3.2.3.2, neglected in diagrams of bending moments and reactive forces.

3.2.3.4 Bending moment in the underhung rudder blade at any horizontal section of the rudder blade, as shown in Fig. 3.2.2.2 shall be determined in accordance with the following formula:

$$M_3 = F_p h_3 \quad [\text{Nm}] \tag{3.2.3.4}$$

where:

F_p – see formula 3.2.2.2-2, [N],

h_3 – vertical distance from the geometric centre of area A_p to the section under consideration, [m] (see Fig. 3.2.2.2).

3.2.3.5 If steering gear contains arrangements generating forces on one side of the rudder stock (e.g. single hydraulic cylinders with tiller or rope/chain drive of the rudder stock sector), then for calculations of the rudder stock bending moments and reactive forces in the rudder stock bearings, the value of this force shall be taken into account when loads exerted by this force add up to those induced by the rudder blade force (i.e. when they increase the loads).

3.2.3.6 For rudder blades where a vertical division is applied instead of a rudder stock vertically running through the blade, shearing forces shall be taken into account in this element.

In underhung rudders, shearing force in any section is equal to the force acting on the rudder area below that section (see formula 3.2.2.2-2).

For supported rudders, when calculating moments bending the rudder stock and blade in accordance with 3.2.3.1, shearing forces shall also be determined using the model of variable stiffness beam (rudder stock with blade) supported on as many bearings as many actual rudder supports.

3.2.3.7 Reactive Forces in Rudder Stock Bearings

3.2.3.7.1 For underhung rudder, where tiller or quadrant is located between the rudder stock upper and lower bearings, reactive forces shall be determined in accordance with the following formulae (see also Fig. 3.2.3.3):

$$R_3 = \frac{Fh_2}{h_4} + P_s \frac{y}{h_4} \quad [\text{N}] \tag{3.2.3.7-1}$$

$$R_2 = F(1 + \frac{h_2}{h_4}) + P_s \frac{h_4 - y}{h_4} \quad [\text{N}] \tag{3.2.3.7-2}$$

where:

P_s – rudder stock drive hydraulic cylinder force, [N],

h_4, y – see Fig. 3.2.3.3.

The case where tiller is located above the upper bearing is subject to special consideration by PRS.

3.2.3.7.2 For supported rudder, calculations of bending the rudder stock with blade shall be performed in accordance with 3.2.3.1 inclusive of determining the reactive forces.

Force induced by the rudder drive (e.g. hydraulic cylinder) shall also be taken into account if it is not balanced by another force (e.g. exerted by the other hydraulic cylinder).

For other types of rudder blade, calculation of the reactive forces is subject to PRS consideration in each particular case.

3.3 Design Loads Acting on Steering Nozzles

3.3.1 Scope of Application

3.3.1.1 Initial design data specified in sub-chapter 3.3 apply solely to determining scantlings of steering nozzles with fixed stabilisers and cannot be used for calculation of steering nozzle gear characteristics.

3.3.1.2 Welded components of rudders shall be made of hull structural steel.

Where higher-strength steel is used, scantlings determined by the relevant requirements of this *Part* of the *Rules* may be reduced using material coefficient k (for section moduli and areas of cross-sections) or $\sqrt{k}$ (for the thicknesses of bent components, such as plating) of the following values:

k = 0.78 for R_e = 315 MPa,

k = 0.72 for R_e = 355 MPa.

Application of steel having R_e > 355 MPa is subject to PRS consent in each particular case.

3.3.1.3 When checking the steering nozzle pintles, as well as the nozzle stock bearings, the surface pressure shall not exceed the values indicated in Table 3.8.1.

3.3.2 Transverse Load

3.3.2.1 Total design load F acting on steering nozzle and stabilizer shall not be taken less than that determined in accordance with the following formula:

$$F_l = F_d + F_{st} \quad [\text{N}] \tag{3.3.2.1-1}$$

F_d – design load acting on nozzle, determined in accordance with the formula below:

$$F_d = 2.86\,pD_d l_d v_p^2 \quad [\text{N}] \qquad (3.3.2.1\text{-}2)$$

F_{st} – design load acting on stabiliser, determined in accordance with the formula below:

$$F_{st} = 2.86\,qmA_{st} v_p^2 \quad [\text{N}] \qquad (3.3.2.1\text{-}3)$$

where:

D_d – nozzle inside diameter, [m],

l_d – nozzle length, [m],

A_{st} – nozzle stabiliser area, [m^2],

v_p – speed determined in accordance with the formula below:

$$v_p = v(1-w) \quad [\text{km/h}] \qquad (3.3.2.1\text{-}4)$$

where:

v – maximum forward speed of the vessel at a draught to the summer load waterline, but for pushers and tugs the maximum speed of one-barge convoy shall be taken, [km/h],

w – mean wake factor; if reliable experimental data are unavailable, factor w shall be determined using a formula agreed with PRS, or $w = 0$ shall be taken,

p, q – factors determined in accordance with Table 3.3.2.1-1, depending on the value of propeller thrust load coefficient ξ_T and on relative nozzle length λ_d,

ξ_T shall be determined in accordance with the formula below:

$$\xi_T = 2.74 \times 10^{-3} \frac{T_s}{D^2 v_p^2} \qquad (3.3.2.1\text{-}5)$$

where:

T_s – propeller thrust at speed v, [N],

D – propeller diameter, [m],

λ_d shall be determined in accordance with the formula below:

$$\lambda_d = \frac{l_d}{D_d} \qquad (3.3.2.1\text{-}6)$$

Table 3.3.2.1-1

ξ_T	λ_d = 0.5		λ_d = 0.7		λ_d = 0.9	
	p	q	p	q	p	q
0.5	50	5.4	38	4.0	32	2.7
1	61	6.3	47	4.7	39	3.1
2	82	8.2	62	6.1	51	4.0
3	103	9.8	78	7.3	64	4.8
4	123	11.5	43	8.5	76	5.6
5	143	13.0	107	9.7	88	6.4

For intermediate values of ξ_T and λ_d, the values of p and q shall be determined by linear interpolation.

m – coefficient determined in accordance with Table 3.3.2.1-2 depending on relative aspect ratio λ_{st} of the stabilizer

λ_{st} shall be determined in accordance with the formula below:

$$\lambda_{st} = \frac{h_{st}}{l_{st}} \qquad (3.3.2.1\text{-}7)$$

where:

h_{st} – nozzle stabilizer height, [m],

l_{st} – nozzle stabilizer length, [m].

Table 3.3.2.1-2

λ_{st}	m
1	2.1
2	3.2
3	3.8
4	4.2
5	4.5

For intermediate values of λ_{st} , the values of m shall be determined by linear interpolation.

3.3.2.2 As the point of F_{st} load application, a point located on the horizontal plane passing through the longitudinal axis of the nozzle at a distance r_{st} from its leading edge shall be taken; this distance shall not be less than that determined in accordance with the following formula:

$$r_{st} = 0{,}25 l_{st} \ \text{[m]} \qquad (3.3.2.2)$$

l_{st} – see 3.3.2.1.

3.3.3 Torque

Total design torque M_l acting on a steering nozzle shall be determined in accordance with the following formula:

$$M_l = M_d - M_{st} \ \text{[Nm]} \qquad (3.3.3\text{-}1)$$

where:

M_d – design torque due to F_d load, determined in accordance with the formula below:

$$M_d = F_d\left(l_{td} - r_d\right) \ \text{[Nm]} \qquad (3.3.3\text{-}2)$$

M_{st} – design torque due to F_{st} load, determined in accordance with the formula below:

$$M_{st} = F_{st}\left(a + r_{st}\right) \ \text{[Nm]} \qquad (3.3.3\text{-}3)$$

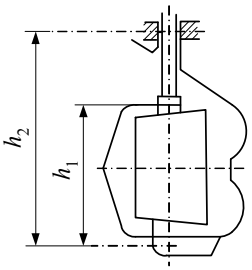
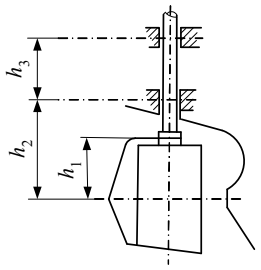
a – distance from the nozzle stock axis to the stabilizer leading edge, [m].

F_{st}, F_d, $l_{td,,}$ $r_{st,}$, r_d – see 3.3.2.

3.3.4 Bending Moments and Support Reaction Forces

Design bending moments acting on the steering nozzle, as well as design reaction forces of supports shall not be taken less than those indicated in Table 3.3.4, depending on the type of the nozzle. It is permitted to take values lesser than those determined in accordance with the formulae, provided more detailed calculations of bending moments and support reaction forces are submitted to PRS for acceptance.

Table 3.3.4

Type of calculations	Type of steering nozzles	
	supported	spade
		
1	2	3
Design bending moment at the nozzle stock – on the stock bearing level, [Nm]	$M_2 = 0.13 F_l h_1 \times \left(1.17 \frac{h_2}{h_1} - 1\right)$	$M_2 = 1.1 F_l h_2$

1	2	3
Design bending moment at the stock to nozzle connection, [Nm]	$M_3 = 0.21F_l h_1 \times \left(1.05\frac{h_2}{h_1} - 1\right)$	$M_3 = 1.1F_l h_1$
Design reaction force of supports at the lower bearing of the stock, [Nm]	$R_1 = F_l \times \left[0.53 - 0.24\left(\frac{h_2}{h_1} - 1.1\right)\right]$	$R_1 = 1.1F_l \times \left(1 + \frac{h_2}{h_3}\right)$
Design reaction force of supports at the pintle, [N]	$R_2 = F_l \times \left[0.57 - 0.24\left(\frac{h_2}{h_1} - 1.1\right)\right]$	–
Design reaction force of supports at the upper bearing, [N]		$R_3 = 1.1F_l \frac{h_2}{h_3}$

3.4 Rudder Stock

3.4.1 Rudder stock diameter, d_{t1}, at the point where only a torque exerted by tiller fitted at the rudder stock end exists, shall not be less than that determined in accordance with the following formula:

$$d_{t1} = 36 \cdot \sqrt[3]{\frac{M_s}{R_m + R_e}} \quad \text{[mm]} \tag{3.4.1}$$

where:
M_s – rudder stock torque (see 3.2.2.2), [Nm],
R_m – tensile strength of material used, [MPa],
R_e – yield stress of material used, [MPa].

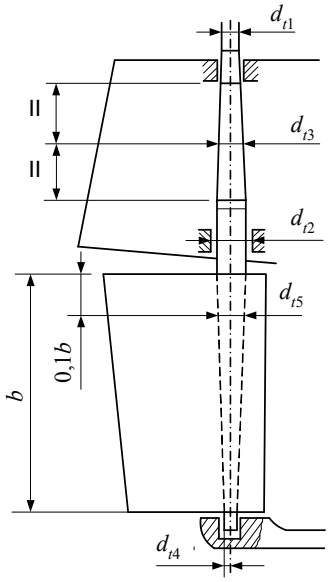


Fig. 3.4.1. Required rudder stock diameters

Where tiller is joined with the rudder stock by means of shape connection (e.g. square socket), diameter of circle inscribed in the rudder stock shape at the connection shall be taken as d_{t1}.

3.4.2 Rudder stock diameter, d_{t2}, in places where it is subjected to simultaneous bending and torsion, shall not be less than the value determined in accordance with the following formula:

$$d_{t2} = 36\sqrt[3]{\frac{\sqrt{0.75M_s^2 + M_g^2}}{R_m + R_e}} \quad \text{[mm]} \tag{3.4.2}$$

where:
M_s – torque for the cross-section under consideration, [Nm],

M_g – bending moment for the cross-section under consideration; $M_g = M_2$ at the lower support of underhung rudder and at the support in way of the bottom for supported rudder, [Nm].

3.4.3 For typical supported rudder, diameters d_{t3} and d_{t4} in the cross-sections indicated in Fig. 3.4.1 may be determined in accordance with the following formulae:

$$d_{t3} = \frac{d_{t1} + d_{t2}}{2} \quad [\text{mm}] \tag{3.4.3-1}$$

$$d_{t4} = 0.6 d_{t2} \quad [\text{mm}] \tag{3.4.3-2}$$

for d_{t2} determined in the position of support located in way of the bottom.

Where rudder stock runs through the entire height of rudder blade and the influence of the rudder blade construction on bending and torsion of the rudder stock – like e.g. in single-plate blades – the following equation applies:

$$d_{t5} = d_{t3} \quad [\text{mm}] \tag{3.4.3-3}$$

3.4.4 For typical construction of underhung rudder, the diameter at midspan of supports may be determined in accordance with the following formulae:

$$d_{t3} = 1.15 \frac{d_{t1} + d_{t2}}{2} \quad [\text{mm}] \tag{3.4.4-1}$$

$$d_{t5} = d_{t2} \quad [\text{mm}] \tag{3.4.4-2}$$

for d_{t2} determined at the rudder stock lower support.

3.4.5 For rudder stock made of tubes, their diameters and thicknesses shall be so selected that the rudder stock torsional strength or torsional and bending strength be equal to that of solid rudder stock made of a material with the same strength characteristics.

This requirement is considered as fulfilled if the following condition is met:

$$d_p \le \sqrt[3]{\frac{d_z^4 - d_w^4}{d_z}} \quad [\text{mm}] \tag{3.4.5}$$

where:

d_p – solid rudder stock diameter, [mm],

d_z – outside diameter of tubular rudder stock, [mm],

d_w – inside diameter of tubular rudder stock, [mm].

Application of tubes having wall thickness lesser than the greater of the following dimensions: $0.1 d_z$ + 2 mm and $0.2 L_K$ [mm] (L_K – length of hull, [m]) is not recommended.

3.4.6 For tillers where the lesser angle out of the two angles between its longitudinal axis and rudder stock axis is less than 70°, bending moment in the point of the tiller fixing shall also be taken into account.

3.4.7 If rudder stock runs through the entire height of rudder blade, then all the horizontal web plates shall be joined to the rudder stock with all-around weld of the total thickness not less than the web plate thickness.

3.4.8 For rudder stocks fixed to the rudder blade with horizontal flanges, the radius of transition of the rudder stock diameter in the flange shall not be less than 12% of the diameter.

For the lateral spacing of bolts more than 2 diameters of rudder stock at the flange, PRS may require submission of the rudder stock flange calculations determining bending stresses. These stresses shall not exceed equivalent stresses in the rudder stock for diameter d_{t2} determined in accordance with formula 3.4.2.

3.5 Streamline Rudder Blade

3.5.1 General Requirements

3.5.1.1 Rudder blade side plating shall be stiffened by horizontal and vertical web plates.

3.5.1.2 Inside the rudder blade there shall be a bending moment bearing member. Such a member shall be aligned with the rudder stock axis. The member may be the rudder stock extension or may have the form of I-section, with the vertical stiffening arm as the web and effective strakes of plating playing the role of I-section faceplates (see Fig. 3.5.2.5).

3.5.2 Rudder Blade Construction

3.5.2.1 Thickness of rudder blade side plating as well as upper and lower plates of streamline rudder blade made of normal strength hull structural steel shall not be less than that determined in accordance with the following formula:

$$s = 5.5a\sqrt{T_K + \frac{10^{-4}F}{A}} + 2.5 \quad [\text{mm}] \tag{3.5.2.1}$$

where:

T_K – draught of vessel, however not less than $T' + \frac{h_f}{2}$ [m],

T' – actual maximum draught of the lower edge of plate under consideration, [m],

h_f – wave height for the particular operating area in accordance with *Part I – Classification Regulations,* [m],

a – the minimum unsupported distance between the horizontal or vertical web plates; this value shall not be greater than 1.2 times the frame spacing in the after part of the vessel, [m],

F – rudder force, determined in accordance with formula 3.2.1-1, [N].

Thickness s shall not be taken lesser than 3 mm or $0.08L_K$, where L_K is the length of hull, [m] (see 1.2.3).

3.5.2.2 Thickness of the nose plates of the rudder blade shall not be less than $1.25s$ (see 3.5.2.1).

3.5.2.3 Thickness of vertical or horizontal web plates shall not be less than that of the rudder blade side plating.

3.5.2.4 Plating and web plates shall be welded together with fillet welding or plug weld with oblong cut-outs.

Such a connection shall be made in accordance with the requirements for analogous elements specified in Chapter 2, *Part II – Hull*.

3.5.2.5 If the rudder blade is connected to the rudder stock with horizontal flanges and bolted joints, the rudder stock need not extend into the rudder blade construction, however a vertical web shall be provided in line with the rudder stock axis (see Fig. 3.5.2.5) to form a girder bearing rudder blade bending moments together with the effective strakes of plating.

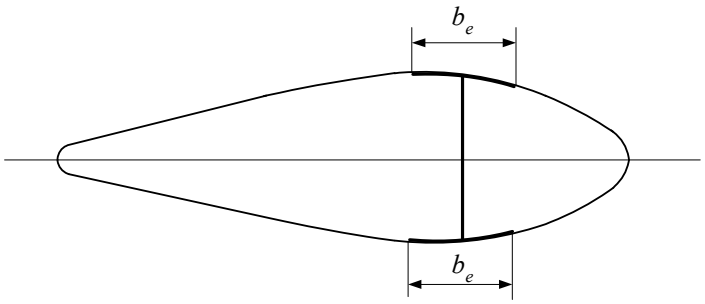


Fig. 3.5.2.5. Streamline rudder blade section with girder applied

b_e – width of effective strake of plating, [mm].

The girder shall fulfil the following requirements:

.1 girder section modulus at each place of rudder blade for thicknesses reduced by 1.5 mm shall not be less than that determined in accordance with the following formula:

$$W = 0.1(d - 0.15)^3 \quad [\text{cm}^3] \tag{3.5.2.5.1}$$

where:

d – rudder stock diameter determined in accordance with formula 3.4.2 for assumed torque M_s = 0 and bending moment determined in accordance with 3.2.3, [cm].

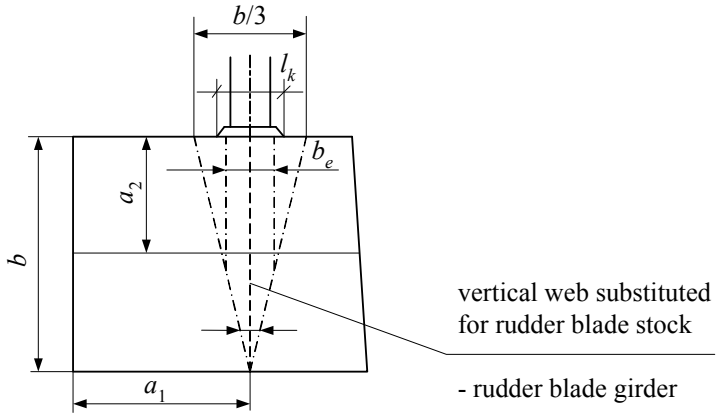


Fig. 3.5.2.5.1. Effective strake of streamline rudder blade side plating

.2 as effective strake of side plating b_e, the least of the following values shall be taken (see Fig. 3.5.2.5.1):

- b_e resulting from a triangle having height b and base $b/3$ (for underhung rudders), [mm],
- b/6 (for supported rudders), [mm],
- $0.44a$, [mm],
- $0.056\sqrt{\frac{235}{R_e}}(s - 1.5)$, [m],
- l_k, [mm].

where:

a – the lesser value of a_1 and a_2, [mm],
R_e – yield stress of material used, [MPa],
s – rudder blade side plating thickness determined in accordance with formula 3.5.2.1, [mm],
l_k – length of flange and rudder blade side plating contact, [mm],
b – rudder blade height, [mm],
a_1, a_2 – distance between members supporting rudder blade side plating, [mm].

Section modulus shall be determined taking account of the curvature of effective strake of rudder blade side plating.

3.5.2.6 Rudder blade side plating, vertical web and flange shall be joined by means of a weld equivalent to the full penetration weld.

3.5.2.7 Rudder blade flange shall fulfil the requirements specified in sub-chapter 3.7.

3.5.2.8 Rudder blade vertical web mentioned in 3.5.2.5 shall have a thickness sufficient to bear the shear force in the upper part of the blade, equal to force F acting on the underhung rudder blade and fulfil the requirements for the form stability specified in *Part II – Hull*, and such thickness shall not be less than those required for other rudder blade structural members, except the flange thickness.

3.6 Single Plate Rudder Blade

3.6.1 Single-plate rudder stock shall run through the entire height of the blade. Rudder stock diameters shall be determined in accordance with sub-chapter 3.4. When changing the rudder stock diameter with the height, the diameters shall not be taken less than those determined in accordance with formula 3.4.2 for bending moments and torques in the particular section of the blade, specified in sub-chapter 3.2.

Horizontal stiffening arms shall be welded throughout the blade length on both sides of the single-plate rudder blade. Stiffening arms shall be also provided in the upper and lower edges of the blade.

3.6.2 Thickness of single-plate rudder blade, s, shall not be less than the lesser one of the following values:

$$s = 0.05L_K + 5 \quad [\text{mm}] \tag{3.6.2-1}$$

$$s = 0.81a_2 v_0 + 2.5 \quad [\text{mm}] \tag{3.6.2-2}$$

where:
L_K – length of hull (see 1.2.3), [m],
a_2 – vertical spacing of stiffening arms, [m],
v_0 – rudder streamline speed in accordance with sub-chapter 3.2.1, [km/h].

3.6.3 For vessels intended to be assigned additional mark **L1** in the symbol of class, thickness of the rudder blade side plating determined in accordance with formulae 3.6.2-1 and 3.6.2-2 shall be increased by 11%.

3.6.4 Section modulus of single-plate rudder blade stiffening arms (determined as $W = \frac{h^2 t}{6}$) in way of the rudder stock shall not be less than that determined in accordance with the following formula:

$$W = 0.292a_2 l^2 v_0^2 \quad [\text{cm}^3] \tag{3.6.4}$$

where:
h – stiffening arm maximum width (distance between the outermost points of the stiffening arm on both sides of blade), [cm],
t – stiffening arm thickness, however $t < s$ (where s is determined in accordance with 3.6.2) shall not be taken, [cm],
a_2 – spacing of rudder blade horizontal stiffening arms, where it is recommended that $a_2 < 1.2$ of the stern frame spacing be taken, [m],
l – distance from rudder stock axis to the after edge of blade, [m],
v_o – rudder streamline speed in accordance with sub-chapter 3.2.1, [km/h].

Required section modulus of the stiffening arms may decrease towards the rudder blade edge in proportion to distance l from the rudder stock axis maintaining, however, the minimum total width not less than 40 mm + blade thickness on the trailing edge.

3.6.5 For vessels intended to be assigned additional mark **L1** in the symbol of class, the value of index W determined in accordance with formula 3.6.3 shall be increased by 23%.

3.7 Flange Couplings Connecting Rudder Stock with Rudder Blade

3.7.1 Where rudder stock is connected to the rudder blade by means of flange couplings, nominal diameter of coupling bolts, d_s, shall not be less than that determined in accordance with the following formula:

$$d_s = 0.62\sqrt{\frac{d_t^3 R_{et}}{n r_s R_{es}}} \quad [\text{mm}] \tag{3.7.1}$$

where:
d_t – rudder stock diameter determined in accordance with formula 3.4.2, [mm],
n – number of connecting bolts, not less than 6,
r_s – mean distance of bolt axes from rudder stock axis, [mm],

R_{et} – rudder stock material yield stress, [MPa],
R_{es} – bolt material yield stress, [MPa].

3.7.2 Distance from any bolt centre to the flange centre shall not be less than 0.9 times diameter d_{t1} determined in accordance with 3.4.1.

For rudders where the rudder stock is subjected to bending in addition to torsional stresses, it is required that the distance from any bolt centre to the flange longitudinal axis of symmetry be not less than 0.6 times the rudder stock diameter at the connection of the rudder stock and flange.

For underhung rudders, it is recommended that the maximum longitudinal spacing of bolts be close to their maximum lateral spacing.

3.7.3 All bolts shall be of fitted type. Nuts shall be of standard proportions corresponding to bolts subjected to tension and have the same strength grade as bolts. Nuts shall be effectively protected against slackening. Yield stress of the material of bolts and nuts shall not be less than 235 MPa.

3.7.4 Thickness of horizontal coupling flange, s, shall not be less than that determined in accordance with the following formula:

$$s = d_s \sqrt{\frac{R_{es}}{R_{ek}}} \quad [\text{mm}] \tag{3.7.4}$$

where:
R_{es} – yield stress of bolt material, [MPa],
R_{ek} – yield stress of flange material, [MPa],
d_s – diameter of connecting bolts determined in accordance with 3.7.1 for n = 6, [mm].

3.7.5 Width of the material strake outside the bolt openings shall not be less than $0.67d_s$.

3.7.6 Construction of vertical flange couplings and cone couplings shall fulfil the requirements specified in the *Rules for the Classification and Construction of Sea-going Ships, Part III – Hull Equipment*.

3.8 Rudder Stock Bearings

3.8.1 Bearing surface, A_b, defined as the product of the height and external diameter of the bushing shall not be less than that determined in accordance with the following formula:

$$A_b = \frac{R}{p_a} \quad [\text{mm}^2] \tag{3.8.1}$$

where:
R – reactive force in bearing determined in accordance with 3.2.3.7, [N],
p_a – allowable surface pressure, determined in accordance with Table 3.8.1, [MPa].

Table 3.8.1
Allowable surface pressure for different bushing materials

Bearing material[3)]	p_a, [MPa]
lignum vitae and soft synthetic material (e.g. teflon)	2.5
white metal, oil lubricated	4.5
synthetic material with hardness between 60 and 70 Shore D[1)]	5.5
steel[2)], bronze and hot-pressed bronze-graphite materials	7.0

1) Indentation hardness test at 23°C and with 50% moisture, according to a recognized standard.
2) Combination of stainless and wear-resistant steel with stock liner shall be of a type approved by PRS.
3) Synthetic bearing materials shall be of a type approved by PRS.

Surface pressure values higher than those specified in Table 3.8.1 may be applied if they have been verified by tests and approved by PRS.

3.8.2 Height/diameter ratio of the bearing surface shall range from 0.8 to 1.2, and for bearings made of synthetic materials it shall not exceed 2.

3.8.3 For carrying the weight of a rudder blade and stock, a thrust bearing shall be applied. The vessel construction under the thrust bearing shall be strengthened effectively.

3.8.4 Means shall be provided to protect a rudder blade and rudder stock against their axial displacement upward by a value greater than it is safe for the steering gear operation. Bearing bushes shall also be protected against incidental slide on the rudder stock.

3.8.5 Bearing casings shall be reliably and rigidly fixed to the hull structure.

3.8.6 Stuffing boxes shall be installed inside the opened rudder stock tube above the deepest load line in order to prevent water from entering into the steering gear compartment and washing out the thrust bearing lubricant.

Where the upper end of the rudder stock tube is located below the deepest load line, then two independent stuffing boxes shall be applied. The stuffing box shall be accessible for inspection and maintenance.

3.8.7 Proper clearances shall be provided in bearings. For non-metallic materials, the bearing clearance shall be determined taking account of the material swelling (e.g. polyamide) due to water absorption and thermal expansion where the increase in volume results in the reduction of the inside diameter of the bush pressed in the rudder stock tube.

3.9 Steering Nozzle Stock

3.9.1 Diameter of the upper part of steering nozzle stock above the upper bearing in way of the tiller shall not be less than that determined in accordance with the following formula:

$$d_0 = 4.03 \sqrt[3]{\frac{M_1}{471 + R_e}} \quad \text{[cm]} \tag{3.9.1}$$

where:

M_1 – design torque determined in accordance with 3.3.3, [Nm],

R_e – yield stress of the steering nozzle stock material, [MPa].

3.9.2 Diameter of the steering nozzle stock in way of the lower bearing shall not be less than that determined in accordance with the following formula:

$$d_1 = 4.24 \sqrt[3]{\frac{\sqrt{0.75M_1^2 + M_2^2}}{471 + R_e}} \quad \text{[cm]} \tag{3.9.2}$$

where:

M_2 – design bending moment determined in accordance with 3.3.4, [Nm].

Diameter d_1 shall be maintained up to the flange.

3.9.3 Diameter of the steering nozzle stock in way of the upper bearing, d_7, shall not be less than that determined in accordance with the following formula:

$$d_7 = 4.24 \sqrt[3]{\frac{\sqrt{0.75M_5^2 + M_6^2}}{471 + R_e}} \quad \text{[cm]} \tag{3.9.3-1}$$

where:

M_5 – torque in the stock in question, generated by nozzle gear at the rated torque, [Nm];

M_6 – bending moment in way of the upper bearing, generated by nozzle gear and determined in accordance with the formula below:

$$M_6 = M_5 \frac{h_4}{r_1} \quad \text{[Nm]} \tag{3.9.3-2}$$

where:
h_4 – distance from the centre of the upper bearing to the centre of quadrant or tiller fastening, measured along the stock axis, [m];
r_1 – distance from the stock axis to the line of force generated by the nozzle gear, acting on the quadrant or tiller, [m].

3.9.4 Transition from d_0 to d_1 diameter shall be gradual and smooth. Where the transition of the nozzle stock diameter is stepped, the fillet radii, as large as practicable, shall be applied. The transition of the nozzle stock into the flange shall be made with a fillet radius not less than 0.12 times the stock diameter in way of the flange.

3.10 Steering Nozzle Plating

3.10.1 Thickness of steering nozzle outer plating, s, shall not be less than that determined in accordance with the following formula:

$$s = K_1 l_1 \sqrt{\frac{98.1 D_d l_d T_K + 0.02 F_d}{D_d l_d R_e}} + 2 \quad \text{[mm]} \tag{3.10.1}$$

where:
D_d – nozzle inside diameter, [m],
l_d – length of nozzle, [m],
F_d – nozzle design load, in accordance with 3.3.2.1, [N],
T_K – vessel draught, [m],
R_e – yield stress of material used, [MPa],
K_1 – factor determined in accordance with Table 3.10.1, depending on u_1 / l_1 ratio,

Table 3.10.1

u_1/l_1	1.0	1.1	1.2	1.3	1.4	1.6	1.8 and above
K_1	5.7	6.0	6.3	6.6	6.8	7.0	7.2

u_1 – spacing of nozzle longitudinal stiffeners, measured on the outer plating, [m]; this spacing shall not exceed 1 m,
l_1 – spacing of nozzle stiffening rings or a distance of such ring from the centre or profile bounding inlet or outlet nozzle, [m]; this spacing shall not exceed 0.6 m.
For intermediate values of u_1 / l_1, K_1 shall be determined by linear interpolation.

3.10.2 Thickness of the inner plating of the steering nozzle, s_w, except for the middle strake, shall not be less than that determined in accordance with the following formula:

$$s_w = 6.39 \frac{l_1}{D_d} \sqrt{T_s} \quad \text{[mm]} \tag{3.10.2-1}$$

where:
T_s – propeller thrust at speed v (for v – see 3.3.2.1), [kN],
D_d, and l_1 – see 3.10.1.

The thickness of the middle strake of the steering nozzle, s_s, shall not be less than that determined in accordance with the following formula:

$$s_s = 7.34 \frac{l_2}{D_d} \sqrt{T_s} + 0.51 \frac{T_s}{D_d^2} \quad \text{[mm]} \tag{3.10.2-2}$$

where:
l_2 – spacing of stiffening rings in way of middle strake of the nozzle inner plating, [m].

Where stainless or clad steel is used, thickness s_s may be reduced respectively upon PRS consent.

3.10.3 Minimum thickness of the outer or inner plating of the steering nozzle in no case shall be less than that determined in accordance with the following formula:

$$s_{\min} = 18\frac{L_K + 37}{L_K + 240} \quad [\text{mm}] \tag{3.10.3}$$

where:
L_K – length of hull, [m].

3.10.4 Middle strake of the nozzle inner plating is to have the width extending not less than to $0.05D_d$ forward and not less than $0.1\ D_d$ abaft the tips of the propeller blades. In no case the width of this strake shall be less than the maximum width of the lateral projection of the propeller blade.

3.10.5 Outer and inner plating of the nozzle shall be reinforced by the stiffening rings and longitudinal stiffeners (webs). Spacing of these stiffening members shall fulfil the requirements specified in 3.10.1. At least four equidistant longitudinal stiffeners shall be provided on the nozzle circumference.

Thickness of the stiffening members, except for those fitted in way of the middle strake of the nozzle inner plating, shall not be less than that of the outer plating as required in 3.10.1.

The stiffeners shall be welded with a double continuous full penetration weld. Where the thickness of the stiffening is 10 mm and over – edge preparation shall be performed prior to welding. The stiffening rings and longitudinal stiffeners shall be provided with sufficient number of openings for free drainage of water which could penetrate inside the nozzle. The distance of edges of these openings from the inner and outer plating of the nozzle shall not be less than 0.25 times the height of the stiffening members. The top and bottom parts of the nozzle shall be fitted with drain plugs of stainless metal.

No cover plates shall be welded to the inner plating of the nozzle.

3.10.6 In way of middle strake of the nozzle inner plating, at least two continuous stiffening rings shall be provided. Thickness of these rings shall not be less than that of the inner plating outside the middle strake, as determined by formulae 3.10.2-1 and 3.10.3.

3.10.7 Particular attention shall be paid to the strength of steering nozzle connection with the flange, boss and other welded elements connecting the nozzle with the stock and pintle.

3.10.8 Thickness of the nozzle stabilizer plating, s_{st}, shall not be less than that determined in accordance with the following formula:

$$s_{st} = K_1 l_1 \sqrt{\frac{98.1 A_{st} T_K + 0.02 F_{st}}{A_{st} R_e}} + 2 \quad [\text{mm}] \tag{3.10.8}$$

where:
A_{st} – nozzle stabilizer area, [m^2],
T_K – vessel draught, [m],
F_{st} – design load acting on the stabilizer, determined in accordance with formula 3.3.2.1-3, [N],
K_1 – factor determined in accordance with Table 3.5.1.1, depending on u_1/l_1 ratio,
R_e – yield stress of stabilizer plating material, [MPa],
u_1 – spacing of horizontal web plates, [m],
l_1 – spacing between the vertical web plates or distance between web plate and the leading or trailing edge of the stabilizer, [m].

3.10.9 Nozzle stabiliser plating shall be reinforced from the inside by continuous horizontal and vertical web plates of a thickness not less than that of the plating as required in 3.10.8.

Top and bottom plates of the stabilizer shall be of a thickness not less than 1.5 times the plate thickness required by 3.10.8. Vertical web plates shall be firmly connected to the top and bottom plates.

Horizontal and vertical web plates shall be provided with a sufficient number of openings for free drainage of water, and the bottom and top plates shall be fitted with drain plugs of stainless material.

3.10.10 In way of stabilizer to nozzle connection, one or several additional stiffeners shall be provided to ensure the general strength of the stabilizer structure. The required section modulus of these stiffeners with the effective flanges shall be determined in accordance with the following formula:

$$W_{st} = 1.39 \frac{F_{st} h_{st}}{R_e} \quad [\text{cm}^3] \tag{3.10.10}$$

where:
F_{st} – design load acting on stabilizer determined in accordance with formula 3.3.2.1-3, [N],
h_{st} – stabilizer height, [m],
R_e – yield stress of material used, [MPa].

The effective flange shall have a thickness equal to that of the stabilizer plating and a width equal to 0.20 times the stabilizer height.

3.10.11 The stabilizer shall be rigidly connected to the nozzle.

In strength calculations, the design load F_{st} acting on the stabilizer shall be determined in accordance with formula 3.3.2.1-3. Depending on the type of nozzle with stabilizer connection, the point of F_{st} load application shall be taken into account when determining the torque caused by this load (see formula 3.3.2.2). Actual stresses in the connection shall not to exceed 0.4 times the yield stress of the material used.

3.11 Steering Nozzle Pintles

3.11.1 Pintle diameter (exclusive of the liner thickness), d_3, shall not be less than that determined in accordance with the following formula:

$$d_3 = \sqrt{\frac{R_2}{471 + R_e}} \quad [\text{cm}] \tag{3.11.1}$$

where:
R_2 – design reaction force, according to 3.3.4, [N],
R_e – yield stress of material used, [MPa].

3.11.2 Length of the pintle tapered part, fitting the pintle into the sole piece, shall not be less than the diameter of the pintle determined according to 3.11.1; the taper on the diameter shall not exceed 1:6. The taper shall pass into cylindrical portion without a step.

Outside diameter of the threaded part of the pintle shall not be less than 0.8 times the minimum diameter of the taper. Outside diameter and length of the nut shall not be less than 1.5 and 0.6 times the outer diameter of the pintle threaded part, respectively.

3.11.3 Length of cylindrical part of the pintle shall not be less than its diameter (including liner, if fitted), but not greater than 1.3 times this diameter.

3.11.4 Thickness of pintle bearing material, including pintle bushings in the bearing, shall not be less than 0.5 times the diameter of the pintle without bushing. Possible deviations from this requirement are subject to PRS consideration in each particular case.

3.11.5 To reliably prevent slackening, the pintle nut shall be locked by means of at least two strips (washers) welded on or a washer and a cotter pin, the pintle being effectively clamped in its seating.

3.11.6 The selected dimensions of pintles shall be checked for surface pressure, taken as:

$$p = \frac{R_2}{d_3 h} 10^{-2} \quad [\text{MPa}] \tag{3.11.6}$$

R_2 – design reaction force in sternframe bearing, determined in accordance with Table 3.3.4, [N],
d_3 – pintle diameter (inclusive of the bushing, if fitted), [cm],
h – pintle liner height, [cm].

This surface pressure shall not exceed the values specified in Table 3.8.1. For application of materials different from those specified in this table for mating parts, the surface pressure is subject to PRS consideration in each particular case.

3.12 Nozzle to Stock Coupling

3.12.1 Where the nozzle stock is connected to the steering nozzle by meansof horizontal flange couplings, the diameter of the coupling bolts shall not be less than that determined in accordance with the following formula:

$$d_2 = 5.54\sqrt{\frac{\sqrt{0.75M_l^2 + M_3^2}}{z\rho(471 + R_e)}} \quad [\text{cm}] \tag{3.12.1}$$

where:
M_l – design torque determined in accordance with 3.3.3, [Nm],
M_3 – design bending moment determined in accordance with 3.3.4, [Nm],
z – number of coupling bolts (studs),
ρ – mean distance from the centre of the bolts to the flange centre, [cm],
R_e – bolt material yield stress, [MPa].

The number of bolts shall not be less than 6. The distance from the centre of any bolt to the flange centre shall not be less than 0.7 times the diameter of the nozzle stock d_0 determined in accordance with 3.9.1. For nozzles, where the nozzle stock is subjected both to torque and bending, it is additionally required that the distance from the centre of any bolt to the centre line of the nozzle be not less than 0.6 times the design diameter of the nozzle stock d_1, determined in accordance with 3.9.2.

3.12.2 All bolts shall be of fitted type; only in the case when a key is applied, the number of fitted bolts may be reduced to two. The nuts shall be of standard proportions like for those subjected to tension. The bolts and nuts shall be reliably protected against slackening.

3.12.3 Thickness of coupling flanges shall not be less than the diameter of bolts, d_2 (calculated for R_e of the flange material). The distance between the centres of the bolt holes and the flange outer edge shall not be less than 1.15 times the bolt diameter.

3.12.4 For the tapered connection of the stock and nozzle, the length of a tapered part of the stock shall not be less than 1.5 times the stock diameter determined in accordance with 3.9.2; the taper on diameter shall not exceed 1:6. The taper shall pass smoothly into the cylindrical portion.

3.12.5 A key shall be set on the cone generatrix. The key ends shall be properly rounded. The key cross-section working area (the product of the key length and width) shall not be less than that determined in accordance with the following formula:

$$A_f = \frac{26M_l}{d_m(471 + R_e)} \quad [\text{cm}^2] \tag{3.12.5}$$

where:
M_l – design torque determined in accordance with 3.3.3, [Nm],
d_m – diameter of the taper cross-section in the middle of the key length, [cm],
R_e – key material yield stress, [MPa].

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

3.12.6 Outside diameter of the threaded part of the nozzle stock shall not be less than 0.9 times the minimum diameter of the taper. Fine thread shall be applied.

Outside diameter and length of the nut shall not be less than 1.5 and 0.8 times the outside diameter of the threaded part of the nozzle stock, respectively.

To reliably prevent slackening, the pintle nut shall be locked by means of at least two strips welded on or a washer and a cotter pin.

3.12.7 Where the nozzle stock is not made of one solid piece, its parts shall be jointed by means of a ribbed-clamp coupling. Such coupling shall be provided with at least 8 bolts. Total sectional area of the bolts, A_b, shall not be less than that determined in accordance with the following formula:

$$A_b = 0.44d^2 \quad [\text{cm}^2] \tag{3.12.7-1}$$

d – nozzle stock diameter in way of connection, [cm].

Thickness of each flange of the ribbed-clamp coupling shall not be less than 0.3 times the nozzle stock diameter in way of the connection. Additionally, keys shall be provided at the connection; the area of their working cross-section shall not be less than that determined in accordance with the following formula:

$$A_f = \frac{26M_l}{d(471+R_e)} \quad [\text{cm}^2] \tag{3.12.7-2}$$

where:
M_l – design torque determined in accordance with 3.3.3, [Nm],
d – nozzle stock diameter in way of connection, [cm],
R_e – key material yield stress, [MPa].

3.12.8 Where the steering nozzle coupling is not built in the structure of the nozzle but connected to the plates of the steering nozzle casing, the strength of such a structure shall be equivalent to that of the stock. Assumed design pressure shall be not higher than 0.4 of key material yield stress.

3.13 Steering Nozzle Stock Thrust Bearings

3.13.1 Thrust bearings of the stock carrying horizontal loads shall fulfil the requirements for pintles specified in paragraph 3.11.6.

3.13.2 For carrying the weight of a nozzle and stock, a thrust bearing shall be installed. Under the thrust bearing, the deck shall be effectively strengthened.

Effective means shall be provided to protect the nozzle and stock against their axial displacement upward by a value exceeding those provided in the steering gear design.

3.13.3 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. The stuffing box shall be located as to be accessible for inspection and maintenance.

3.14 Quadrant or Tiller

3.14.1 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.

3.14.2 Boss of the main quadrant or main tiller shall have an outside diameter not less than 1.8d and height – not less than 0.9d, where d – stock diameter in way of the connection.

Emergency tiller shall have an outside diameter not less than 1.5d, and height – not less than 0.8d.

3.14.3 Split bosses shall be connected with at least two bolts at each side. For each side, the total sectional area of the bolt cores, A_r, shall not be less than that determined in accordance with the following formula:

$$A_r = \frac{0.116d_{t1}^3}{l} \cdot \frac{R_{et}}{R_{es}} \quad [\text{mm}^2] \tag{3.14.3-1}$$

$$A_r = 0.135d_{t1}^2 \quad [\text{mm}^2] \tag{3.14.3-2}$$

where:
d_{t1} – stock diameter, [mm],
l – distance from bolt axis to stock axis, [mm],
R_{et} – yield stress of rudder stock material, [MPa],
R_{es} – yield stress of bolt material, [MPa].

3.14.4 Dimensions of a tiller quadrant arm and other parts associated with transmitting forces from the steering gear to rudder stock shall be determined based on the rudder stock design torque and induced reaction forces as well as characteristics of the materials used. Allowable equivalent stress shall not exceed 0.7R_e.

3.15 Rudder Angle Limiters

3.15.1 Steering gear (rudder or steering nozzle) shall be provided with mechanical limiters of rudder angle to prevent the rudder or steering nozzle from being put over either side to an angle greater by about 1.5° above the setting of the steering gear limit switches. Rudder angle limiters shall be installed on the vessel hull.

Parts fixing the limiters to the hull and the hull members subjected to the forces induced by such limiters shall be strengthened respectively.

3.15.2 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, M_{skr}, not less than the value determined in accordance with the following formula:

$$M_{skr} = 1.135 d_{t1R}^{3} R_e 10^{-4} \quad \text{[Nm]} \tag{3.15.2}$$

where:

d_{t1R} – actual diameter of rudder stock in way of parts supported by limiters, [mm],

R_e – yield stress of the rudder stock material, [MPa],

M_{skr} may be limited to the value of respectively $1.5M_s$ or $1.5M_l$, where:

M_s – rudder stock torque, determined in accordance with 3.2.2.1,

M_l – total design torque acting on a steering nozzle, determined in accordance with 3.3.

The stresses in these parts due to the above mentioned torque shall not exceed 0.95 the yield stress of such a part material.

3.16 Steering Gear Drive

3.16.1 General Requirements

3.16.1.1 Main and emergency drives shall be provided on a vessel fitted with a steering gear, except as provided in paragraph 3.16.1.2.

3.16.1.2 Emergency drive is not required on the vessels fitted with:

.1 manual rudder drive,

.2 several rudders or steering nozzles and independent steering gears,

.3 one steering gear with hydraulic drive supplied by two independent power sources.

3.16.1.3 Steering system shall be designed taking account of overloading equivalent to 1.5 the design torque for the duration of up to 1 min.

3.16.1.4 Electrical control systems shall fulfil the requirements specified in *Part VII – Electrical Equipment and Automation*.

3.16.1.5 Steering gear shall be of a self-locking type. Application of another type of steering gear is permitted where rudder may be stopped from the control station in any required position when the rudder stock is subjected to the rated torque.

3.16.1.6 Steering gear may be manually driven if rudder stock head diameter, d_{t1}, determined in accordance with 3.4.1 (or steering nozzle stock diameter, d_0, determined in accordance with 3.9.1) does not exceed 150 mm. If the steering system is provided with multi-blade rudders or several steering nozzles with the common steering gear, in this criterion design diameter d_0 shall be used, this being determined in accordance with the following formula:

$$d_o = \sqrt[3]{d_{o1}^3 + d_{o2}^3 + ... + d_{on}^3} \quad \text{[mm]} \tag{3.16.1.6}$$

where:

n – number of rudders or steering nozzles,

d_{oi} (for i = 1...n) – rudder stock diameter or steering nozzle stock diameter determined in accordance with 3.4.1 or 3.9.1, respectively.

3.16.1.7 If the steering system is manually driven, each revolution of the steering wheel shall correspond to the rudder movement by an angle not less than 3°.

3.16.1.8 Steering wheel force shall not exceed 120 N for main and 160 N for auxiliary steering gear drive. Greater force is acceptable after putting the rudder to an angle of 20° for main steering gear and 15° – for auxiliary steering gear, however they shall not exceed 160 N and 200 N, respectively.

3.16.1.9 As an emergency manual drive of rudder, a tiller put on the rudder stock or a tackle fitted to the quadrant may be applied. Irrespective of the adopted design solution, the possibility for operating of the steering gear by one person shall be maintained.

3.16.1.10 In case of failure or disturbed operation of the steering gear, it shall be possible to actuate an independent emergency drive or use manual drive within 5 seconds. In the wheelhouse, the possibility for identification which type of drive is in operation shall be provided.

Where the emergency drive or manual drive is not actuated automatically, provision shall be made for their instant actuation by the helmsman through a quick simple action.

Jaw clutch may be engaged if it is not being subjected to torque.

Where the emergency hydraulic pump drive is effected by a power generation set with an auxiliary engine which is not in continuous operation while the vessel is navigating, power supply from another source, e.g. a battery, shall be provided until the auxiliary engine has started.

3.16.1.11 Emergency manual drive of rudder shall allow the vessel to reach a berthing location.

Also, while the emergency drive is in operation or manual drive is being used, the vessel manoeuvrability characteristics shall be attainable in accordance with the requirements specified in Chapter 2.

3.16.1.12 Rudder angular position with accuracy ±2.5° shall be clearly indicated at the steering post. Electrical indicators of rudder angular position shall have their own power supply.

3.16.1.13 Actuators, power units and electrical equipment of the steering gear shall fulfil the requirements specified in *Part VI – Machinery and Piping Systems* and *Part VII – Electrical Equipment and Automation*.

3.16.2 Steering Gear Hydraulic Drive

3.16.2.1 No other power consumers may be connected to the steering gear hydraulic drive unit.

3.16.2.2 Hydraulic tanks shall be equipped with a warning system that monitors a dropping of the oil below the lowest content level needed for safe operation

3.16.3 Rudder Manual Drive

3.16.3.1 Manual steering wheel shall not be turned by other drive than manual.

3.16.3.2 In no rudder position shall a reverse movement of the steering wheel be possible in case of inadvertent engagement of the manual drive coupling.

3.16.3.3 Tiller rods and tiller chains may be used to pull the rudder in steering gears on vessels of the length not exceeding 80 m.

3.16.3.4 Where a rod, chain or flexible steel rope is used to pull the rudder, their actual breaking force, V, shall not be less than that determined in accordance with the following formula:

$$V = \frac{9.5 M_s}{r_s} \text{ [N]} \qquad (3.16.3.4.)$$

where:

M_s – design torque determined in accordance with 3.2.2 or 3.3.3, [Nm],

r_s – quadrant radius, [m].

Lanyards and fittings shall be designed taking account of the rod, chain or rope strength.

Diameters of roller guides shall not be less than 16 times the tiller rope diameter.

3.16.3.5 Rudder steering systems shall fulfil the relevant requirements of standard PN-EN 28847.

3.16.3.6 Propeller steering systems shall be designed in compliance with the propulsion unit manufacturer and fulfil the requirements of the relevant standards (PN-EN ISO 8847, PN-EN 28848 and PN-EN 29775).

3.16.3.7 Chains, lanyards, shock absorbers, shackles, etc. shall have relevant test certificates. After their manufacture and prior to their installation, tiller rods and tiller ropes shall be subjected to static tensile test with the load twice as great as the anticipated rated load.

3.16.3.8 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.

3.16.3.9 Tiller chains, rods and ropes shall be effectively shielded and protected against damage.

3.16.3.10 In vessels of a length not exceeding 50 m, galvanized steel ropes may be used instead of tiller chains and tiller rods. While selecting the rope, it shall be taken into account that its tensile strength be twice as great as that of the chain resulting from the calculation for such an arrangement. Additionally, the rope diameter shall not be less than 8 mm.

The diameter of roller guides shall be adjusted to the rope flexibility. For the rope of structure 6 × 37, the roller diameter shall be at least 10 times the rope diameter. The diameter of grove in the roller guide shall be larger by 0.8 mm than the line radius.

On the rudder quadrant, the ropes shall be guided in separate groves.

3.16.3.11 Bevel gears, shafts, articulations, etc. may be applied instead of ropes, chains and roller guides.

3.16.3.12 Where tiller chains and rods are used in the steering gear, the following spare parts shall be available on board the vessel:
– 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.

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

4 ANCHORING EQUIPMENT

4.1 General

4.1.1 The requirements specified in Chapter 4 apply to anchoring equipment of self-propelled vessels, vessels having no motive power, vessels navigating independently, vessels navigating in convoys as well as floating equipment used in operating areas 1, 2 and 3. All such vessels shall be provided with anchoring equipment permanently ready to be used and capable of holding the vessel on the thrown anchors.

4.1.2 Floating establishments, such as e.g. floating landing stages which permanently stay in one place, need not have anchoring equipment provided that their safety at berth is ensured by other means considered by PRS as sufficient.

4.1.3 Application of anchoring equipment of a vessel which serves other purpose than carriage of cargo or persons and is neither a tug nor a pusher (floating equipment, houseboats dredgers, vessels of atypical construction and regular vessels intended for service in special conditions) is subject to PRS consideration in each particular case.

4.1.4 Where another anchoring equipment (e.g. special anchors and winches on dredgers, dead anchors, etc.) is provided on the vessel in addition to that mentioned in paragraph 4.1.1, such equipment is considered as a special one and is not subject to PRS survey.

4.1.5 The requirements specified in this Chapter are specified at the assumption that Hall anchors are applied. Where other types of anchors are applied, detailed scope of requirements is subject to PRS consent in each particular case (see also paragraph 4.1.6).

4.1.6 Where high holding power anchors are used, the mass of each of them may be reduced in proportion to the increase in the holding power compared to Hall anchor determined for the vessel in accordance with sub-chapter 4.2.

4.1.7 Construction of the anchoring equipment (including anchors located in chock recesses) shall be such as to avoid hazard to other vessels. Anchors shall neither wholly nor partially protrude beyond the shell plating.

4.1.8 Anchoring equipment control stations shall be so located that the control operations from there be safe.

4.1.9 Anchor throwing working stations shall be provided with means of antislip protection. This does not apply to the remote anchor throwing post located in the wheelhouse.

4.1.10 It is recommended that hawse-pipe holes on open decks be provided with covers.

4.1.11 On board vessels and convoys whose wheelhouse has been designed for radar navigation by one person and exceeding 86 m in length L or 22.9 m in breadth B it shall be possible to drop the stern anchors from this position. Where necessary, additional stiffenings and/or brackets shall be added to enable direct transmission of loads from machinery foundations to strengthening system under deck plating. The size of stiffeners and brackets shall be chosen considering the anchor chain breaking force, so that stresses in the structure do not exceed permissible values.

4.1.12 Anchoring equipment shall be located on longitudinals, deck beams and/or members which form a part of the deck structure to enable effective distribution of the load imposed on the hull structure.

4.2 Bow and Stern Anchors

4.2.1 Vessels intended for the carriage of goods, apart from ship-borne lighters whose length L does not exceed 40 m, shall be equipped with bow anchors whose total mass P is determined in accordance with the following formula:

$$P = kBT \quad [\text{kg}] \tag{4.2.1}$$

where:

$k = c\sqrt{\frac{L}{8B}}$, for lighters, however, $k = c$ shall be taken

where:

c – empirical factor taken in accordance with Table 4.2.1

Table 4.2.1

Deadweight tonnage D [t]	c
$D \leq 400$	45
$400 < D \leq 650$	55
$650 < D \leq 1000$	65
$D > 1000$	70

4.2.2 Vessels carrying containers on deck shall be equipped with bow anchors of total mass P increased by additional mass ΔP depending on the windage area of these containers in accordance with Table 4.2.2.

Table 4.2.2

Windage area[1] F_N [m^2]	Additional mass[2] ΔP [kg]
35	20
70	45
105	70
140	120
175	170
210	220

1) It shall be taken that an increase of windage area F_N by each 70 m^2 above 210 m^2 results in a mass increase by 50 kg each time.

2) for intermediate values of windage area F_N , the amount of additional mass ΔP shall be determined as follows:
for $F_N > 35$ m^2 – by interpolation,
for $F_N < 35$ m^2 – in accordance with the following formula:

$$\Delta P = 20F_N/35 \quad [\text{kg}] \tag{4.2.2}$$

4.2.3 On vessels whose deadweight tonnage is $D < 400$ t which, owing to their design and intended purpose, are used only on predetermined short-haul sections, the inspection body may accept that only two thirds of total mass P is required for the bow anchors P.

4.2.4 Floating Equipment Anchors

If floating equipment is capable of being reliably anchored with mooring anchor or mooring posts, the inspection body may consider waiver of the requirements specified in paragraphs 4.2.1 and 4.2.7 provided that the self-propelled floating equipment is equipped with at least one anchor in accordance with these requirements where factor k is taken equal to 45, and the floating equipment minimum moulded depth is substituted for T in the formula.

4.2.5 Worksite Craft Anchors

Where a worksite craft is capable of being reliably anchored with mooring anchor or mooring posts, the inspection body may consider waiver of the requirements specified in paragraphs 4.2.1 and 4.2.7. Self-propelled worksite craft shall, however, be equipped with at least one anchor in accordance with these requirements where factor k is taken equal to 45, and the worksite craft minimum moulded depth H is taken equal to moulded draught T.

4.2.6 Vessels not intended for the carriage of goods, apart from pushers, shall be fitted with bow anchors whose total mass P is determined in accordance with the following formula:

$$P = kBT \quad [\text{kg}] \tag{4.2.6}$$

where:

k – factor taken in accordance with paragraph 4.2.1, however, where in order to obtain the value of empirical factor c, the water displacement in m^3 entered in the Community Certificate shall be taken instead of the deadweight tonnage (if required).

4.2.7 Vessels referred to in paragraph 4.2.1 whose maximum length does not exceed 86 m shall be equipped with stern anchors whose total mass is equal to 25% of mass, P. Vessels whose maximum length exceeds 86 m shall be equipped with stern anchors whose total mass is equal to 50% of mass, P, determined in accordance with formula 4.2.1 or 4.2.2.

4.2.8 Stern anchors are required for lighters. Vessels for which the stern anchor mass would be less than 150 kg the decision on providing stern anchors rests with the Owner (for vessels mentioned in paragraph 4.2.3, the reduced mass of the bow anchors shall be taken into account to determine the mass of stern anchors). PRS recommends that stern anchors be applied if the vessel operates in narrow waterways where the vessel turn upstream is impossible.

4.2.9 Vessels intended to propel rigid convoys which do not exceed 86 m in length shall be equipped with stern anchors whose total mass is equal to 25% of maximum mass *P* determined in accordance with formula 4.2.1 or 4.2.2 for the formations (considered to be a nautical unit). The maximum mass of those calculated for the formations intended in the vessel service (in accordance with its technical characteristics) including formations permitted and entered in the Community Certificate (if required) shall be taken.

4.2.10 Vessels intended to propel rigid convoys which do not exceed 86 m in length downstream shall be equipped with stern anchors whose total mass is equal to 50% of maximum mass, *P*, determined in accordance with formula 4.2.1 or 4.2.2 for the formations (considered to be a nautical unit). The maximum mass of those calculated for the formations intended in the vessel service (in accordance with its technical characteristics) including formations permitted and entered in the Community Certificate (if required) shall be taken.

4.2.11 Total mass, *P*, specified for bow anchors may be distributed between one or two anchors. It may be reduced by 15% where the vessel is equipped with only a single bow anchor and the hawse pipe is located amidships. Total mass, *P*, required for stern anchors for pushers and vessels whose maximum length exceeds 86 m may be distributed between one or two anchors. The mass of the lightest anchor shall not be less than 45 % of that total mass.

4.2.12 Anchor masses established in accordance with paragraphs 4.2.1 to 4.2.7 and 4.2.9 to 4.2.11 may be reduced for certain special anchors see 4.3.1.

4.2.13 Cast iron anchors are not permitted.

4.2.14 The mass of every anchor shall be indicated on it in characters which stand out in relief in a durable manner.

4.3 Special Anchors with Reduced Mass

4.3.1 Specification of Authorized Anchors

4.3.1.1 Table 4.3.1.1 contains information on special anchors with reduced mass authorized by the competent authorities.

Table 4.3.1.1

Anchor No.	Type of anchor	Authorized reduction of anchor mass (%)	Competent authority
1	HA-DU	30	Germany
2	D'Hone Spezial	30	Germany
3	Pool 1 (hollow)	35	Germany
4	Pool 2 (solid)	40	Germany
5	De Biesbosch-Danforth	50	Germany
6	Vicinay-Danforth	50	France
7	Vicinay AC 14	25	France
8	Vicinay Type 1	45	France
9	Vicinay Type 2	45	France
10	Vicinay Type 3	40	France

Anchor No.	Type of anchor	Authorized reduction of anchor mass (%)	Competent authority
11	Stockes	35	France
12	D'Hone Danforth	50	Germany
13	Schmitt high holding anchor	40	Netherlands
14	SHI high holding anchor , type ST (standard)	30	Netherlands
15	SHI high holding anchor, type FB (fully balanced)	30	Netherlands
16	Klinsman anchor	30	Netherlands
17	HA-DU-POWER anchor	50	Germany

4.3.2 Authorization and Test Procedure of Special Anchors with Reduced Mass

4.3.2.1 Special anchors with reduced mass referred to in paragraph 4.2.12 shall be authorized by the competent authorities. The competent authority determines the authorized reduction of anchor mass for special anchors in accordance with the procedure outlined below.

4.3.2.2 Authorization as a special anchor is only possible if the reduction of anchor mass established is at least 15%.

4.3.2.3 Application for the authorization of a special anchor in accordance with paragraph 4.3.2.1 shall be submitted to the competent authority. Ten copies of the following documents shall be forwarded with each application:

– an outline of the dimensions and mass of the special anchor, giving the main dimensions and type designation for each available anchor size;
– a braking force diagram for the reference anchor A (in accordance with paragraph 4.3.3.2) and the special anchor B to be authorized which has been prepared and assessed by an institution designated by the competent authority.

4.3.2.4 The competent authority notifies the Commission of any applications to reduce anchor mass which it considers to authorize after testing. The competent authority consequently notifies the Commission of any authorized special anchor, giving its type designation and authorized reduction of anchor mass. The competent authority grants authorization to the applicant at latest 3 months after notifying the Commission – provided that the latter does not raise objections.

4.3.3 Test Procedure

4.3.3.1 The braking force diagrams in accordance with paragraph 4.3.2.3 shall show the braking forces as a function of speed for the reference anchor A and the special anchor B to be authorized on the basis of tests in accordance with paragraphs 4.3.3.2 to 4.3.3.5. In paragraph 4.3.4, one possible braking force test is shown.

4.3.3.2 The reference anchor A used in the tests shall be a conventional folding stockless anchor corresponding to the sketch and details given below, with a mass of at least 400 kg.

A tolerance of ±5% applies to the dimensions and mass given. However, the surface area of each fluke must be at least 0,15 m^2.

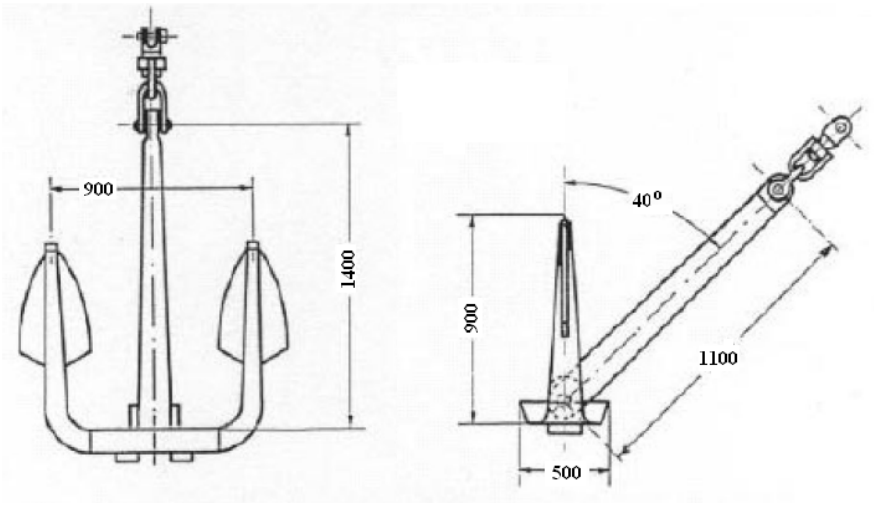


Fig. 4.3.3.2

4.3.3.3 The mass of the special anchor B used in the tests shall not deviate by more than 10% from the mass of the reference anchor A. If the tolerances are greater, the forces shall be recalculated proportionally to mass.

4.3.3.4 Braking force diagrams shall give a linear representation of speed v in the range 0 to 5 km/h (speed over ground). To this end, three tests shall be carried out in an upstream direction for the reference anchor A and the special anchor B on an alternating basis over each of two stretches of river determined by the competent authority, one with coarse gravel and one with fine sand. On the River Rhine the stretch between 401 and 402 km of the river can serve as a reference stretch for the coarse gravel tests and the stretch between 480 and 481 km of the river for the fine sand tests.

4.3.3.5 For each test, the anchor being tested shall be towed with a steel wire cable whose length between the points of connection on the anchor and one the towing craft above the anchorage ground is 10 times the height of the connection point on the craft above the anchorage ground.

4.3.3.6 The percentage of reduction of anchor mass shall be calculated in accordance with the following formula:

$$r = 75 \cdot \left(1 - 0.5 \frac{PB}{PA}\left(\frac{FA}{FB} + \frac{AA}{AB}\right)\right) \quad [\%] \qquad (4.3.3.6)$$

where:

r – percentage of reduction of anchor mass of special anchor B in relation to reference anchor A;
PA – mass of reference anchor A;
P – mass of special anchor B;
FA – holding force of reference anchor A at v = 0.5 km/h;
FB – holding force of special anchor B at v = 0.5 km/h;
AA – surface area on the braking force diagram defined by:
- the line parallel to the y-axis at v = 0 km/h;
- the line parallel to the y-axis at v = 5 km/h;
- the line parallel to the x-axis at holding force F = 0 kN;
- the braking force curve for reference anchor A;

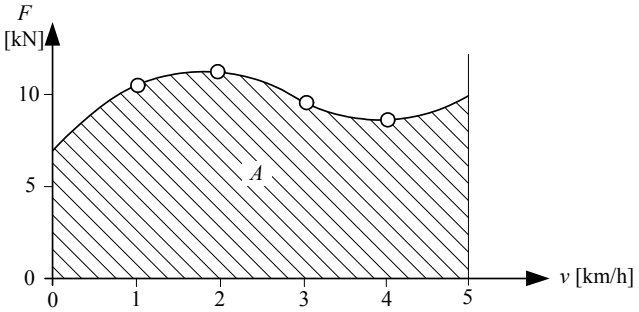


Fig. 4.3.3.6. Model braking force diagram

AB – surface area on the braking force diagram defined by*:*

- the line parallel to the y-axis at $v = 0$ km/h;
- the line parallel to the y-axis at $v = 5$ km/h;
- the line parallel to the y-axis at holding force $F = 0$ kN;
- the braking force curve for special anchor B.

4.3.3.7 The acceptable percentage is the average of six values of *r* calculated in accordance with paragraph 4.3.3.6.

4.3.4 Example of an Anchor Test Method with a Single-file Two-part Pushed Convoy

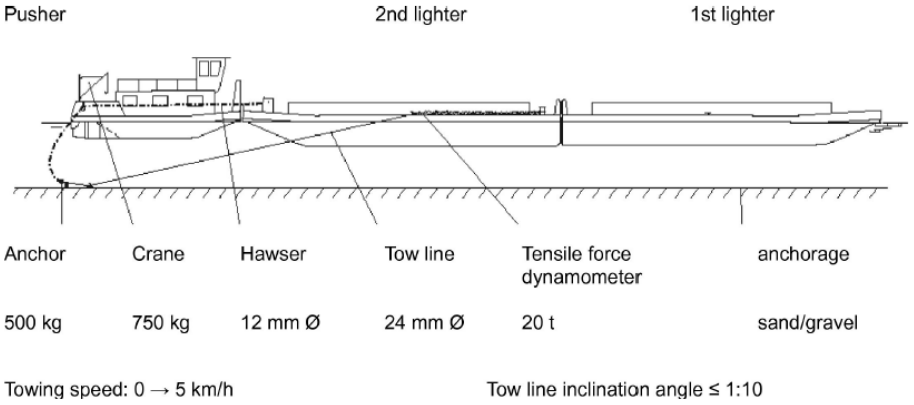


Fig. 4.3.4

4.4 Anchor Chains and Lines

4.4.1 Each bow anchor chain shall have the following minimum length:

.1 40 m – for vessels with length *L* not exceeding 30 m,

.2 10 m longer than length of vessel *L* – for vessels with length *L* more than 30 m and up to 50 m,

.3 60 m – for vessels with length *L* more than 50 m.

4.4.2 Each stern anchor chain shall have at least 40 m in length. Where vessels need to stop facing downstream, they shall have stern anchor chains of at least 60 m in length each.

4.4.3 Minimum tensile strength, *R*, of anchor chains shall be determined in accordance with the following formulae:

.1 for anchors having a mass not exceeding 500 kg:

$$R = 0.35P_1 \quad \text{[kN]} \qquad (4.4.3\text{-}1)$$

.2 for anchors having a mass of more than 500 kg and not exceeding 2 000 kg:

$$R = \left(0.35 - \frac{P_1 - 500}{15000}\right)P_1 \quad \text{[kN]} \qquad (4.4.3\text{-}2)$$

.3 for anchors having a mass of more than 2 000 kg:

$$R = 0.25P_1 \quad [\text{kN}] \tag{4.4.3-3}$$

where:

P_1 – theoretical mass of each anchor determined in accordance with paragraphs 4.2.1 to 4.2.7 and 4.2.9 to 4.2.11, [kg].

Anchor chains shall be selected in accordance with the relevant standards in force. Where anchors have mass greater than that required in accordance with paragraphs 4.2.1 to 4.2.7 and 4.2.9 to 4.2.11, the anchor chain tensile strength shall be determined as a function of the actual anchor mass. If heavier anchors with respectively stronger anchor chains are aboard, only the minimum masses and minimum tensile strengths required in accordance with paragraphs 4.2.1 to 4.2.7, and 4.2.9 to 4.2.11 and 4.4.3 shall be entered in the Community Certificate.

4.4.4 Application of anchor steel ropes (lines) instead of anchor chains is permitted. The lines shall have the same tensile strength as that required for chains, but shall be longer by 20%. It is recommended that a chain segment of a length of more than 1 m and not exceeding 5 m be used between an anchor and anchor line.

4.4.5 Between the anchor and anchor chain or anchor line a connecting piece (swivel) shall be applied. The connecting pieces (swivels) shall withstand a tensile load higher by 20% than the tensile strength of the corresponding chain or cable.

4.4.6 The requirements for anchor chains and anchor lines in respect of their material and characteristics are specified in *Part IX – Materials and Welding,* of the *Rules for the Classification and Construction of Sea-going Ships*.

4.5 Securing of Anchors, Anchor Chains and Anchor Lines

4.5.1 Provision shall be made to stop the anchor chain or anchor line while the vessel is lying at anchor. This may be achieved by a stopper, windlass brake or other effective means.

4.5.2 Effective means shall be provided for securing the anchor in its voyage position.

4.5.3 End lengths of anchor chains or anchor lines shall be so connected to the hull as to enable them to be released when necessary.

The connection shall be so designed as to be readily disengageable irrespective of whether the anchor chain (or line) is loaded or not.

4.5.4 Components of the chain releasing device shall be checked, by calculations, for strength assuming that they are subjected to 0.6 the chain breaking load. The stresses occurring in the chain releasing device components shall not exceed 0.95 of the applied material yield point.

4.5.5 On vessels having anchor of 700 kg in mass and above, the chain releasing device shall be operable from the deck to which permanent and ready access is provided. Anchor chain releasing device thread shall be self-locking.

4.5.6 Anchor chain locker shall have sufficient capacity to accommodate the whole anchor chain. The chain locker shape shall be such as to ensure easy leading of the chains through the hawse pipe, their self-laying in the chain locker and free running out of the chain when dropping the anchor.

On vessels intended to carry goods which are not dangerous, a chain locker drainage system may be provided.

On oil tankers, chain lockers located in spaces where is the risk of explosion shall be watertight and chain pipes shall be fitted with closing arrangements to minimise the quantity of water which may penetrate into the chain locker.

4.5.7 Thickness of the hawse pipe shall not be less than 0.4 times the diameter of the used chain.

4.6 Windlasses

4.6.1 Windlasses shall be fitted on board the vessel for dropping and hoisting anchors of 50 kg in mass and above, as well as for holding the vessel while at anchor. For anchors of a mass exceeding 500 kg, it is recommended that a power-operated windlass be fitted.

4.6.2 On vessels carrying oil and flammable chemicals, the construction of windlass foundation shall allow free air circulation under the windlass. In general, internal combustion engines shall not be used for the windlass drive on such vessels. Application of such engines is subject to PRS consent in each particular case.

4.6.3 Construction of windlasses shall provide for the safe working conditions, among others by means of appropriate arrangements to prevent inadvertent release of the loaded chain or line. Windlasses without an automatic brake shall be fitted with brakes adequate to the pulling force.

4.6.4 Hand-operated windlasses shall be fitted with devices to prevent kickback of the crank. Powered and hand-operated windlasses shall be so designed as to preclude the manual drive shaft being set in motion by the mechanical drive.

4.6.5 Windlasses shall fulfil the requirements specified in *Part VI – Machinery and Piping Systems* and in *Part VII – Electrical Equipment and Automation*.

5 MOORING EQUIPMENT

5.1 General

5.1.1 Every vessel shall be provided with mooring equipment for warping to coastal or floating berths and for proper fastening the vessel thereto.

5.1.2 The number, kinds of mooring mechanisms and appliances, as well as their arrangement on the vessel shall be determined on the basis of structure particulars, designation, size and general arrangement of the vessel.

5.1.3 The mooring appliances shall be so arranged as to allow vessels to be attached side by side when preparing them for navigation in convoy.

5.2 Mooring Ropes

5.2.1 Vessels shall be fitted with three steel wire mooring ropes. The minimum lengths of the ropes shall be as follows:

.1 the first rope – L+20 m, but not more than 100 m,

.2 the second rope – 2/3 of the first rope length,

.3 the third rope – 1/3 of the first rope length.

For vessels having the length L less than 20 m, the third, shortest rope, is not required.

Ropes which are part of the coupling device shall not be considered as mooring ropes.

5.2.2 The breaking load, R_s, of the ropes specified in 5.2.1 shall be determined by the following formulae:

.1 for $LBT \leq 1000$ m^3:

$$R_s = 60 + \frac{LBT}{10} \quad \text{[kN]} \tag{5.2.2-1}$$

.2 for $LBT > 1000$ m^3:

$$R_s = 150 + \frac{LBT}{100} \quad \text{[kN]} \tag{5.2.2-2}$$

Steel wire mooring ropes may be replaced by ropes made of another material, having the same length and minimum breaking load.

For vessels navigating on the European Union inland waterways, the type 3.1 certificate in accordance with European standard EN 10204:1991 shall be carried on board. The minimum breaking load of the rope shall be given in this certificate.

5.2.3 In tankers carrying flammable liquids having a flash-point not exceeding 60ºC, the use and stowage of steel wire mooring ropes only on the superstructure decks, which do not form the upper shell of cargo compartments is permitted, provided that no pipelines for loading and unloading the cargo are carried through these decks and that they are located at a distance not less than 3 m from the spaces containing the flammable liquids.

5.2.4 The requirements concerning the materials and properties of mooring ropes are specified in *Part IX – Materials and Welding* of the *Rules for the Classification and Construction of Sea-going Ships*.

5.3 Mooring Equipment

5.3.1 Mooring equipment shall be so designed as to ensure the position of the rope at right angle to the axis of rotation of mooring mechanisms.

In way of passageways, the mooring equipment shall be located as close to the ship's side as practicable.

5.3.2 Mooring equipment shall be arranged on deck in such a way that it is readily accessible and the clearance required for safe operation is available. The mooring equipment shall be protected against movable parts of deck machinery and other appliances, the requirements of 5.2.3 being taken into account.

Mooring equipment workstations shall be such as to protect the equipment operators against slipping.

Mooring mechanisms control posts shall be arranged in such a way that there is no danger of injury for the operators in the event of the rope breakage.

In the case of manual mooring operations, the arrangement of mooring bollards, open fairleads and closed fairleads in relation to one another, as well as the height of their mounting to the vessel shall be such as to ensure a safe putting of mooring ropes on the bollards, including the ropes laying, as well as proper arrangement of the ropes on bollards, so that they will not pile up.

5.3.3 The selection of mooring equipment shall be made in accordance with industry standards (e.g. ISO 3913 – 1977/Add.1:1980) accepted by PRS.

Any weld joints or their equivalents connecting the mooring equipment to the supporting structure are part of the equipment and are subject to industry standards applicable to this equipment.

Where the mooring equipment is not selected in accordance with a recognized industry standard, the load used to assess its strength and the strength of its attachment to the vessel shall comply with requirements of paragraphs 5.3.4 and 5.3.5.

5.3.4 Subject to the requirements of paragraph 5.3.3, bollards, closed fairleads and open fairleads, as well as other mooring appliances and their seats shall be so selected that when subjected to the load equal to the breaking load of the mooring rope for which they are intended, the stresses in their parts do not exceed 0.95 times the yield stress of material the parts are made of.

In the case of grey iron castings, the safety factor shall be not less than 2.

The breaking load of the mooring rope stopper shall be not less than 0.15 times the breaking load of the rope for which the stopper is intended.

5.3.5 Mooring bollards shall be situated on seats attached to the deck or shall penetrate the deck. Bollards with seating arrangements penetrating the deck shall not be used on decks forming the upper shell of compartments intended for the carriage or storage in bulk of flammable liquids having a flash-point below 60°C.

5.3.6 Where steel wire mooring ropes are used, the minimum diameter of the bollard shall be 10 times the diameter of the rope; in the case of fibre ropes – this value may be lesser. The minimum diameter of fairlead rollers shall be 5 times the rope diameter.

5.3.7 Mooring bollards shall be made of steel, cast steel or cast iron. In vessels in which only natural or synthetic fibre mooring ropes are used, bollards made of light alloys are permitted. Bollards may be welded or cast.

5.3.8 Mooring equipment shall be located on longitudinals, beams and/or girders, which are part of deck construction so as to ensure efficient distribution of the mooring load. Where necessary, additional stiffenings and/or brackets shall be added to enable direct transmission of loads from machinery foundations/bollards to strengthening system under deck plating. The size of stiffeners and brackets shall be chosen considering the mooring ropes breaking force, so that stresses in the structure do not exceed permissible values.

6 COUPLING DEVICES

6.1 General Requirements

6.1.1 The requirements of the present Chapter apply to pushers and self-propelled vessels intended for pushing purposes provided with coupling devices, fitted at the bow, incorporating coupling ropes, as well as to barges pushed in rigid pushed convoys.

6.1.2 The requirements of the present Chapter apply exclusively to convoys operating on inland waterways. In the case of rigid convoys, operation of the craft is limited to operating area 2 (the wave height up to 1.2 m).

Types of convoys, other than those specified in 6.1.1, as well as coupling devices of vessels forming convoys using articulated coupling, side-by-side coupling and other systems, not defined above, are subject to separate consideration of PRS.

6.1.3 Vessels intended for navigation in pushed convoys shall be equipped with suitable coupling devices in accordance with the anticipated system of forming the convoys and navigation conditions. The number and arrangement of such devices shall ensure a safe connection to other vessels.

6.1.4 Vessels which are to be used for pushing purposes (pushers) shall be provided with suitable pushing devices. The vessels intended for being pushed shall be equipped with coupling devices, bollards or equivalent devices in number and so arranged as to ensure a safe connection to other craft in the convoy.

6.1.5 Rigidity of the rope coupling shall be attained by pre-tension of the rope. To exert rope pretension, winches with a sufficiently long coupling rope shall be used. The coupling device for convoys navigating in operating area 2 shall be fitted with a shock absorber.

6.1.6 Coupling devices of pushers, self-propelled vessels intended for pushing and barges in the pushed convoy, connected to other barges ahead of them, shall be fitted at the bow, on deck reinforcements or on additional reinforcements ensuring efficient distribution of load.

Pushed barges shall be provided with coupling devices fitted at the stern, on deck reinforcements or on additional reinforcements ensuring efficient distribution of load.

6.1.7 The design of the coupling device shall ensure forming an assembly of a vessel and barges being in different loading conditions.

6.1.8 The parts of the coupling device shall not project beyond the sides of the vessel.

6.1.9 The coupling devices shall be so arranged on the deck as not to interfere with the operation of other devices and shall be easy to operate. Ropes shall be guided as close as possible to the deck and shall not be led over the hatchway covers.

The convoy vessels shall be connected in such a way as to enable crew's easy and safe cross-over between the coupled vessels with the coupling devices connected.

6.1.10 For the purpose of longitudinal connection of the convoy craft, at least two systems of coupling ropes shall be provided – one system at each side.

6.1.11 Roller fairleads shall be used for guiding the coupling ropes.

6.1.12 The use of bollards and other mooring equipment for coupling the vessels is permitted, provided that the calculated coupling forces do not exceed the permissible values and the number of the bollards used do not interfere with normal mooring operations.

6.1.13 If pushed barges are also intended for towing, the towing device of the barges shall comply with the requirements given in 7.2.

6.1.14 Each rope shall be put around bollards or similar mooring equipment in not more than three turns.

6.2 Forces and Permissible Stresses

6.2.1 Due to the fact that turning ability of pushed convoys depends on the rudder surface area and the type of the applied steering gear (conventional rudders, steering nozzles, etc.), it is recommended that coupling devices should be selected on the basis of experimental tests or specialist literature. Where detailed calculations of loads at connection points or the results of measurements taken on model or prototype are not available – the forces acting in the coupling devices of rigid convoys and the required breaking load of the rope shall be determined in accordance with the requirements given below.

6.2.2 The coupling force, F_{SB}, acting in the longitudinal direction on one side in the contact point between the pusher and pushed lighters or other craft shall be taken not less than:

$$F_{SB} = 0.27 N_p \frac{L_s}{B_s} \text{ [kN]} \qquad (6.2.2\text{-}1a)$$

The coupling force, F_{SF}, acting in the longitudinal direction on one side in the contact point between the pushing motor vessel and pushed craft shall be taken not less than:

$$F_{SF} = 0.08 N_p \frac{L_s}{h} \text{ [kN]} \qquad (6.2.2\text{-}1b)$$

where:
N_p – main engine power output, [kW],
L_s – distance from the stern of the pusher or pushing craft to the contact point, [m],
B_s – breadth of the pushing craft, [m],
h – respective lever arm of the longitudinal connection, [m] (see Fig. 6.2.3).

The actual breaking strength of the rope, F_{rp}, shall be not less than determined by the formula:

$$F_{rp} = k_r \frac{F}{n_i} \text{ [kN]} \qquad (6.2.2\text{-}2)$$

where:
F – actual breaking strength of the rope equal to F_{SB} or F_{SF}, according to formula 6.2.2-1a or 6.2.2-1b, [kN],
k_r – safety coefficient, $k_r = 1.5$
n_i – total number of the ropes on one side of the convoy in the contact point.

6.2.3 The coupling force, F_{SL}, acting in the longitudinal direction on one side in the contact point between the pushed craft shall be taken not less than:

$$F_{SL} = 0.08 N_p \frac{L'_s}{h'_k} \text{ [kN]} \qquad (6.2.3\text{-}1)$$

where:
N_p – main engine power output, [kW],
L'_s – distance from the stern of the pusher or pushing craft to the contact point, [m],
h'_k – respective lever arm of the longitudinal connection, [m] (see Fig. 6.2.3).

The value of F_{SL} for a pushing craft at the contact point between the first pushed craft and the craft coupled ahead of it need not be greater than 1200 kN. For the contact points of all other longitudinal connections between pushed craft, the dimensioning of the coupling devices shall be based on the coupling force determined according to formula 6.2.3-1.

The actual breaking strength of the rope, F_{rb}, shall be not less than determined by the formula:

$$F_{rb} = k_r \frac{F_{SL}}{n_i} \quad [\text{kN}] \tag{6.2.3-2}$$

where:
F_{SL} – actual breaking strength of the rope, according to formula 6.2.3-1, [kN],
k_r – safety coefficient, k_r = 1.5,
n_i – total number of the ropes on one side of the convoy in the contact point.

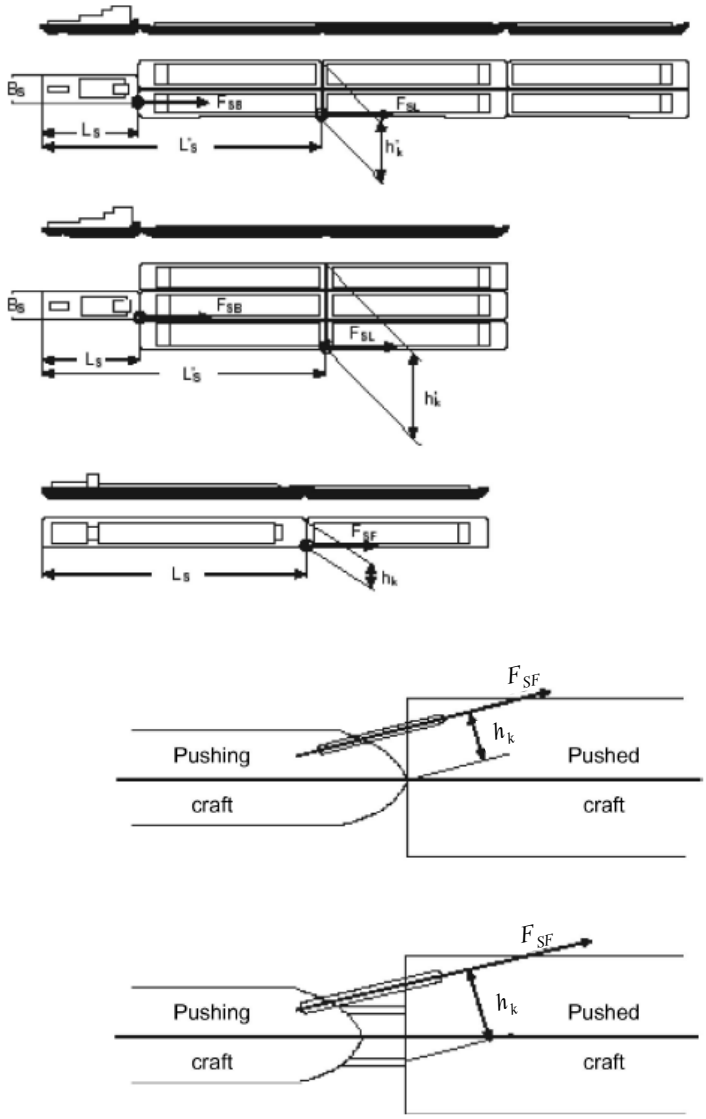


Fig. 6.2.3

6.2.4 The transverse force acting on the vessel at contact points, F_y, shall be calculated from the formula:

$$F_y = 0.1 N_p \quad [\text{kN}] \tag{6.2.4}$$

where:
N_p – main engine power output of the pusher, [kW].

6.2.5 The vertical force acting on the convoy navigating in operating area 2, at contact points, F_z, shall be calculated from the formula:

$$F_z = 1.64 t A_{WL} \quad [\text{kN}] \tag{6.2.5}$$

t – relative movement of the vessels in the pushed convoy, [m]; where data are not available, the following values may be taken:
t = 0.3 m – for barges with a length ≤ 30 m,
t = 0.2 m – for barges with a length ≥ 60 m;
t – for intermediate lengths of barges to be determined by interpolation,
A_{WL} – waterline cross-sectional area of the pusher, [m^2].

The vertical forces acting on convoys navigating in operating area 3 shall be taken as half of those calculated according to formula 6.2.5.

6.2.6 The calculation of the rope pre-tension is subject to special consideration of PRS in each particular case. It is assumed that this force shall be not less than 1/6 of the actual breaking load of the rope.

6.2.7 All parts of hand-operated winches intended for tensioning the coupling rope, where the rope is wound on the drum by moving a wheel, shall be so constructed and protected as to withstand the load equal to the breaking load of the rope. Pawls and racks in such appliances shall not be made of cast iron.

6.2.8 Equivalent stresses in other elements of coupling devices (bollards, rollers, hooks, catches, etc.) for the load equal to the coupling rope breaking load shall not exceed 0.9 times the yield stress of the material from which they are made. This requirement applies to all types of pushed convoys. The equivalent stresses shall be calculated from the formula:

$$\delta_{zr} = \sqrt{\sigma^2 + 3\tau^2} \quad [\text{MPa}] \tag{6.3.8}$$

where:
σ – normal stresses in the considered cross-section, [MPa],
τ – shear stresses in the considered cross-section, [MPa].

6.2.9 Coupling equipment shall be located on longitudinals, beams and/or girders, which are part of the deck construction or are added thereto (where necessary) so as to facilitate transmission of load from coupling ropes through foundations structure to strengthening system under deck. The stiffeners size shall be so chosen that stresses in coupling ropes do not exceed permissible stresses as defined in 6.2.8.

7 TOWING ARRANGEMENTS

7.1 General Requirements

7.1.1 Every vessel shall be provided with arrangements enabling it to be towed, consisting of towing ropes, towing bollards and fairleads, within the scope depending on the type of the vessel. Unmanned vessels, including pushed barges, need not be provided with towing ropes.

7.1.2 Tugs and pusher tugs shall be fitted with towing arrangements.

7.1.3 The required towing arrangements include:

- **.1** towing ropes; the number of the towing ropes shall be appropriate for the performed towing operations;
- **.2** towing hooks;
- **.3** towing hook release device;
- **.4** towing bollards, belaying cleats,
- **.5** towing beams and other arrangements for leading the towing rope (rollers, leading sheaves, etc.), as well as bollards and other elements preventing the line from being swung overboard;
- **.6** towing winches.

All components of the towing arrangements, as well their fastenings shall be so selected that when subjected to the load equal to the towing rope breaking load, the stresses in these components will not exceed 0.95 times the yield stress of the material from which they are made.

7.1.4 Towing equipment shall be arranged in such a way that its use will not constitute a hazard to the safety of the crew, the vessel or the cargo. The towing arrangements shall be located on deck reinforcements or on additional reinforcements ensuring efficient distribution of load. Where necessary, additional stiffenings and/or brackets shall be added to enable direct transmission of loads from the bollard or foundations of other items of towing equipment to strengthening system under deck plating. The size of stiffeners and brackets shall be chosen considering towing rope breaking force, so that stresses in the structure do not exceed permissible values.

7.1.5 The towing arrangements shall consist of winches or a tow hook. The towing arrangements shall be located ahead of the propeller plane. This requirement does not apply to tugs steered by their propulsion units, such as rudder-propellers or cycloidal propellers.

7.1.6 No part of the towing arrangement operating under the load from the towing rope tension, subjected to tensile loads or bending shall be made from cast iron.

7.1.7 Craft of the length L exceeding 86 m shall not be authorized for towing downstream.

7.2 Towing Ropes

7.2.1 Every self-propelled vessel adapted to towing other vessels and every pusher shall be fitted with at least one steel towing rope of not less than 100 m in length.

7.2.2 The minimum breaking load of the towing rope, R_h, shall be determined by the formulae:

.1 for tugs:

$$R_h = 1/3N \quad [\text{kN}] \tag{7.2.2.1}$$

but $R_h > 2.5F_h$, where:

N – main engine power output of tug/pusher/vessel, [kW],

F_h – rated bollard pull of tug, [kN],

where the towing force of tug, F_h, may be determined on the basis of measurement by dynamometer or by calculation, depending on the effective power of the main engine, assuming the following values of the towing force per power unit:

- 166.5 N/kW – for tugs with fixed propeller;
- 220.0 N/kW – for tugs with controllable pitch propeller;
- 240.0 N/kW – for tugs with propeller in Kort nozzle;
- 280.0 N/kW – for tugs with controllable pitch propeller in Kort nozzle;
- 186.5 N/kW – for tugs with cycloidal propeller.

.2 for pushers and other vessels:

$$R_h = 1/4N \quad [\text{kN}] \tag{7.2.2.2}$$

7.2.3 For pushers and other self-propelled vessels operating on domestic inland waterways, the value of the towing rope breaking load may be assumed to be not lower than the value of the mooring rope breaking load; for pushers, the mooring rope breaking load, determined for a typical barge in a given pushed convoy, shall be taken.

7.2.4 Towing ropes may be made of steel, natural or synthetic fibre. When towing the barges carrying flammable liquids, the towing rope shall not cause sparking.

7.2.5 Towing ropes shall additionally comply with the requirements set forth in the *Rules for the Classification and Construction of Sea-going Ships*, paragraphs 4.2.1.2 to 4.2.1.4, *Part III – Hull Equipment*.

7.2.6 Tugs shall be equipped with a number of steel wire ropes that are suitable for their operation.

7.3 Towing Hooks

7.3.1 The type and the design of the towing hook shall correspond in the best possible way with the purpose and the service conditions of the tug.

7.3.2 Parts of the towing equipment transferring forces, as well as their fastening to the vessel's hull, except for towing ropes, shall be checked by calculation for the transfer of the total breaking load of the towing rope. Equivalent stresses in these parts shall not exceed 0.95 times the yield stress of the material from which they are made.

7.3.3 The towing hook shall be generally calculated as a curved bar. Where formulae for a simple beam model are used, permissible stresses shall be reduced by 35 per cent.

7.3.4 The towing hook shall be manufactured by blacksmith forging or drop forging. Relative elongation of the hook material shall be not less than 18 per cent. The manufacture of towing hooks from rolled materials (plates) will require a special consent of PRS.

7.3.5 The towing hook shall be of slip-type and be fitted with a towing rope release device operating efficiently in the range of loads on the towing hook from zero to three times the rated bollard pull of tug F_h and at any possible deflection of the towing rope from the centre plane of the vessel.

7.3.5.1 The towing hook capability of being released safely from the wheelhouse is not required if the design of the tug or pusher or other fittings prevent them against capsizing.

7.3.5.2 The force necessary to operate the towing rope release device shall not be greater than 160 N.

7.3.6 The towing hook shall be fitted with shock absorbers whose damping force shall be not less than 1.3 times the rated bollard pull of tug F_h. The towing hooks for tugs of the main engines total power output less than 220 kW need not be fitted with shock absorbers.

7.3.7 The safe working load (SWL) of the towing hook shall be not greater than the rated load. The rated pull of the tug, F_h, shall be assumed as the rated load. The SWL shall be marked on the towing hook.

7.3.8 Prior to installation on board the vessel, the towing hook shall be tested with a proof load equal to twice the SWL.

7.3.9 The components of the towing hook operating under load shall be made of material having PRS *Inspection Certificate*.

7.3.10 When determining the place for towing hook or towing winch installation on board the vessel, the requirements of *Part IV – Stability and Freeboard* shall be taken into account.

7.4 Towing Bollards

7.4.1 The requirements specified in 5.3.2 – 5.3.5 for mooring bollards and fairleads apply also to towing bollards and fairleads.

7.5 Towing Beams

7.5.1 In the after part of the tug, in the area of the towing rope possible deflection, towing beams – arranged across the vessel, from side to side – shall be provided or other devices guiding the towing rope shall be used. The number of towing beams for each tug shall be determined, depending on the length of the after part of the tug and the arrangement of the towing equipment. It is recommended that towing beams should be spaced 2.0 to 2.5 m apart.

7.5.2 The height of towing beams, as well as that of the bulwark shall ensure safe working conditions and free movement of the crew in way of the towing rope. Where necessary, people's access to dangerous areas shall be limited.

7.5.3 Towing beams, their supporting elements and other parts of the towing equipment, which come in contact with the towing rope, shall be made of pipes or a suitable bar. Towing beams shall be of a parabolic shape; wide and high beams shall be supported by trestle-shaped supports.

7.5.4 In vessels fitted with towing beams, towing rope side separators or cleats preventing the rope from slipping of the beams shall be used.

7.6 Towing Winches

Towing winches shall comply with the requirements specified in Part *VI – Machinery and Piping Systems*.

8 EQUIPMENT ENSURING UNOBSTRUCTED VIEW FROM THE WHEELHOUSE

8.1 General

8.1.1 Wheelhouse shall be arranged in such a way that the helmsman may at all times perform his task while the vessel is under way.

8.1.2 Under normal operating conditions, sound pressure generated by the vessel and measured at the level of helmsman's head at the steering position shall not exceed 70 dB(A).

8.1.3 Where a wheelhouse has been designed for radar navigation by one person, the helmsman shall be able to accomplish his task while seated and all of the display or monitoring instruments and all of the controls needed for operation of the vessel shall be arranged in such a way that the helmsman may use them comfortably while the vessel is under way without leaving his position or losing sight of the radar screen.

8.2 Requirements Regarding Unobstructed View

8.2.1 The wheelhouse shall be so designed that the helmsman has adequate visibility in all directions from the steering position.

8.2.2 The visibility from the wheelhouse is considered adequate if the following conditions are satisfied:

.1 the helmsman's field of unobstructed vision from his normal position is at least 240° of the horizon and at least 140° within the forward semicircle. If, at the field of unobstructed vision of at least 240°, no sufficient adequate unobstructed view is provided towards the rear, the inspection body may require other measures to be taken, in particular the installation of suitable auxiliary optical or electronic devices,

.2 no window frame, post or other obstacles lie within the helmsman's usual axis of vision,

.3 on pushers, coupling devices are clearly visible,

.4 subject to the requirements stated in 8.2.4 to 8.2.7, window visibility is ensured in all weather conditions, especially during the rain, snow and frost.

8.2.3 The area of unobstructed vision for the helmsman ahead of the vessel in an unladen state with half of its supplies but without ballast shall not exceed two vessel lengths or 250 m, whichever is lesser.

Optical and electronic means for reducing the area of obstructed vision shall not be taken into account during the inspection.

To further reduce any area of obstructed vision, only suitable electronic devices shall be used.

8.2.4 The height of the lower edge of the side windows shall be kept as low as possible and the height of the upper edge of the side and rear windows shall be kept as high as possible. In determining whether the requirements for visibility from the wheelhouse are complied with, the helmsman shall be assumed to have a height of eye of 1650 mm above the deck at the steering position.

8.2.5 The upper edge of the forward facing windows of the wheelhouse shall be high enough to allow a person at the steering position with the height of eye of 1800 mm a clear forward view to at least 10 degrees above the horizontal plane at eye-level height.

8.2.6 Provision shall be made for suitable means ensuring a clear view through the front windows in all weather conditions.

8.2.7 The glazing used in wheelhouses shall be made of safety glass and have a light transmission of at least 75 %.

To avoid reflections, the bridge front windows shall be glare-free or shall be so fitted as to preclude reflections. This requirement is considered complied with if the windows are inclined from the vertical plane so as to form an outward angle of not less than 10° and not more than 25°.

8.2.8 Passengers, when seated, shall not obstruct the view from the wheelhouse.

8.3 Retractable Wheelhouses

8.3.1 For some vessels, to ensure an adequately unobstructed view, the use of a retractable wheelhouse may be necessary.

8.3.2 Retractable wheelhouse and its securing appliances shall be so arranged as to ensure the safety of persons on board the vessel while securing the wheelhouse in its different vertical positions.

In all operating conditions, including electric power failure, the possibility for immediate switch-off of the securing appliances shall be provided.

8.3.3 The hoisting and lowering of the wheelhouse shall not hamper the operations performed from the wheelhouse.

8.3.4 The uppermost and lowermost positions of the wheelhouse shall be signalled visually.

8.3.5 The wheelhouse hoisting or lowering operations shall automatically trigger an audible and visual warning signal. The signal shall be clearly visible and audible in the area of the wheelhouse.

8.3.6 The wheelhouse alarm system shall be independent of other control and safety systems so that damage to these systems will not make the wheelhouse alarm system inoperable.

8.4 Wheelhouse Hoisting and Lowering Mechanism

8.4.1 The wheelhouse hoisting and lowering mechanism shall be capable of hoisting at least 1.5 times the weight of the wheelhouse fully equipped and manned.

8.4.2 The mechanism, referred to in 8.3.1, shall be so designed as to ensure its proper operation, without getting stuck, in all anticipated conditions of the wheelhouse asymmetric loading and under all anticipated angles of heel and trim of the vessel.

8.4.3 The wheelhouse hoisting and lowering mechanism shall be provided with a drive (hydraulic, electric, etc.) ensuring operation of the mechanism in all service conditions.

8.4.4 The wheelhouse hoisting and lowering mechanism shall enable stopping the wheelhouse in any position so as to allow the crew to safely enter and leave the wheelhouse.

8.4.5 Limit switches shall be provided for automatic stopping of the wheelhouse hoisting and lowering mechanism.

8.4.6 It shall be possible to perform the wheelhouse lowering operation in all conditions and by one person only.

8.4.7 Provision shall be made for emergency lowering of the wheelhouse from both the bridge and from a position outside the bridge. The emergency lowering of the wheelhouse shall be possible under all conditions and by means independent of the hoisting/lowering mechanism drive.

The speed of the wheelhouse emergency lowering shall be not less than the speed ensured by the hoisting/lowering mechanism drive.

8.4.8 The possibility of connecting the wheelhouse hoisting hydraulic system with other hydraulic systems shall be specially agreed with PRS.

9 OPENINGS IN HULL, SUPERSTRUCTURES AND DECKHOUSES AND THEIR CLOSING APPLIANCES

9.1 General Requirements

9.1.1 The structural requirements for the openings in hull, superstructures and deckhouses and their closing appliances are given in *Part II – Hull* and in *Part IV – Stability and Freeboard*.

9.1.2 Any type of closing appliances may be used, provided that protection against displacement is ensured.

9.1.3 All companion hatches, skylights and ventilating trunks may be closed with covers attached to their coamings by means of hinges.

9.2 Covers of Companion Hatches, Ventilating Trunks and Skylights

9.2.1 Covers of companion hatches, skylights and ventilating trunks shall be fitted with securing devices capable of being operated from outside of the cover. Where the hatches are also used as emergency exits, the securing devices shall be capable of being operated from both sides of the cover. When secured, the covers shall be tight in accordance with the requirements set forth in *Part IV – Stability and Freeboard* (Table 5.6.3). The tightness shall be provided by gaskets made of rubber or other suitable material.

9.2.2 For the purpose of the present sub-chapter, the manholes mean, in general, the openings without coamings which lead to trunks, tanks not intended for the carriage of cargo, etc.

The dimensions of manholes shall be at least 0.35 m × 0.45 m or – if the manholes are round – their diameter shall be at least 0.38 m.

9.2.3 The thickness of steel covers of manholes shall be not less than that of the plating surrounding the manhole, unless the spacing of cover stiffeners is bigger than that of deck stiffenings. If the spacing of cover stiffeners is bigger than that of deck stiffeners, the cover thickness shall be increased proportionally to deck thickness. The thickness of covers made from other material is subject to special consideration of PRS in each particular case. The covers shall have effective securing devices.

9.2.4 When secured, the covers of manholes shall be tight. The tightness shall be provided by a rubber gasket or a gasket made from other suitable material resistant to the action of liquids for the carriage of which the tank is intended. The tightness tests shall be carried out in accordance with the requirements of Chapter 8, *Part II – Hull*.

9.3 Doors

9.3.1 The number of doors in watertight bulkheads below the freeboard deck shall be limited to the minimum consistent with the design of the vessel and the safety of the vessel operation. In watertight bulkheads, doors operated from both sides of a bulkhead shall be used. The strength of the doors shall be equal to that of the bulkhead.

9.3.2 No openings, including doors are permitted in a collision bulkhead, an after peak bulkhead (excluding the situation described below), the bulkheads separating cargo holds from the crew spaces, engine room, boiler room and the associated work spaces. There shall be no doors in bulkheads separating the engine rooms from passenger areas or crew and shipboard personnel .

Doors in the after peak bulkhead are only permitted provided it can be determined by remote monitoring in the wheelhouse whether they are open or closed and that the following readily legible notice is displayed on both sides of the doors:

Close the door immediately after use.

9.3.3 Doors closed by their own weight or by falling mass are not permitted.

9.3.4 The external doors leading from the open deck to superstructures, deckhouses and companion ways shall open outwards and shall be weathertight.

Clear width of outer doors and their fire resistance (if applies) are to be compliant with the requirements of *Part V – Fire Protection.*

9.3.5 Crew accommodation spaces shall be directly accessible from the deck. Where such arrangement is not possible, exit to the deck through one emergency exit shall be provided. Doors in crew accommodation spaces shall be capable of being safely opened from both sides.

In addition, doors leading to workspaces shall be protected against their unauthorized opening or closure.

9.3.6 In crew accommodation spaces, the upper edge of the doors shall be situated at least 1.9 m above deck or floor, and a clear width of the doors shall be at least 0.6 m (see also requirements concerning the width of escape routes contained in *Part V – Fire Protection*). The specified height may be attained by the use of sliding or folding covers or flaps.

9.3.7 In crew accommodation spaces, the height of doorway sills shall not exceed 0.4 m, the requirements specified in 9.3.8 being also complied with.

9.3.8 The height of doorway sills in closed superstructures shall be 300 mm for operating area **1** and 150 mm for operating areas **2** and **3**. The height of doorway sills shall be determined with reference to safety clearance of opening (see paragraph 5.4.4, *Part IV – Stability and Freeboard*).

9.3.9 The direction of inner doors opening shall be compliant with the requirements of *Part V – Fire Protection*, sub-chapters 2.2 and 2.3 (for passenger ships, see 15.4.1).

9.4 Hatch Covers

9.4.1 The requirements regarding the construction and strength of covers are given in sub-chapter 5.10.6, *Part II – Hull*. The height of hatch coamings shall comply with the requirements specified in 5.6.5, *Part IV – Stability and Freeboard.*

9.4.2 Hatch covers shall be capable of withstanding the loads to which they are likely to be subjected. Hatch covers designed to be walked on shall be capable of withstanding the load of at least 75 kg. Hatch covers which are not designed to be walked on shall be clearly marked as such. Hatch covers designed to receive deck cargo shall have the permissible load in t/m^2 marked on them. Where supports are needed to achieve the maximum permissible load, this shall be appropriately indicated on the covers and the relevant documentation shall be kept on board.

9.4.3 Hatch covers shall be easily accessible and safe to handle. In particular, they shall be protected against being drifted by the wind or by loading gear.

Sliding covers shall be fitted with catches to prevent their accidental horizontal movement of more than 0.4 m; they shall be capable of being locked in their final position. Appropriate devices shall be fitted to hold stacked hatch covers in position.

Hatch cover components of more than 40 kg shall be designed to slide or fold or be fitted with mechanical opening devices.

9.4.4 Hatch covers shall be tight when secured, in accordance with the requirements specified in *Part IV – Stability and Freeboard* (Table 5.6.3). The tightness of hatch covers shall be ensured by the use of gaskets made of suitable material.

9.5 Cargo Tank Hatch Covers in Tankers

9.5.1 In tankers, the cargo tank hatchway openings shall be of a round or oval shape. The height of the hatchway coamings shall comply with the requirements specified in 5.6.5, *Part IV – Stability and Freeboard*, while the construction of the coamings shall comply with the requirements specified in *Part II – Hull*.

9.5.2 Covers of cargo tank hatchways shall be made of steel, bronze or brass.

Covers of cargo tank hatchways shall not be made of aluminum or aluminum alloys. The use of synthetic materials is subject to special consideration of PRS in each particular case.

9.5.3 Covers of cargo tank hatchways shall be permanently attached to their coamings and shall be tight when secured, under the inner pressure of liquid carried in the tank (tightness tests – see Chapter 8, *Part II – Hull*). The cover gasket shall be resistant to the action of the liquid carried in the tank.

9.5.4 The thickness of the cover steel plating shall be not less than the deck plating surrounding the cover and not less than 6 mm - where the spacing of hatch cover stiffeners is not greater than that of deck stiffeners. Where the spacing of hatch cover stiffeners is greater, the thickness of the cover steel plating in relation to the deck thickness shall be increased proportionally.

9.5.5 Sight-glasses in cargo tank covers shall have a clear diameter of 150 mm; other types of inspection openings are subject to special consideration of PRS in each particular case.

9.5.6 When selecting materials and designing the cargo hatchway covers for vessels carrying flammable liquids in tanks, particular attention shall be paid to the protection against sparks when opening and closing the cover.

9.6 Cargo Ports

9.6.1 The number of cargo ports shall be reduced to the minimum compatible with the design and proper operation of the vessel.

9.6.2 The lower edge of cargo port shall not be below the deepest load waterline.

9.7 Side Scuttles

9.7.1 Side scuttles, skyligths and windows in superstructures shall be capable of being closed and shall be at least weathertight.

9.7.2 The number of side scuttles in the hull plating below the freeboard deck shall be reduced to a minimum compatible with the design and service conditions of the vessel, as well as with the requirements specified in *Part IV – Stability and Freeboard*. Side scuttles shall be watertight and shall be fitted with fixed storm covers. Vessels intended for navigation in operating areas **2** and **3** may be provided with removable covers. The construction of side scuttles shall be in accordance with the relevant standards.

9.7.3 The glass of windows in skylights covers shall be hardened and be at least 5 mm in thickness if the inner diameter of side scuttles is 0.15 m or below.

Where the side scuttle diameter is greater, the glass shall be thicker. Where wire-reinforced glass is used, its thickness need not be greater than 5 mm and the glass need not be hardened.

9.7.4 In the first tier superstructure and deckhouse spaces, side scuttles of light type or rectangular windows of a design complying with the relevant standards may be fitted.

For the purpose of lighting the spaces located under the open freeboard deck, flush scuttles made of prismatic glass, provided with watertight frame mounted into the deck may be fitted. The glass surface shall be situated at the level of the outer surface of the deck plating. Flush scuttles shall be fitted in places affording the least risk of damage.

9.8 Emergency Exits

9.8.1 The number, design and dimensions of exits, including emergency exits shall be compatible with the purpose and size of the relevant space. Where any of these exits is an emergency exit, it shall be clearly marked as such.

9.8.2 Emergency exits from the crew accommodation spaces, including windows and skylights to be used as emergency exits shall have a clear opening of not less than 0.36 m^2 and the smallest clear dimension shall be not less than 0.5 m. Each such exit shall enable the space to be left quickly in an emergency.

9.8.3 Insulation and lining of escape routes shall be made of non-combustible materials.
Provision shall be made for using appropriate means, such as ladders and steps as escape routes.

9.9 Windows below the Margin Line

9.9.1 Windows may be situated below the margin line if they are watertight, cannot be opened, possess sufficient strength.

9.9.2 Window panes shall be manufactured from pre-stressed glass or laminated glass. They may also be made from a synthetic material, provided it is authorized for use in a fire-protection context.
Only pre-stressed glass complying with ISO 614, shall be used.

9.9.3 Round windows shall comply with ISO 1751 (for Series B: medium heavy-duty windows, type: non-opening window).

9.9.4 Angular windows shall comply with ISO 3903 (for Series E: heavy-duty windows, type: non-opening window).

9.9.5 ISO standard windows may be replaced by windows whose construction is at least equivalent to that determined by the requirements of paragraphs 9.9.2 to 9.9.4.

10 CREW ACCOMMODATION SPACES, SIDE DECKS, STAIRS, LADDERS AND SIMILAR DEVICES

10.1 Crew Accommodation Spaces

10.1.1 In the forward part of the vessel, the floors of the crew accommodation spaces shall be not more than 1.2 m below the plane of the maximum draught.

10.1.2 Headroom in the crew accommodation spaces shall be not less than 2.00 m.

10.1.3 The arrangement and layout of interior work spaces, including their dimensions shall be compatible with the work to be carried out and shall meet the health and safety requirements. The work spaces shall be fitted with sufficient non-dazzle lighting and with sufficient ventilation arrangements. If necessary, these spaces shall be fitted with heating appliances capable of maintaining an adequate temperature.

10.1.4 The floors of interior work spaces shall be solid and durable, and shall be designed not to cause tripping or slipping.

10.1.5 Openings in decks and floors shall, when open, be suitably protected to prevent a person from falling through the openings. Windows and skylights shall be so arranged and fitted that they can be operated and cleaned safely.

10.2 Side Decks

10.2.1 Side decks shall be fitted with foot rails.

10.2.2 The clear width of side decks shall be at least 0.6 m. That figure may be reduced to 0.5 m at certain points that are necessary for the operation of the vessel such as deck washing valves; at bollards and cleats – to 0.4 m.

10.2.3 Up to a height of 0.9 m above the side deck, the clear width of the side deck may be reduced to 0.50 m, provided that the clear width above, between the outer edge of the hull and the inner edge of the hold is not less than 0.65 m [1].

10.2.4 The requirement contained in 10.2.2 is applicable to the height of 2 m above the side deck.

10.3 Access to Work Spaces

10.3.1 Appropriate stairs, ladders or steps shall be installed in accesses, exits and passageways where there is more than a 0.5 m difference in floor level. Work spaces which are manned continuously shall be fitted with stairs if there is a difference in floor level of more than 1 m. This requirement does not apply to emergency exits.

10.3.2 Where there is no deck-level access to the crew accommodation spaces and the difference in level is more than 0.3 m, the crew accommodation space shall be accessible by means of stairs.

10.3.3 The clear width of passageways shall be not less than 0.6 m; for vessels with the breadth, *B*, not exceeding 8 m, the width of the passageway may be reduced to 0.5 m. The clear height of the passageway, including the sill shall be not less than 1.9 m.

10.3.4 Vessels with holds shall have at least one permanently installed means of access at each end of each hold.

The permanently installed means of access may be dispensed with if at least two movable ladders are provided which reach at least 3 rungs over the hatch coaming at an angle of inclination of 60^{o}.

10.3.5 Companionways and ladders providing access to engine and boiler rooms and bunkers shall be firmly attached and be made of steel or another shock-resistant and non-combustible material.

10.3.6 Points of access and passageways for the movement of persons and objects shall be so arranged that in front of the access opening, there is sufficient room not to impede movement.

10.3.7 Doors shall be so arranged that they can be opened and closed safely from either side. They shall be protected against accidental opening or closing.

10.4 Stairs, Ladders and Similar Devices

10.4.1 Stairs shall be safe, securely fixed and shall comply with the following requirements:

- **.1** the width of the stairs shall be not less than 0.6 m,
- **.2** the depth of the step shall be not less than 0.15 m; the step depth of at least 0.26 m is recommended,
- **.3** steps shall have non-slip surfaces,
- **.4** the clear width between handrails shall be not less than 0.6 m,
- **.5** stairs with more than 3 steps shall be fitted with at least one handle or handrail.

The requirements concerning stairs on passenger vessels are given in sub-chapter 15.8.

10.4.2 In addition, the construction of stairs shall be in accordance with PN-EN 13056. Each step shall be capable of withstanding the working load of 1.5 kN.

10.4.3 If the stairs are located in narrow spaces within the working area and are seldom used, it will be sufficient if they comply with the binding PN-EN 790 standard.

10.4.4 The clear width of ladders and steps shall be not less than 0.3 m; the rungs shall be spaced not more than 0.3 m and not less than 0.15 m apart.

10.4.5 Ladders and separately attached steps shall be clearly recognizable from above and shall be equipped with safety handles above exit openings.

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[1] This paragraph is a temporary requirement (according to Article 1.06 of Directive 2006/87/EC) and will be valid until 1 December 2016.

10.4.6 The minimum width of movable ladders shall be 0.4 m and the width of their base shall be at least 0.5 m. The ladders shall be protected against toppling or skidding; the rungs shall be securely fixed in the uprights.

10.5 Protection against Falling

10.5.1 Decks and side decks shall be flat and in no point be likely to cause tripping; it shall be impossible for puddles to form.

10.5.2 Decks, side decks, engine-room floors, landings, stairways and the tops of side deck bollards shall have non-slip surface.

10.5.3 The tops of side deck bollards and obstacles in passageways, such as the edges of steps, shall be painted in a colour contrasting with the surrounding deck.

10.5.4 The outer edges of decks and side decks shall be fitted with bulwarks that are at least 0.90 m high or with a guard rail in accordance with European standard EN 711. Work stations where persons might fall more than 1 m, shall be fitted with bulwarks or coamings that are at least 0,90 m high or with a guard rail in accordance with European standard EN 711. Where the guard rails of side decks are retractable:

a) a continuous handrail 0.02 to 0.04 m in diameter shall additionally be secured to the coaming at a height of 0.7 to 1.1 m; and
b) sign in accordance with Fig.10.5.4, shall be affixed in clearly visible positions at the point where the side deck begins, at least 15 cm in diameter.

Where there is no coaming, a fixed guard rail shall be installed instead[1].

Sign in blue and white

Fig. 10.5.4. 'Wear life jacket' sign

10.5.5 By way of derogation from paragraph 4, in the case of lighters and barges without accommodation, bulwarks or guard rails shall not be required where:

a) foot rails have been fitted to the outer edges of the decks and side decks;
b) handrails in accordance with 10.5.4 a) have been fitted to the coamings; and
c) signs in accordance with Fig. 10.5.4, at least 15 cm in diameter, have been affixed in clearly visible positions on deck[2].

10.5.6 By way of derogation from paragraph 10.5.4, in the case of vessels with flush- or trunk-decks it shall not be required that guard rails be fitted directly on the outer edges of those decks, or on side decks where:

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[1] This paragraph is a temporary requirement (according to Article 1.06 of Directive 2006/87/EC) and will be valid until 1 December 2016.

[2] This paragraph is a temporary requirement (according to Article 1.06 of Directive 2006/87/EC) and will be valid until 1 December 2016.

a) the passageway runs over those flush decks, surrounded by fixed guard rails in accordance with EN 711: 1995; and
b) signs in accordance with Fig. 10.5.4, at least 15 cm in diameter, have been affixed in clearly visible positions at the transitions to areas unprotected by guard rails[3].

10.5.7 At work stations where there is danger of falling more than 1 m the inspection body may require appropriate fittings and equipment to ensure safe working.

11 GUARD RAILS AND BULWARKS

11.1 General Requirements

11.1.1 All exposed parts of continuous decks and superstructure decks shall be protected at edges by appropriately high bulwarks or fixed guard rails.

The deck edge along the sides of the vessel shall be fitted with a toe rail (profile). If a coaming (face plate or a projecting shell plating) is provided at an appropriate distance from the installed guard rail, the toe rail (profile) is not required (see figure 11.1.1).

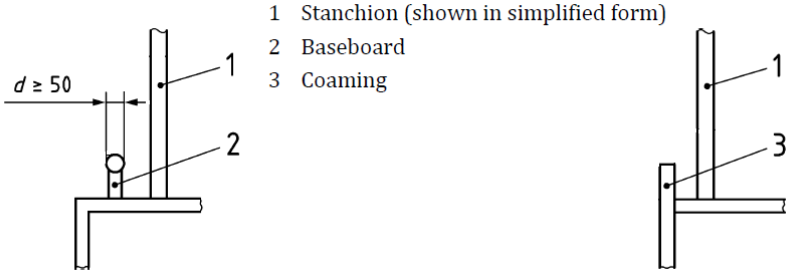


Fig. 11.1.1. Guard rails in way of deck edge

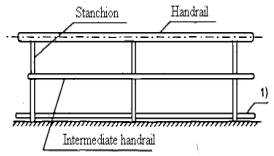
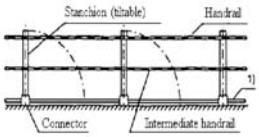
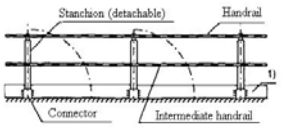
11.1.2 Workstations where a person might fall from a height greater than 1 m shall be fitted with a bulwark (or a hatchway coaming) that are at least 700 mm high or guard rails complying with the requirements given in Tables 11.2.1-1 and 11.2.1-2 that are at least 900 mm high.

11.2 Construction of Guard Rails

11.2.1 Guard rails shall comprise handrails and shall comply with PN-EN 711 (see tables 11.2.1-1,2).

[3] This paragraph is a temporary requirement (according to Article 1.06 of Directive 2006/87/EC) and will be valid until 1 December 2016.

Table 11.2.1-1
Types of guard rails

Area	Application	Design		Figure (simplified)	Material		Remarks on construction
		Symbol	Guard rail		Handrail	Intermediate handrail	
Working area	General in working area	CF	fixed [2]		metal section	metal section	Stanchions solidly connected to the deck
	On gangway where a solid handrail is an obstacle to cargo handling	CT	tiltable		wire rope or round steel chain	wire rope or chain	
	To prevent people from falling outside of the gang-way	CD			wire rope or round steel chain	wire rope or chain	Depending on position: connectors fixed to the coaming or to the deck with soft toe brackets

[1] Guard rails of CF and CT design are shown with a toe rail. Guard rail of CD design is presented with a hatchway coaming. Each type can have a toe rail or a coaming

[2] The guard rail is considered to be fixed even if it is tiltable in segments or detachable in special working areas.

Table 11.2.1-2
Sample dimensions of stanchions and handrails made of steel, [mm]

Area	Abbreviation	Interval between stanchions	Stanchion [4]		Handrail [4]		Intermediate rail [4]	
Working area	CF	≤ 1000	Steel tube [1]	42.4×2.6	Steel tube [1]	42.4×2.3	Round steel Diameter 20 mm [2]	
		≤ 1200		42.4×3.2		42.4×2.3		
		≤ 1600		48.3×3.2		42.4×2.3		
		≤ 1750		48.3×3.6		42.4×2.3	Steel tube [1]	42.4×2.3
		≤ 2000	Flat steel [2] [6]	60×10		42.4×2.3		42.4×2.3
		≤ 2800		60×15		42.4×2.6		42.4×2.6
		≤ 3000		60×15		42.4×3.2		42.4×`3.2
	CT CD	≤ 3000 (see also Tab.11.2.3)	Steel tube [1]	42.4x2.6	Steel cable[3] 6×19. Nominal diameter 8 mm		Round steel chain[5]. Nominal thickness 6.3 mm	

[1] Seamless and welded steel tubes according to EN 10220.

[2] Shipbuilding steel according to EN 10025-2.

[3] Round twisted rope according to ISO 2408.

[4] Dimensions of steel profile have been calculated for E = 2.1×10^5 MPa and for maximum bending stress equal to: σ = 160 MPa.

[5] Short link chain in accordance with ISO 1835.

[6] Measure the greatest resisting moment at right angle to handrail.

11.2.2 The structure under fixing points of guard rail posts shall be of strength not lesser than the strength required for the posts

11.2.3 Railings on ships with an aluminum alloy hull may be also made of aluminum alloys under condition that criteria given in tables 11.2.4 and 11.2.5 are taken into account.

11.2.4 Requirements regarding specific dimensions as shown in table 11.2.4 shall be met.

Table 11.2.4
Safety dimensions[1]

Working areas	
CF, CT, CD Type (fixed, tiltable, detachable)	
Distance between intermediate rail and deck	475 +/–25
Space between railing stanchions for steel chains	max. 2000
Space between railing stanchions for steel cables	max. 3000
Distance between upper edge of total rail or upper edge of coaming from deck	50^{+10}_{0}
Distance between inner edge of toe rail or of coaming from the inner edge of the stanchion	max. 100
Railing heights	950 +/–50

Note: General tolerances shall be according to ISO 2768-c.

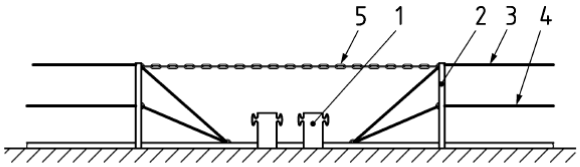
11.2.5 In table 11.2.5, evaluation loads and admissible deflections for stanchions, hand rails and intermediate rails are specified which have to be taken into account for testing sturdiness. Concurrent loading of the hand rail and intermediate rails or hand rail and intermediate rails or networks should not be included in the calculations for the stanchions.

Table 11.2.5
Sturdiness requirements

Abbreviation	Evaluation Loads [N]		Permissible deflection without permanent deformation [mm]	
			horizontal	vertical
CF	Hand rail per [m]	500	50	
	Intermediate rail per [m]	500	50	
CT CD	Stanchion	500	50	-
	Hand rail	200	200	
	Intermediate rail	200	200	

11.2.6 Sample designs of a railing in specific areas are shown in figure 11.2.6.

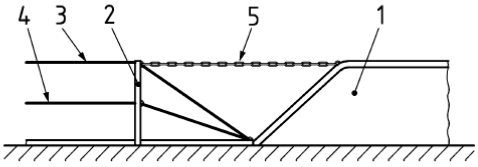
[1] All dimensions given in [mm].



Key

1 Mooring equipment
2 Tiltable stanchion
3 Hand rail
4 Intermediate rail
5 Round steel chain or steel cable

Sample design of a railing in area of the mooring equipment



Key

1 Bulwark
2 Tiltable stanchion
3 Hand rail
4 Intermediate rail
5 Round steel chain or steel cable

Sample design of a railing in the transition to the bulwark — working areas

Fig.11.2.6. Sample designs for areas of mooring equipment and transitions to bulwark

11.3 Bulwark

11.3.1 Height of Bulwark

The height of the bulwark shall be not less than:
900 mm – in cargo vessels amidships,
500 mm – in cargo vessels fore and after parts,
500 mm – in tugs and pushers.

11.3.2 Construction of Bulwark

The thickness of the bulwark plating and stays shall be not less than 3 mm. The stays shall be used as transverse strengthening at intervals of 4-6 frame spaces. The upper edge of the bulwark shall be longitudinally stiffened by a suitable section.

Where the stays are positioned other than in transverse beam plane, brackets or stiffeners transmitting loads from the stay to deck/side stiffener shall be added in the stay plane under deck.

Bulwark and hull structure in the region where stays are supported will be separately considered by PRS, taking into account wave loads and the load exerted by crew and/or passengers standing by the bulwark (in accordance with PN-EN 711 Standard).

11.3.2.1 Freeing Ports

In the bulwark of vessels navigating in area 1 and 2, freeing ports shall be applied in accordance with the below provisions:

.1 Where the bulwarks of height of 900 mm on the weather portions of upper deck form wells, the minimum freeing port area A in square meters on each side of the vessel for each well shall be determined in accordance with the following formula:

$$A = Kl \ [m^2] \qquad (11.3.2.2.1)$$

where:

K – dimensionless factor:

$K = 0.07$ for a vessel navigating in area 1;

$K = 0.035$ for a vessel navigating in area 2.

(for intermediate values, K shall be determined by linear interpolation);

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

For vessels without deck sheer, the value of A determined in accordance with formula 11.3.2.2.1 shall be increased by 50%.

.2 If the bulwark in way of well is more than 900 mm in average height h_s [mm], the area determined in accordance with paragraph 11.3.2.2.1 shall be increased in accordance with the following formula:

$$\Delta A = 0.004 \frac{\Delta h}{100} l \quad [\mathrm{m}^2] \qquad (11.3.2.2.2)$$

where:

l [m] – see 11.3.2.2.1;

ΔA – freeing port area increase;

$\Delta h = h_s$ – 1200 [mm]

.3 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:

$$\Delta A = 0.004 \frac{\Delta h}{100} l \quad [\mathrm{m}^2] \qquad (11.3.2.2.3)$$

where:

l [m] – see 11.3.2.2.1;

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 11.3.2.2.1.

.4 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.

12 CARGO HOLDS EQUIPMENT

12.1 Ceilings

12.1.1 In cargo vessels having single bottom, the bottom ceiling in holds shall be made of wood or steel plates, or of other materials upon PRS' consent. The type and thickness of materials used for the ceiling depend on the cargoes carried in the holds and the methods of their loading and unloading.

12.1.2 In vessels having double bottom, the wooden ceiling is not required; however, covers over bilge wells shall be provided.

12.1.3 The thickness of the wooden ceiling shall be not less than 40 mm. Covers or partly dismountable ceilings shall be fitted to provide access to bilge wells.

12.1.4 The steel plate ceiling shall be so fitted as to permit examination of the bottom members and of the bottom from the inside during periodical classification surveys. The connection of the steel plates with the bottom and side members, as well as with the shell plating shall be such as not to impair the hull structural members. Covers or partly dismountable floors shall be fitted to facilitate access to bilge wells.

12.1.5 When the ceiling is fitted on the double bottom, the ceiling planks shall be placed on battens of at least 15 mm in thickness, located in line with each floor or every second floor. The ceiling may be fitted directly on the inner bottom, provided it is protected by anticorrosive media.

12.2 Sheathing

12.2.1 Transverse and longitudinal bulkheads of fuel or oil fuel tanks adjacent to holds shall be sheathed on the hold side. The drains of bilges or wells shall be provided between the sheathing and the bulkheads.

12.2.2 To protect the vessel sides against sweating, it is recommended that in holds intended for the carriage of general cargo, the cargo battens (sweat battens) made of wood and having the dimensions of at least 25 × 100 mm should be fitted on the sides. The battens shall be spaced not more than 300 mm apart. Other effective means for the protection of the side against sweating on the hold side, particularly in the case of double skin construction, may be permitted.

13 OTHER EQUIPMENT

13.1 Miscellaneous Equipment

13.1.1 The vessel shall be provided with additional equipment including at least:

.1 a heaving line,

.2 a boarding gangway ladder of at least 0.4 m in width and at least 4 m in length, whose side edges are marked with brightly-coloured stripes; that gangway shall be equipped with a handrail. The inspection body may permit shorter gangways for small vessels,

.3 a gaff hook,

.4 an appropriate first-aid kit, which shall be kept in the crew accommodation space or in the wheelhouse and shall be stored in such a way that it is easily and safely accessible, if necessary; if the first-aid kit is stored under cover, the cover shall be marked with a symbol for first-aid kit, having a side length of at least 10 cm, as shown in Fig. 13.1.1,

.5 a notice concerning the rescue and revival of person overboard,

.6 a searchlight that can be operated from the wheelhouse.

.7 receptacles:

a) a marked receptacle for domestic waste,

b) separate, marked receptacles, with sealing covers, made of steel or another sturdy, non-flammable material, of adequate size but holding at least 10 l, for the collection of:

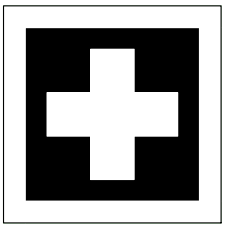
i) oily cleaning cloths,

ii) hazardous or pollutant solid wastes,

iii) hazardous or pollutant liquid wastes,

iv) slops,

v) other oily or greasy waste.



Sign in green and white

Fig. 13.1.1. ‘First-aid kit’ sign

13.1.2 Vessels whose side height above the light ship waterline exceeds 1.5 m shall be equipped with embarkation stairway or ladder.

13.2 Ship’s Boats

13.2.1 The following vessels shall be equipped with ship’s boats according to PN-EN 1914:

– motor vessels and towed barges exceeding 150 t deadweight,

– tugs and pushers with moulded water displacement of more than 150 m^3,

– floating equipment,
– passenger vessels.

13.2.2 It shall be possible for one person to launch the ship's boat within five minutes (from the first manual action necessary). If a powered launching device is used, it shall be so constructed that safe and quick launching of the boat shall not be impaired if its power supply fails.

13.2.3 Inflatable ship's boats shall be inspected according to the manufacturer's instructions.

14 STANDARDS OF VESSELS' EQUIPMENT

14.1 General

14.1.1 For motor vessels, pushers, pushed convoys and passenger vessels, compliance with, or failure to comply with, the provisions of Chapter 14 shall be entered in item 47 of the Community Certificate by the inspection body. These provisions are supplementary equipment requirements which apply in addition to the requirements with which a vessel has to comply for the Community Certificate to be issued.

14.1.2 With regard to hull equipment two standards: S1 and S2 are distinguished.

14.1.3 The requirements for standards S1 and S2 with respect to hull equipment are given in Subchapters 14.2 and 14.3 .

14.2 Standard S1

14.2.1 The steering system shall be able to be operated by one person, even in maximum draught, without requiring particular force.

Hydraulically operated steering systems fulfill this requirement. Manually driven steering systems shall not require a force of more than 160 N in order to be operated.

14.2.2 The required ship's boat shall be capable of being released by one crew member alone and in an appropriate amount of time.

14.2.3 The operation of cranks and similar revolving parts of lifting devices shall not require a force of more than 160 N.

Cranks and similar rotating means of operation include:
– manually operated anchor winches (the maximum force required shall be deemed to be that when the anchors are hanging freely),
– cranks for lifting hatches,
– cranks on mast and funnel winches.

Cranks and similar rotating means of operation do not include:
– mooring and coupling winches**,**
– cranks on cranes, unless intended for ship's boats.

14.2.4 The principal control units and monitoring instruments shall be ergonomically arranged.

These requirements are deemed to be fulfilled if:

.1 the wheelhouse is arranged in accordance with European Standard EN 1864; or

.2 the wheelhouse is designed for radar navigation by one person; or

.3 the wheelhouse meets the following requirements:

– the control units and monitoring instruments are in the forward field of vision and within an arc of not more than 180° (90° to starboard and 90° to port), including the floor and ceiling. They shall be clearly legible and visible from the normal position of the helmsman;
– the main control units such as the steering wheel or steering lever, the engine controls, the radio controls and the controls for the acoustic signals and the warning and manoeuvring signals required under national or international navigational authority regulations, as appropriate, shall be arranged in such a way that the distance between the controls on the starboard side and those on the port side is not more than 3 m. The helmsman shall be able to operate the engines without let-

ting go of the controls for the steering system and while still being able to operate the other controls such as the radio system, the controls for the acoustic signals and the warning and manoeuvring signals required under national or international navigational authority regulations, as appropriate;
- the warning and manoeuvring signals required under national or international authority regulations, as appropriate, are operated electrically, pneumatically, hydraulically or mechanically. By way of derogation, it may be operated by means of a tension wire only if safe operation from the steering position is possible in this way.

14.2.5 The equipment required under paragraph 3.1.1, shall be capable of being remotely operated from the steering position.

14.3 Standard S2

14.3.1 For motor vessels operating separately: the requirements of standard S1 apply and the vessels shall be additionally equipped with a bow thruster which can be operated from the steering position.

Motor vessels which according to the Community Certificate are also suitable for pushing but which:
- do not have hydraulically or electrically operated coupling winches; or
- whose hydraulically or electrically operated coupling winches do not meet the requirements of point 3.3 of Administrative Instruction No. 20 of the Directive 2008/126/EC, as amended,

shall be given standard S2 as motor vessel operating separately.

The following entry shall be made under item 47 of the Community Certificate:

Standard S2 does not apply to the motor vessel when pushing.

14.3.2 For motor vessels propelling in side-by-side formation: the requirements of standard S1 apply and the vessels shall be additionally equipped with a bow thruster which can be operated from the steering position.

Motor vessels which according to the Community Certificate are:
- suitable for pushing and
- fitted with hydraulically or electrically operated coupling winches that fulfill the requirements of point 3.3 of Administrative Instruction No. 20 of the Directive 2008/126/EC, as amended,

but which do not have their own bow thruster shall be given standard S2 as motor vessel pushing a convoy.

The following entry shall be made under item 47 of the Community Certificate:

Standard S2 does not apply to the motor vessel when operating separately.

14.3.3 For motor vessels propelling pushed convoys made up of the motor vessel itself and a craft in front: the requirements of standard S1 apply and the vessels shall be additionally equipped with hydraulic or electrically operated coupling winches. This equipment is, however, not required if the front craft in the pushed convoy is equipped with a bow thruster which can be operated from the steering position of the pusher.

14.3.4 For pushers propelling pushed convoys: the requirements of standard S1 apply and the vessels shall be additionally equipped with hydraulic or electric coupling winches. This equipment is, however, not required if the foremost craft in the pushed convoy is equipped with a bow thruster which can be operated from the steering position of the pusher.

14.3.5 For passenger vessels: the requirements of standard S1 apply and the vessels shall be additionally equipped with a bow thruster which can be operated from the steering position. This equipment is, however, not required if the propulsion system and steering system of the passenger vessel guarantee equal manoeuvrability.

15 PASSENGER VESSELS

15.1 Application and general

15.1.1 The requirements of the present Chapter apply to vessels assigned additional mark **pas**, affixed to the symbol of class, described in *Part I – Classification Regulations*. The requirements regarding the passenger vessels hull structure are given in sub-chapter 7.6, *Part II – Hull*.

15.1.2 The requirements of the present Chapter are not applicable to masts, sails and rigging in vessels which are primarily propelled by sail.

15.1.3 Passenger rooms shall on all decks be located aft of the level of the collision bulkhead and, if they are below the bulkhead deck, forward of the level of the aft-peak bulkhead. They shall be separated from the engine and boiler rooms in a gas-tight manner.

15.1.4 Deck areas which are enclosed by awnings or similar mobile installations not only above but also fully or partially to the side shall satisfy the same requirements as enclosed passenger rooms.

15.2 Anchors

15.2.1 Passenger vessels shall be equipped with bow anchors of a total mass P calculated from the formula:

$$P = kBT \quad [\text{kg}] \tag{15.2.1-1}$$

where:
k – dimensionless coefficient:

$$k = c\sqrt{\frac{L}{8B}}$$

where:
c – empirical coefficient taken according to Table 15.2.1.

Table 15.2.1
Values of coefficient *c*

Water displacement ∇ [m^3]	c
$\nabla < 400$	45
$400 \le \nabla < 650$	55
$650 \le \nabla < 1000$	65
$\nabla \ge 1000$	70

Passenger vessels whose superstructure windage area exceeds the hull windage area shall be equipped with bow anchors of total mass P increased by additional mass ΔP determined on the base of Table 4.2.2, where the windage area shall be taken as the difference of areas, calculated in accordance with the following formula:

$$F_N = F_{SW} - F_{HW} \quad [\text{m}] \tag{15.2.1-2}$$

where:
F_{SW} – superstructure windage area, [m^2]
F_{HW} – hull windage area, calculated to the freeboard deck (see *Part IV – Stability and Freeboard*), [m^2]

$$F_{SW} + F_{HW} = F_W$$

15.2.2 In sailing vessels having $L_{WL} \le 45$ m and a maximum number of passengers not exceeding L_{WL} in whole metres, anchors may project beyond the hull plating, provided they are transported in hawse pipes.

15.2.3 Vessels having $L > 110$ m shall be fitted with arrangements allowing the stern anchor handling from the wheelhouse.

15.3 Exits and Passageways

15.3.1 Rooms or groups of rooms designed or arranged for 30 or more passengers or including berths for 12 or more passengers shall have at least two exits. On day trip vessels, one of these two exits can be replaced by two emergency exits.

Rooms, with the exception of cabins, and groups of rooms that have only one exit, shall have at least one emergency exit.

15.3.2 Where rooms are located below the bulkhead deck, one of the exits can be a watertight bulkhead door, leading to an adjacent compartment from which the upper deck can be reached directly. The other exit shall lead directly or, if permitted in accordance with 15.3.1, as an emergency exit, into the open air or to the bulkhead deck. This requirement does not apply to individual cabins.

15.3.3 Exits, referred to in 15.3.1 and 15.3.2, shall be suitably arranged and shall have a clear width of at least 0.8 m and a clear height of at least 2.0 m. For doors of passenger cabins and other small rooms, the clear width can be reduced to 0.7 m.

15.3.4 In the case of rooms or groups of rooms intended for more than80 passengers, the sum of the widths of all exits intended for passengers and which shall be used by them in an emergency shall be at least 0.01 m per passenger.

15.3.5 If the total width of the exits is determined by the number of passengers, the width of each exit shall be at least 0.005 m per passenger.

15.3.6 Emergency exits shall have the shortest side at least 0.6 m long or a minimum diameter of 0.7 m. They shall open in the direction of escape and be marked on both sides.

15.3.7 Exits of rooms intended for use by persons with reduced mobility shall have a clear width of at least 0.9 m. Exits normally used for embarking and disembarking of people with reduced mobility shall have a clear width of at least 1.5 m.

15.3.8 Passageways intended for use by persons with reduced mobility shall have a clear width of 1.3 m and be free of doorsteps and sills more than 0.025 m high. Walls in passageways intended for use by persons with reduced mobility shall be equipped with handrails at a height of 0.9 m above the floor. If the width of the passageway exceeds 1.5 m, handrails shall be fitted on both sides of this passage.

Where, for any reason, the required height of a sill or coaming of a passageway is greater than 0.025 m (e.g. due to the necessity of ensuring the watertightness of compartment), an adequate ramp shall be provided to enable persons with reduced mobility to move along the passageways.

15.3.9 Provision shall be made to prevent access by unauthorized persons to parts of the vessel not intended for passengers, in particular to places which provide access to the wheelhouse, winches and the engine room. A sign, as shown in Fig. 15.3.9, shall be displayed in a prominent position at each such access.

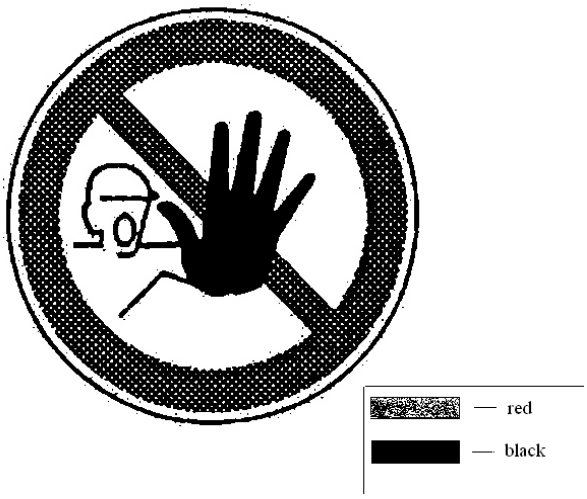


Fig. 15.3.9. 'No entry for unauthorized persons' sign

15.3.10 Glass doors and walls in passageways, as well as window panes shall be manufactured from hardened glass or laminated glass. They may be also made from a synthetic material, where permitted by fire protection requirements.

15.3.11 Transparent doors and transparent walls extending as far as floor in passageways shall be clearly marked.

15.4 Doors of Passenger Rooms

15.4.1 The direction of doors opening and their fire class (if applicable) shall be compliant with the requirements of Part V – Fire Protection, sub-chapters 6.1.3, 6.1.7 and 6.1.13.

15.4.2 Cabin doors shall be made in such a way that they can also be unlocked from the outside at any time.

15.4.3 Power operated doors shall open easily in the event of failure of the power supply to the operating mechanism.

15.4.4 Doors intended for use by persons with reduced mobility shall be such as to provide, from the direction from which the door opens, a minimum clearance of 0.6 m between the inner edge of the door frame on the lock side and an adjacent perpendicular wall.

15.5 Doors in Watertight Bulkheads

15.5.1 Doors in watertight bulkheads which are taken into account in damage stability calculations, as well as their actuators shall be located in the safe area (see the definition given in 1.2.2) and shall comply with the requirements specified in 15.5.2 and 15.5.3.

15.5.2 Manually operated doors without remote control are permitted only in areas not accessible to passengers. They shall remain closed at all times and be opened temporarily to allow access. These doors shall be fitted with suitable devices to enable them to be closed quickly and safely and shall be provided with the following notice:

Close the door immediately after passing through.

15.5.3 Doors in bulkheads that are open for long periods shall comply with the following requirements:

– they shall be capable of being closed from both sides of the bulkhead and from an easily accessible point above the bulkhead deck;

– after being closed by remote control, the door shall be such that it can be opened again locally and closed safely. Closure shall not be impeded by carpeting or foot rail;
– the time of remote controlled closure shall be at least 30 seconds but not more than 60 seconds;
– during the door closure, an automatic acoustic alarm shall sound at the door;
– the door drive and alarm shall be also capable of operating independently of the onboard power supply; there shall be a device at the location of the remote control that displays whether the door is open or closed.

15.5.4 By way of derogation from paragraph 15.5.2, passenger vessels not exceeding 45 m in length and authorized to carry at most a number of passengers corresponding to the length of the vessel in meters are allowed to have on board, in the passenger area, a manually controlled bulkhead door without remote control if:
– the vessel has only one deck;
– this door is accessible directly from the deck and is not more than 10 m away from the deck;
– the lower edge of the door opening lies at least 30 cm above the floor of the passenger area; and
– each of the compartments divided by the door is fitted with a bilge level alarm.

15.6 Openings in Superstructures and Sides

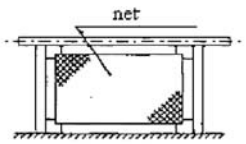
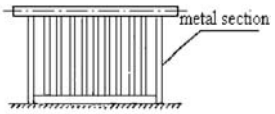
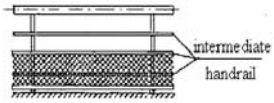
15.6.1 Superstructures or their roofs consisting completely of panoramic panes and enclosures created by awnings or similar mobile installations and their substructures shall be designed as to, and shall only be manufactured from materials which, in the event of an accident, reduce as much as possible the risks of injury to the persons on board.

15.6.2 Side scuttles shall, generally, be of the non-opening type. Where side scuttles of the opening type are used, they shall be so constructed that their opening without the use of a special tool will be impossible.

15.7 Guard Rails and Bulwarks

15.7.1 Areas accessible to passengers shall be surrounded by a bulwark at least 1.00 m high or a guard rail of PF, PG or PZ construction according to Table 15.7.1-1, with dimensions as given in Table 15.7.1-2.

Table 15.7.1-1
Types of guard rails in passenger area

<table>
<tr><td rowspan="4">General in passenger area</td><td colspan="2">Design</td><td rowspan="2">Figure (simplified)</td><td colspan="2">Material</td><td rowspan="2">Remarks on construction</td></tr>
<tr><td>Symbol</td><td>Guard rail</td><td>Handrail</td><td>Intermediate rail or network</td></tr>
<tr><td>PF</td><td rowspan="3">fixed [1]</td><td> 
</td><td rowspan="3">Metal section [2]</td><td>Netting, plates[4]</td><td rowspan="3">Stanchions solidly connected to the deck</td></tr>
<tr><td>PG</td><td> 
</td><td>Metal section</td></tr>
<tr><td>PZ[3]</td><td> 
</td><td>Netting, plates[4], metal section</td></tr>
</table>

[1] The guard rail is considered to be fixed even if it is tiltable or detachable in special working conditions.
[2] If necessary, with mounted wooden or plastic profile.
[3] The lower part of PZ guard rail shall be secured up to half the length by nettings, canvas or other appropriate measures to prevent children slipping outboard through gaps in the guard rail.
[4] E.g. glass, wood or plastic.

Table 15.7.1-2
Sample dimensions of stanchions and handrails made of steel, [mm]

Symbol	Interval between stanchions	Stanchion [4]		Handrail [4]		Intermediate rail [4]
PF PG PZ	≤ 800	Steel tube [1]	48.3×3.6	Steel tube [1]	42.4×2.3	Network Profiles
	≤ 900	Flat steel [2] [3]	60×10		42.4×2.3	
	≤ 1350		60×10		42.4×2.3	
	≤ 1850		70×15		42.4×2.6	
	≤ 2000		80×12		42.4×2.6	

[1] Seamless and welded steel tubes according to EN 10 220.
[2] Shipbuilding steel according to EN 10025-2.
[3] Measure the greatest resisting moment at right angle to handrail.
[4] Dimensions of steel profile were calculated for E =2.1 × 10^5 MPa and for maximum bending stress equal to σ = 160 MPa.

15.7.2 Bulwarks and railings of decks intended for use by persons with reduced mobility shall be at least 1.1 m high.

15.7.3 Openings and equipment for embarking or disembarking, as well as openings for loading or unloading shall be such that they can be secured and have a clear width of at least 1.0 m. Openings, used normally for embarking or disembarking of persons with reduced mobility, shall have a clear width of at least 1.5 m.

15.7.4 If the openings and equipment for embarking or disembarking cannot be observed from the wheelhouse, optical or electronic aids shall be provided.

15.7.5 Requirements regarding specific dimensions as shown in table 15.7.5 shall be met.

Table 15.7.5
Safety dimensions[1]

Passenger areas	
PF, PG, PZ Type (fixed)	
Clear distance between the vertical bars and between network and hand rail or stanchion	max. 120
Clear distance between network and deck	max. 50
Clear distance between network and bulwark	max. 20
Space between railing stanchions	max. 2000
Distance between upper edge of toe rail or upper edge of coaming from deck	50^{+10}_{0}
Distance between inner edge of toe rail or of coaming from the inner edge of the stanchion	max. 100
Railing heights	General: min. 1000

Note: General tolerances shall be according to ISO 2768-c.

15.7.6 In table 15.7.6, evaluation loads and admissible deflections for stanchions, hand rails, intermediate rails, bars and panelling are specified which have to be taken into account for testing sturdiness. Concurrent loading of the hand rail and intermediate rails or hand rail and intermediate rails or networks should not be included in the calculations for the stanchions.

[1] All dimensions given in [mm].

Table 15.7.6
Sturdiness requirements

Abbreviation	Evaluation Loads [N]		Permissible deflection without permanent deformation [mm]	
			horizontal	vertical
PF	Hand rail per [m]	1000	25	
PG	Network per [m^2]	1000	25	–
PZ	Intermediate rail	500	25	

15.7.7 Guard rails ships with an aluminum alloy hull may be also made of aluminum alloys under condition that criteria given in tables 15.7.5 and 15.7.6 are taken into account

15.8 Stairways, Gangways, Landings and Lifts

15.8.1 Stairs and their landings in passenger area shall be constructed in accordance with PN-EN 13056. Each step shall be capable of withstanding the working load of 2 kN.

15.8.2 Stairs and their landings shall have a clear width of at least 0.8 m; if they lead to connecting corridors or areas used by more than 80 passengers – at least 0.01 m per passenger.

15.8.3 Stairs and their landings shall have a clear width of at least 1.00 m if they provide the only means of access to a room intended for passengers.

15.8.4 Where there is not at least one staircase on each side of the vessel in the same room, the stairs shall lie in the safe area.

15.8.5 Stairs intended for use by persons with reduced mobility shall additionally comply with the following requirements:

.1 the gradient of the stairs shall not exceed 38°,
.2 the stairs shall have a clear width of at least 0.9 m,
.3 spiral staircases are not permitted,
.4 the stairs shall not run in a direction transverse to the vessel's centre line,
.5 the handrails of the stairs shall extend approximately 0.3 m beyond the top and bottom of the stairs without restricting traffic routes,
.6 handrails, front sides of at least the first and the last step, as well as the floor coverings at the ends of the stairs shall be marked with distinctive colour.

15.8.6 Lifts intended for persons with reduced mobility, as well as lifting equipment, such as stairlifts or lifting platforms, shall be constructed according to a relevant standard or a regulation of the Flag State Administration.

15.8.7 For sailing vessels having $L_{WL} \leq 45$ m and a maximum permissible number of passengers not exceeding L_{WL} in whole meters, the use of a gangway of a length lesser than that required in 13.1.1.2 may be permitted.

15.8.8 The design of gangways shall comply with PN-EN 14206.

15.9 Muster Areas

15.9.1 The total area of the muster areas, A_s, shall be not less than the area calculated from the following formulae:

.1 day trip vessels:

$$A_s = 0.35 F_{\max} \quad [\mathrm{m}^2] \qquad (15.9.1.1)$$

.2 cabin vessels:

$$A_s = 0.45 F_{\max} \quad [\mathrm{m}^2] \qquad (15.9.1.2)$$

where:
$F_{\max}$ – the maximum permitted number of passengers on board.

15.9.2 The area of each muster or evacuation area shall be larger than 10 m^2.

15.9.3 The muster area shall be clear of furniture, whether movable or fixed.

15.9.4 If movable furniture is located in a room in which muster areas are provided, the furniture shall be secured appropriately to avoid slipping.

15.9.5 Life-saving appliances shall be easily accessible from the evacuation areas.

15.9.6 It shall be possible to evacuate people safely from these evacuation areas, using either side of the vessel.

15.9.7 The muster areas shall lie above the margin line.

15.9.8 Muster areas shall be indicated on the *Safety Plan*[1] and shall be appropriately marked on board the vessel.

15.9.9 If fixed seats or benches are located in a room in which muster areas are provided, the corresponding number of persons need not be taken into account when calculating the total area of muster areas according to 15.9.1. However, the number of persons for whom fixed seats or benches are provided in a certain room must not exceed the number of persons for whom muster areas are available in this room (and who are taken into account in formulae 15.9.1.1 and 15.9.1.2).

15.9.10 The requirements given in 15.9.4 and 15.9.9 are also applicable to open decks on which muster areas are provided.

15.9.11 If collective life-saving appliances are available on board, the number of persons for whom such appliances are available may be disregarded when calculating the total surface area of the muster areas, referred to in 15.9.1.

15.9.12 In all cases where reductions according to 15.9.9 to 15.9.11 are applied, the total area, referred to in 15.9.1, shall be sufficient for at least 50 % of the maximum permitted number of passengers.

15.10 Height of Spaces

The clear height of spaces shall be not less than 2 m.

15.11 Steering Gear

.1 The steering gear in sailing vessels shall be designed for permanent list up to 20°.

.2 Existing passenger ships constructed or converted before 31 December 2005, and engaged only in domestic navigation in short excursion voyages at daytime, are exempted from installation of an additional rudder angle indicator in the steering gear room, assuming that standard indicator is installed on the rudder stock or on its quadrant and that the emergency helm is properly marked in place of its fitting.

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[1] In accordance with Art. 15.13 of Annex II to Directive 2006/137/EC every passenger vessel shall be provided with *Safety Plan* informing, inter alia, about regions intended for people with reduced mobility, escape routes and emergency exits.

15.12 Special Guidelines for Hull Equipment for Persons with Reduced Mobility

15.12.1 General

15.12.1.1 It is necessary to ensure that persons with reduced mobility can stay and move safely on board vessels. In addition, in an emergency such persons should have the same level of safety as other passengers.

15.12.1.2 It is not necessary that all passengers areas fulfill the specific safety requirements of persons with reduced mobility. Therefore, those requirements apply only to certain areas. However, the persons in question must be given the opportunity of being informed of the areas specially adapted for them in view of safety, so that they can organize their stay on board accordingly. It is the responsibility of the Shipowner to make the corresponding areas available, mark them properly and indicate them to persons with reduced mobility.

15.12.2 Areas Provided for Use by Persons with Reduced Mobility

15.12.2.1 Areas provided for use by persons with reduced mobility range from, in the simplest case, the ship's entrance area to the places from which an evacuation will take place in an emergency. They shall include:
- a place where life-saving equipment is stowed or issued in an emergency,
- seats,
- a suitably-adapted toilet,
- connection corridors.

15.12.2.2 The number of seats corresponds at least approximately to the number of persons with reduced mobility that – over a lengthy period – are most frequently onboard simultaneously. The number should be determined by the Shipowner on the basis of experience, as this is beyond the knowledge of the competent authority.

For each 100 passengers the ship may carry, at least one place shall be reserved for a wheelchair, so that the wheelchair user may travel with other passengers, sitting in the wheelchair.

At least 4% of the ship's passenger seats shall be suitable for disabled persons. These seats should have sufficient space and be provided with suitable handholds in order that disabled persons may support themselves when sitting down or getting up from the seat.

15.12.2.3 On cabin vessels consideration shall also be given to connecting corridors to passenger cabins used by persons with reduced mobility. The number of such cabins is to be determined by the Shipowner in the same way as number of seats. With the exception of the width of doors, no requirements are imposed for the special arrangement of cabins. It is the responsibility of the Shipowner to make any further necessary arrangements.

15.12.3 Exits of Rooms and Connecting Corridors

When determining the width of connecting corridors, exits and openings in bulwarks or guard rails intended for use by persons with reduced mobility or usually used for the embarkation or disembarkation of persons with reduced mobility, consideration shall be given to buggies and the fact that people may be dependent on various types of walking aids or wheelchairs. In the case of exits or openings for embarkation or disembarkation, account shall also be taken of the additional space needed for any assisting staff.

15.12.4 Doors

The arrangement of the area surrounding doors intended for use by persons with reduced mobility shall ensure that persons dependent for example on walking aids can open such doors safely.

15.12.5 Stairways and Elevators

The requirements for the arrangement of stairways shall, in addition to possible reduced mobility, also take into account eyesight impediments.

15.12.6 Bulwarks and Guard Rails

The bulwarks and guard rails of decks intended for use by persons with reduced mobility shall provide for a greater height since such persons are more likely to lose their balance or be unable to hold on by themselves.

15.12.7 Traffic Areas

For various reasons, persons with reduced mobility need to support themselves or hold on more frequently, so walls in traffic areas intended for use by persons with reduced mobility shall be equipped with handrails at an appropriate height.

15.12.8 Toilets

Persons with reduced mobility shall be also able to stay and move safely in toilets, so at least one toilet shall be adapted accordingly.

16 VESSELS INTENDED FOR THE CARRIAGE OF DANGEROUS CARGOES

16.1 Application

16.1.1 The requirements of the present Chapter apply to vessels for the carriage of hazardous materials irrespective of that one of the following additional marks: **ADN**, **zb ADN-G**, **zb ADN-C**, **zb ADN-N** (see *Part I – Classification Regulations*, paragraphs 3.7.5.3 and 3.7.5.4) is assigned or not.

16.1.2 In sub-chapters 16.3 to 16.6, requirements referring to ship's equipment are given in addition, compliant with ADN 2009 regulations.

16.1.3 The requirements relating to hull structure of the vessels, set down in 16.1.1, are given in sub-chapter 7.12, *Part II – Hull*.

16.2 Types of Vessels

Definitions of vessels types are given in sub-chapter 7.12.2, *Part II-Hull*.

16.3 Vessels Intended for the Carriage of Dangerous Goods in Packages or in Bulk

The requirements of sub-chapter 16.3 are applicable to vessels intended for the carriage of dangerous goods in packages or in bulk irrespective of that an additional mark **ADN** is assigned or not.

16.3.1 Holds

16.3.1.1 The construction of any hold shall enable its cleaning and drying.

16.3.1.2 The hatchway covers shall be spraytight and weathertight or be covered with waterproof tarpaulins. This requirement does not refer to dangerous goods carried in:
- sprayproof containers,
- IBCs*,
- large packages,
- MEGCs*,
- portable tanks*,
- tank-containers*,
- vehicles*,
- wagons*

which are closed or sheeted.

* see definitions in sub-chapter 1.2.1 of AND.

16.3.1.3 Tarpaulin used to cover the holds shall be waterproof.

16.3.1.4 Where dangerous goods are carried in bulk, the only permitted covering of hatch openings shall be splash-tight hatch covers.

16.3.1.5 No heating appliances shall be installed in the holds.

16.3.2 Water Ballast

The double-hull spaces and double bottoms may be arranged for being filled with water ballast.

16.3.3 Oil Fuel Tanks

Double bottoms within the hold area may be arranged as oil fuel tanks, provided their depth is not less than 0.6 m. Oil fuel pipes and openings to such tanks are not permitted in the holds.

The air pipes of all oil fuel tanks shall be led to 0.5 m above the open deck. Their open ends shall be fitted with a protective device consisting of a gauze grid or a perforated plate.

16.3.4 Location of openings and doors

16.3.4.1 Gastight closing appliances shall be provided for openings in the accommodation and wheelhouse facing the holds.

16.3.4.2 No entrances or openings of the engine rooms and service spaces shall face the protected area[1].

16.4 Type „G" Tankers

16.4.1 Application

The requirements of sub-chapter 16.4 are applicable to tankers which acc. to *ADN Rules* are required to be type G tank vessels irrespective of that an additional mark **zb ADN-G**, is assigned or not.

16.4.2 Construction Materials

16.4.2.1 Every part of the vessel, including any installation and equipment which may come into contact with the cargo, shall consist of materials which can neither be dangerously affected by the cargo nor cause decomposition of the cargo or react with it so as to form harmful or hazardous products.

The ship's hull and the cargo tanks shall be constructed of shipbuilding steel or another, at least equivalent metal.

The independent cargo tanks may also be constructed of other materials, provided these have at least equivalent mechanical properties and resistance against the effects of temperature and fire.

16.4.2.2 Except where explicitly permitted in paragraphs 16.4.2.3, 16.4.2.4, 16.4.2.5 or in the *Certificate of approval*[2], the use of wood, aluminum alloys or plastic materials within the cargo area is prohibited.

16.4.2.3 The use of wood, aluminum alloys or plastic materials within the cargo area is only permitted for:

- gangways and external ladders,
- movable items of equipment,
- chocking of cargo tanks which are independent of the vessel's hull and chocking of installations and equipment,
- masts and similar round timber equipment,
- lids of boxes which are placed on the deck.

16.4.2.4 The use of wood or plastic materials within the cargo area is only permitted for supports and stops of any kind.

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1 Definition of 'protected area' – see ADN, 2009, para 1.2.1

2 Consistent with the requirements given in Annex B.2 to the document, referred to in 16.1.2 (marginal 210 282). This Certificate is issued in accordance with the procedures described in Annex C (Chapter I) to the a.m. document.

16.4.2.5 The use of plastic materials or rubber within the cargo area is only permitted for:
– all kinds of gaskets (e.g. for dome or hatch covers),
– insulation of cargo tanks and of hoses for loading and unloading.

16.4.2.6 All permanently fitted materials in the accommodation spaces or the wheelhouse, with the exception of furniture, shall not readily ignite.

They shall not evolve fumes or toxic gases in dangerous quantities, if involved in a fire.

16.4.2.7 The paint used in the cargo area shall not be liable to produce sparks in case of impact.

16.4.2.8 The use of plastic material for the ship's boats is permitted only if the material does not readily ignite.

16.4.3 Protection against the Penetration of Gases

16.4.3.1 The vessel shall be designed so as to prevent gases from penetrating into the accommodation and service spaces.

16.4.3.2 Heights of door sills and coamings

.1 Outside the cargo area, the lower edges of door-openings in the sidewalls of superstructures and the coamings of access hatches to under-deck spaces shall have a height of not less than 0.50 m above the deck.

This requirement need not be complied with if the wall of the superstructure facing the cargo area extends from one side of the ship to the other and has doors the sills of which have a height of not less than 0.50 m. The height of this wall shall not be less than 2.00 m. In this case the lower edges of door-openings in the sidewalls of superstructures and the coamings of access hatches behind this wall shall have a height of not less than 0.10 m. The sills of engine room doors and the coamings of its access hatches shall, however, always have a height of not less than 0.50 m.

.2 In the cargo area, the lower edges of door-openings in the sidewalls of superstructures shall have a height of not less than 0.50 m above the deck and the sills of hatches and ventilation openings of premises located under the deck shall have a height of not less than 0.50 m above the deck. This requirement does not apply to access openings to double-hull and double-bottom spaces.

16.4.3.3 The bulwarks shall be provided with sufficiently large openings, located directly above the deck.

16.4.4 Cargo Tank Openings

16.4.4.1 Cargo tank openings shall be located on deck in the cargo area.Cargo tank openings with a cross-section greater than 0.10 m^2 shall be located not less than 0.50 m above the tank.

16.4.4.2 Cargo tank openings shall be fitted with gastight closures.

16.4.4.3 The exhaust outlets of the pressure relief valves shall be located not less than 2 m above the deck at a distance of not less than 6 m from the accommodation and service spaces located outside the cargo area. This height may be reduced when within a radius of 1 m round the pressure relief valve outlet there is no equipment, no workstation and appropriate signs indicate the area.

16.4.5 Admittance on Board

Clearly visible notice boards displaying the prohibition of unauthorized persons admittance on board shall be placed on both sides of the vessel.

When the vessel is required to carry two blue cones or two blue lights, persons under 14 years of age are not permitted on board.

16.4.6 Emergency Exit

Spaces, the entrances or exits of which are likely to become partly or completely immersed in the damaged condition shall have an emergency exit which is situated not less than 0.1 m above the damage waterline. This requirement does not apply to the forepeak and the afterpeak.

16.4.7 Inspection Openings

Cargo holds and other accessible spaces within the cargo area shall be so arranged as to ensure that they may be completely inspected and cleaned in an appropriate manner.

The dimensions of openings, except those of double-hull spaces and double bottom which do not have a wall adjoining the cargo tanks, shall be sufficient to allow a person wearing breathing apparatus to enter or leave the space without difficulty. The cross-sectional area of such openings shall be not less than 0.36 m^2, and the side length – not less than 0.5 m. The openings shall be so designed as to allow an injured or unconscious person to be removed from such spaces without difficulty, if necessary, by means of fixed equipment. The distance between the reinforcements in these spaces shall be not be less than 0.5 m. In double bottom, this distance may be reduced to 0.45 m.

Cargo tanks may have round openings with a diameter of not less than 0.68 m**.**

16.4.8 Ends of air pipes of oil fuel tanks

Open ends of air pipes of all oil fuel tanks shall extend to not less than 0.5 m above the open deck. These open ends and the open ends of overflow pipes leading to the deck shall be fitted with a protective device consisting of a gauze diaphragm or a perforated plate.

16.5 Type „C" Tankers

16.5.1 The requirements of sub-chapter 16.5 are applicable to tankers which acc to *ADN Rules* are required to be type C tank vessels irrespective of that an additional mark **zb ADN-C**, is assigned or not.

16.5.2 Construction Materials

16.5.2.1 Every part of the vessel, including any installation and equipment which may come into contact with the cargo shall consist of materials which can neither be dangerously affected by the cargo nor cause decomposition of the cargo or react with it so as to form harmful or hazardous products.

16.5.2.2 Except where explicitly permitted in paragraphs 16.5.2.3, 16.5.2.4, 16.5.2.5 or in the *Certificate of approval*, the use of wood, aluminium alloys or plastic materials within the cargo area is prohibited.

16.5.2.3 The use of wood, aluminum alloys or plastic materials within the cargo area is only permitted for:

- gangways and external ladders,
- movable items of equipment (aluminum gauging rods are, however, permitted, provided that they are fitted with brass feet or protected in another way to avoid sparking),
- chocking of cargo tanks which are independent of the vessel's hull and chocking of installations and equipment,
- masts and similar round timber equipment,
- lids of boxes which are placed on the deck.

16.5.2.4 The use of wood or plastic materials within the cargo area is only permitted for supports and stops of any kind.

16.5.2.5 The use of plastic materials or rubber within the cargo area is only permitted for:

- coating of cargo tanks and of pipes for loading and unloading;
- insulation of cargo tanks and of hoses for loading and unloading;
- all kinds of gaskets (e.g. for dome or hatch covers).

16.5.2.6 All permanently fitted materials in the accommodation spaces or the wheelhouse, except furniture, shall not readily ignite. They shall not evolve fumes or toxic gases in dangerous quantities, if involved in a fire.

16.5.2.7 The paint used in the cargo area shall not be liable to produce sparks in case of impact.

16.5.2.8 The use of plastic material for the ship's boats is permitted only if the material does not readily ignite.

16.5.3 Protection against the Penetration of Gases

16.5.3.1 The vessel shall be designed so as to prevent gases from penetrating into the accommodation and service spaces.

16.5.3.2 Heights of door sills and coamings:

.1 Outside the cargo area, the lower edges of door-openings in the sidewalls of superstructures and the coamings of access hatches to under-deck spaces shall have a height of not less than 0.50 m above the deck.

This requirement need not be complied with if the wall of the superstructure facing the cargo area extends from one side of the ship to the other and has doors the sills of which have a height of not less than 0.50 m. The height of this wall shall not be less than 2.00 m. In this case the lower edges of door-openings in the sidewalls of superstructures and the coamings of access hatches behind this wall shall have a height of not less than 0.10 m. The sills of engine room doors and the coamings of its access hatches shall, however, always have a height of not less than 0.50 m.

.2 In the cargo area, the lower edges of door-openings in the sidewalls of superstructures shall have a height of not less than 0.50 m above the deck and the sills of hatches and ventilation openings of premises located under the deck shall have a height of not less than 0.50 m above the deck. This requirement does not apply to access openings to double-hull and double-bottom spaces.

16.5.3.3 The bulwarks shall be provided with sufficiently large openings located directly above the deck.

16.5.4 Cargo Tank Openings

16.5.4.1 Cargo tank openings shall be located on deck in the cargo area.

16.5.4.2 Cargo tank openings with a cross-section greater than 0.10 m^2 and openings of safety devices for preventing overpressures shall be located not less than 0.50 m above the tank.

16.5.4.3 Cargo tank openings shall be fitted with gastight closures.

16.5.4.4 Closures which are normally used during loading or unloading operations shall not cause sparking when operated.

16.5.5 Admittance on Board

Clearly visible notice boards displaying the prohibition of unauthorized persons admittance on board shall be placed on both sides of the vessel.

When the vessel is required to carry two blue cones or two blue lights, persons under 14 years of age are not permitted on board.

16.5.6 Emergency Exit

Spaces, the entrances or exits of which are likely to become partly or completely immersed in the damaged condition shall have an emergency exit which is situated not less than 0.1 m above the damage waterline. This requirement does not apply to the forepeak and the afterpeak.

16.5.7 Inspection Openings

Cargo holds and other accessible spaces within the cargo area shall be so arranged as to ensure that they may be completely inspected and cleaned in an appropriate manner.

The dimensions of openings, except those of double-hull spaces and double bottom which do not have a wall adjoining the cargo tanks, shall be sufficient to allow a person wearing breathing apparatus to enter or leave the space without difficulty. The cross-sectional area of such openings shall be not less than 0.36 m^2, and the side length – not less than 0.5 m. The openings shall be so designed as to allow an injured or unconscious person to be removed from such spaces without difficulty, if necessary, by means of fixed equipment. The distance between the reinforcements in these spaces shall be not less than 0.5 m. In double bottom, this distance may be reduced to 0.45 m.

If compliance with dimensions requirements in way of the double hull cargo holds, containing independent cargo tanks, is not practicable, provision shall be made for easy dismantling of such tanks for the purpose of carrying out their inspection.

Cargo tanks may have round openings with a diameter of not less than 0.68 m.

16.5.8 Ends of air pipes of oil fuel tanks

Open ends of air pipes of all oil fuel tanks shall extend to not less than 0.5 m above the open deck. These open ends and the open ends of overflow pipes leading to the deck shall be fitted with a protective device consisting of a gauze diaphragm or a perforated plate

16.6 Type „N" Tankers

16.6.1 The requirements of sub-chapter 16.6 are applicable to tankers which acc to *ADN Rules* are required to be type N tank vessels irrespective of that an additional mark **zb ADN-N**, is assigned or not.

16.6.2 Construction Materials

16.6.2.1 Every part of the vessel, including any installation and equipment which may come into contact with the cargo shall consist of materials which can neither be dangerously affected by the cargo nor cause decomposition of the cargo or react with it so as to form harmful or hazardous products.

16.6.2.2 Except where explicitly permitted in paragraphs 16.6.2.3, 16.6.2.4, 16.6.2.5 or in the *Certificate of approval*, the use of wood, aluminum alloys or plastic materials within the cargo area is prohibited.

16.6.2.3 The use of wood, aluminum alloys or plastic materials within the cargo area is only permitted for:

- gangways and external ladders,
- movable items of equipment (aluminum gauging rods are, however, permitted, provided they are fitted with brass feet or protected in another way to avoid sparking),
- chocking of cargo tanks which are independent of the vessel's hull and chocking of installations and equipment,
- masts and similar round timber equipment,
- lids of boxes which are placed on the deck.

16.6.2.4 The use of wood or plastic materials within the cargo area is only permitted for supports and stops of any kind.

16.6.2.5 The use of plastic materials or rubber within the cargo area is only permitted for:

- coating of cargo tanks and of pipes for loading and unloading,
- insulation of cargo tanks and of hoses for loading and unloading,
- all kinds of gaskets (e.g. for domes or hatch covers).

16.6.2.6 All permanently fitted materials in the accommodation spaces or the wheelhouse, except furniture, shall not readily ignite. They shall not evolve fumes or toxic gases in dangerous quantities, if involved in a fire.

16.6.2.7 The paint used in the cargo area shall not be liable to produce sparks in case of impact.

16.6.2.8 The use of plastic material for the ship's boats is permitted only if the material does not readily ignite.

16.6.3 Protection against the Penetration of Gases

16.6.3.1 The vessel shall be designed so as to prevent gases from penetrating into the accommodation and service spaces.

16.6.3.2 Heights of door sills and coamings:

.1 Outside the cargo area, the lower edges of door-openings in the sidewalls of superstructures and the coamings of access hatches to under-deck spaces shall have a height of not less than 0.50 m above the deck.

This requirement need not be complied with if the wall of the superstructure facing the cargo area extends from one side of the ship to the other and has doors the sills of which have a height of not less than 0.50 m. The height of this wall shall not be less than 2.00 m. In this case the lower edges of door-openings in the sidewalls of superstructures and the coamings of access hatches behind this wall shall have a height of not less than 0.10 m. The sills of engine room doors and the coamings of its access hatches shall, however, always have a height of not less than 0.50 m.

.2 In the cargo area, the lower edges of door-openings in the sidewalls of superstructures shall have a height of not less than 0.50 m above the deck and the sills of hatches and ventilation openings of premises located under the deck shall have a height of not less than 0.50 m above the deck. This requirement does not apply to access openings to double-hull and double-bottom spaces.

16.6.3.3 The bulwarks shall be provided with sufficiently large openings located directly above the deck.

16.6.3.4 Paragraphs 16.6.3.1 ÷ 16.6.3.3 do not apply to "open type N" vessels.

16.6.4 Cargo Tank Openings

16.6.4.1 Cargo tank openings shall be located on deck in the cargo area.

16.6.4.2 Cargo tank openings with a cross-section greater than 0.10 m^2 and openings of safety devices for preventing overpressures shall be located not less than 0.50 m above the tank.

16.6.4.3 Cargo tank openings shall be fitted with gastight closures.

16.6.4.4 Closures which are normally used during loading or unloading operations shall not cause sparking when operated.

16.6.5 Admittance on Board

Clearly visible notice boards displaying the prohibition of unauthorized persons admittance on board shall be placed on both sides of the vessel.

When the vessel is required to carry two blue cones or two blue lights, persons under 14 years of age are not permitted on board.

16.6.6 Emergency Exit

Spaces, the entrances or exits of which are likely to become partly or completely immersed in the damaged condition shall have an emergency exit which is situated not less than 0.1 m above the damage waterline. This requirement does not apply to the forepeak and the afterpeak.

16.6.7 Inspection Openings

Cargo holds and other accessible spaces within the cargo area shall be so arranged as to ensure that they may be completely inspected and cleaned in an appropriate manner.

The dimensions of openings, except those of double-hull spaces and double bottom which do not have a wall adjoining the cargo tanks, shall be sufficient to allow a person wearing breathing apparatus to enter or leave the space without difficulty. The cross-sectional area of such openings shall be not less than 0.36 m^2, and the side length – not less than 0.5 m. The openings shall be so designed as to allow an injured or unconscious person to be removed from such spaces without difficulty, if necessary, by means of fixed equipment. The distance between the reinforcements in these spaces shall be not be less than 0.5 m. In double bottom, this distance may be reduced to 0.45 m.

Cargo tanks may have round openings with a diameter of not less than 0.68 m.

16.6.8 Ends of air pipes of oil fuel tanks

Open ends of air pipes of all oil fuel tanks shall extend to not less than 0.5 m above the open deck. These open ends and the open ends of overflow pipes leading to the deck shall be fitted with a protective device consisting of a gauze diaphragm or a perforated plate

SUPPLEMENT – ADJUSTING REQUIREMENTS

1 APPLICATION

1.1 The requirements of Chapters 2 to 4 of the Supplement apply only to craft carrying on 30 December 2008 a valid vessel certificate according to the Rhine Vessel Inspection Regulation in force on 31 December 1994, or which were under construction or undergoing conversion on 31 December 1994.

1.2 The requirements applying to craft not covered by paragraph 1.1 of the Supplement are given in Chapter 5 of the Supplement.

1.3 The requirements of Chapter 6 of the Supplement apply to craft not navigating on zone R waterways.

2 ADJUSTING REQUIREMENTS FOR CRAFT WHICH ARE ALREADY IN SERVICE

2.1 General

2.1.1 Without prejudice to Chapters 3 and 4 of the Supplement, craft shall be adapted to comply with the requirements of paragraph 2.2 of the Supplement.

2.1.2 Until their adaptation to the requirements given in Sub-chapter 2.2 of the *Supplement*, craft shall comply with the Rhine Vessel Inspection Regulations in force on 31 December 1994.

2.2 Adjusting Requirements

The adjusting requirements and deadlines for valid rules with regard to hull equipment are given in the table 2.2 of the *Supplement*.

Table 2.2

Paragraph in *Part III*	Content	Deadline and comments
13.1.1.7	Receptacles made of steel or another sturdy, non-flammable material and holding at least 10 l.	NRC, at the latest on renewal of the Community Certificate
9.3.2	Monitoring of doors in aft-peak bulkheads	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2010
4.1.6	Anchors not protruding in foresections of vessels	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2041
2.2.1	Minimum speed	For craft laid down before 1996 at the latest on issue or renewal of the Community Certificate after 01.01.2035
3.1.1	Manoeuvrability required by Chapter 2	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2035
3.1.4	Permanent lists and ambient temperatures	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2010
3.1.6	Penetration by rudder stock	For craft laid down before 1996: NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2015
3.16.1.10	Single operation sufficient to operate second driving unit	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2010
3.16.1.11	Manoeuvrability required by Chapter 2 ensured by second drive unit/manual drive	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2035
3.16.2.1	Connection of other consumers to hydraulic steering apparatus drive unit	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2010
3.16.2.2	Separate hydraulic reservoirs	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2010
3.16.3.1	Wheel of manual drive not driven by powered drive unit	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2010

Paragraph in *Part III*	Content	Deadline and comments
8.2.3	Obstructed vision up to two vessel's lengths ahead of the vessel if less than 250 m	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2049
8.2.2.2	Unobstructed view in the helmsman's usual axis of vision	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2015
8.2.7	Minimal light transmission	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2010
8.4.7	Retractable wheelhouses	NRC, at the latest on issue or renewal of the Community Certificate. Non-hydraulic lowering system: at the latest on issue or renewal of the Community Certificate after 01.01.2035
8.4.5	Retractable wheelhouses	NRC, at the latest on issue or renewal of the Community Certificate
4.2.1; 4.2.3; 4.2.6 to 4.2.14; 4.4.1 to 4.4.5	Anchor equipment	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2010
5.2.2	Certificate for mooring ropes made of steel wire or other materials	First cable to be replaced on the vessel: NRC, at the latest 01.01.2008. Second and third cables: 01.01.2013
13.2.1	Application of the European standard to dinghies	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2015
10.5.4	Equipment of outer edges of decks, side decks and work stations Height of coamings	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2020 NRC, at the latest on issue or renewal of the Community certificate after 1.01.2035
10.2.2; 10.2.4	Side decks	([1]) First issue or renewal of the Community Certificate after 01.01.2035, when larger than 7.30 m.
10.2.3	Clear width of side deck	NRC, at the latest on issue or renewal of the Community certificate after 1.0.1.2035, for craft exceeding 7.30 m in width
10.3.3	Access to workplaces	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2035
9.3.5; 10.3.1	Doors and accesses, exits and passageways where there is more than 0.50 m difference in floor level	Issue or renewal of the Community Certificate
10.3.1	Stairs in working spaces which are manned continuously	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2035
9.8.2	Exits and emergency exits	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2035
10.4.1	Ladders, steps and similar devices	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2035
10.4.4; 10.4.5	Ladders, steps and similar devices	Issue or renewal of the Community Certificate
9.4.2; 9.4.3	Hatch covers	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2010
10.1.1	Situation of floors	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2035
10.1.2	Headroom in crew accommodation	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2035
9.3.6	Size of doors	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2035
10.4.1.1; 10.4.1.2	Situation of stairs	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2035

Paragraph in *Part III*	Content	Deadline and comments
15.5.3	Time for closure process	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2015
9.3.2	Optical warning system	NRC, at the latest on issue or renewal of the Community Certificate
15.1.3	Passengers area's under the bulkhead deck behind the collision bulkhead and in front of the aft peak bulkhead.	NRC, at the latest on renewal of the Community certificate after 1.01.2045
15.1.4	Enclosures	NRC, at the latest renewal of the Community certificate
15.6.1	Requirements for enclosures Enclosures	NRC, at the latest renewal of the Community certificate after 1.01.2045. NRC, at the latest renewal of the Community certificate
15.9.1	Number of passengers for whom evacuation area is determined	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2045
15.3.3	Clear height of exits	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2045
14.3.3	Clear width of doors of passenger cabins and other small rooms	For the measurement of 0.7 m, NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2045, applies
15.3.6	Size of emergency exits	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2045
15.3.7	Exits of rooms intended for use by persons with reduced mobility	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2045
15.4.4	Doors intended for use by persons with reduced mobility	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2045
15.3.8	Requirements for connecting corridors	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2045
15.9.1	Requirements for muster areas	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2045
15.8.1 to 15.8.6	Requirements for stairs and their landings in the passenger areas	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2045
15.7.1	Railing according to European standard EN 711: 1995	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2045
15.7.2	Height of bulwarks and railings of decks intended for use by persons with reduced mobility	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2045
15.7.3	Clear width of openings used normally for the embarking or disembarking of persons with reduced mobility	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2045
15.3.8	Traffic areas and walls in traffic areas intended for use by persons with reduced mobility	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2045
15.3.10	Design of glass doors and walls in traffic areas and window panes	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2045
14.6.1	Requirements for superstructures or their roofs consisting completely of panoramic panes	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2045
15.12.8	Requirements for toilets fitted for use by persons with reduced mobility	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2045

Symbols and definitions in the table:

NRC – the provision does not apply to craft which are already operating, unless the parts concerned are replaced or converted, i.e. the requirement applies only to Newly-built craft and to the Replacement or Conversion of the parts or areas concerned. If existing parts are replaced by replacement parts using the same technology and of the same type, this does not constitute replacement ("R") within the meaning of the adjusting requirements.

"Issue or renewal of the Community Certificate" – the requirement shall be complied with by the time of the next issue or renewal of the Community Certificate after the date indicated.
([1]) The requirements apply to vessels laid down after 31.12.1994 and to vessels in service with the following provision:
The requirements of paragraphs 10.2.2 to 10.2.4 shall be complied with where the entire hold area is renewed.
Where a conversion modifying the clear width of the side deck covers the entire length of the side decks, then:
– requirements of paragraphs 10.2.2 to 10.2.4 shall be complied with, if the clear width of the side deck before the conversion to a height of 0,90 m, or if the clear width above that height is to be reduced;
– the clear width of the side deck before the conversion to a height of 0.90 m, or the clear width above that height shall be not lower than the measurements indicated in paragraphs 10.2.2 to 10.2.4.

3 ADJUSTING REQUIREMENTS FOR CRAFT WHICH WERE LAID DOWN ON OR BEFORE 01.04.1976

3.1 General

3.1.1 The requirements of Chapter 2 and Sub-chapter 3.2 of the *Supplement* apply only to craft which were laid down on or before 01.04.1976.

3.2 Adjusting Requirements

The adjusting requirements and the deadlines for rules with regard to hull equipment are given in the table 3.2 of the *Supplement*.

Table 3.2

Paragraph in *Part III*	Content	Deadline and comments
15.5.1 to 15.5.3	Bulkheads	RC, at the latest on issue or renewal of the Community Certificate after 01.01.2045
9.9.1	Watertight windows	RC, at the latest on issue or renewal of the Community Certificate after 01.01.2045
15.9.1	Number of passengers	Issue or renewal of the Community Certificate after 01.01.2045

Symbols and definitions in the table:

RC – the provision does not apply to craft which are already operating, unless the parts concerned are replaced or converted, i.e. the requirement applies only to the Replacement or Conversion of the parts or areas concerned. If existing parts are replaced by replacement parts using the same technology and of the same type, this does not constitute replacement ("R") within the meaning of the adjusting requirements.
"Issue or renewal of the Community Certificate" – the requirement shall be complied with by the time of the next issue or renewal of the Community Certificate after the date indicated.

4 OTHER ADJUSTING REQUIREMENTS

4.1 General

4.1.1 Requirements of paragraphs 15.3.1 to 15.3.5 apply only to craft laid down after 30.08.1984 and to conversions of the areas concerned, at the latest when the Community Certificate is renewed after 01.01.2045.

5 ADJUSTING REQUIREMENTS FOR CRAFT NOT COVERED BY PARAGRAPH 1.1 OF THE SUPPLEMENT

5.1 General

5.1.1 The requirements of Chapter 5 of the Supplement apply:
- to craft not covered by paragraph 1.1 of the Supplement;
- to craft for which a vessel certificate in accordance with the Rhine Vessel Inspection Regulations was issued for the first time between 01.01.1995 and 30.12.2008, provided they were not under construction or undergoing conversion on 31.12.1994;
- to craft which obtained another traffic license between 01.01.1995 and 30.12.2008.

5.1.2 It shall be provided that those craft comply with the Rhine Vessel Inspection Regulations as applicable on the date on which the vessel certificate or the other traffic license is granted.

5.1.3 The craft shall be adapted to comply with requirements of Chapter 5 of the Supplement which enter into force following the first issue of the vessel certificate or other traffic license according to the table 5.2 of the Supplement.

5.2 Adjusting Requirements

The adjusting requirements and the deadlines for rules with regard to hull equipment are given in the table 5.2 of the Supplement.

Table 5.2

Paragraph in *Part III*	Content	Deadline and comments	Valid for craft with vessel certificate or traffic licence before
10.5.4	Height of bulwarks and coamings, and shipside guard rails	NRC, at the latest on issue or renewal of the Community certificate after 1.02.2035	1.12.2013
13.1.1.7	Receptacles made of steel or another sturdy, non-flammable material and holding at least 10 l.	NRC, at the latest on renewal of the Community Certificate	1.12.2013
15.1.3	Passengers area's under the bulkhead deck behind the collision bulkhead and in front of the aft peak bulkhead.	NRC, at the latest on renewal of the Community certificate	1.12.2013
15.1.4	Enclosures	NRC, at the latest on issue or renewal of the Community certificate	1.12.2013
4.1.6	Anchors not protruding in foresections of vessels	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2041	01.10.1999
8.2.3	Obstructed vision ahead of the vessel two vessel's lengths if less than 250 m	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2049	30.12.2008
5.2.2	Certification of wire ropes and other ropes	The first rope replaced on the vessel: NRC, at the latest 01.01.2008 Second and third ropes: 01.01.2013	01.04.2003
13.2.1	Application of the European standard to dinghies	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2015	01.10.2003
15.9.1	Number of passengers for whom an evacuation area is determined	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2045	01.01.2006
15.3.3	Clear height of exits	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2045	01.01.2006

Paragraph in *Part III*	Content	Deadline and comments	Valid for craft with vessel certificate or traffic licence before
15.3.3	Clear width of doors of passenger cabins and other small rooms	For the measurement of 0.7 m, NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2045 applies	01.01.2006
15.3.6	Size of emergency exits	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2045	01.01.2006.
15.3.7	Exits intended for use by persons with reduced mobility	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2045	01.01.2006
15.4.4	Doors intended for use by persons with reduced mobility	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2045	01.01.2006
15.6.1	Requirements for enclosures within the superstructure that consist totally or partly of panoramic windows. Requirements for enclosures	NRC, at the latest on renewal of the Community certificate after 1.01.2045 NRC, at the latest on renewal of the Community	1.12.2013
15.9.1	Requirements for muster areas	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2045	01.01.2006
15.8.1 to 15.8.6	Requirements for stairs and their landings in the passenger areas	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2045	01.01.2006
15.7.1	Railing according to European standard EN 711: 1995	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2045	01.01.2006
15.7.2	Height of bulwarks and railings of decks intended for use by persons with reduced mobility	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2045	01.01.2006
15.7.3	Clear width of openings used for the embarking or disembarking of persons with reduced mobility	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2045	01.01.2006
15.8.8	Gangways in accordance with European standard EN 14206: 2003	NRC, at the latest on issue or renewal of the Community Certificate	01.01.2006
15.3.8	Traffic areas and walls in traffic areas, intended for use by persons with reduced mobility	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2045	01.01.2006
15.3.10	Design of glass doors and walls in traffic areas and window panes	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2045	01.01.2006
15.12.8	Requirements for toilets fitted for use by persons with reduced mobility	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2045	01.01.2006

Symbols and definitions in the table:

NRC – the provision does not apply to craft which are already operating, unless the parts concerned are replaced or converted, i.e. the requirement applies only to Newly-built craft and to the Replacement or Conversion of the parts or areas concerned. If existing parts are replaced by replacement parts using the same technology and of the same type, this does not constitute replacement ("R") within the meaning of the adjusting requirements.

"Issue or renewal of the Community Certificate" – the requirement shall be complied with by the time of the next issue or renewal of the Community Certificate after the date indicated.

6 ADJUSTING REQUIREMENTS FOR CRAFT NOT NAVIGATING ON ZONE R WATERWAYS

6.1 General

6.1.1 The requirements of Chapter 6 of the Supplement apply:
– to craft for which the Community Certificate was issued for the first time before 30.12.2008,
– to craft which obtained another traffic license before 30.12.2008 not navigating on zone R waterways.

6.1.2 It shall be provided that those craft comply with the requirements of PRS Rules on the date on which the Community Certificate or the other traffic license is issued**.**

6.1.3 Community Certificates delivered before 30.12.2008 remain valid until the date of expiry indicated on the certificate.

6.1.4 If it is difficult in practical terms to apply the requirements of Chapter 6 of the Supplement following the expiry of the adjusting requirements, or if their application gives rise to unreasonably high costs, the inspection body may allow derogations from these requirements subject to recommendations by the Committee. These derogations shall be entered in the Community Certificate**.**

6.2 Adjusting Requirements for Craft already in Service

6.2.1 Without prejudice to Sub-chapters 6.3 and 6.4, craft shall be adapted to comply with requirements of paragraph 6.2.2 of the Supplement.

6.2.2 The adjusting requirements and the deadlines for rules with regard to hull equipment are given in the table 6.2.2 of the Supplement.

Table 6.2.2

Paragraph in *Part III*	Content	Deadline and comments
9.3.2	Monitoring of doors in the aft-peak bulkhead	
4.1.6	Anchors not protruding in foresection of vessels	NRC, at the latest on issue or renewal of the Community Certificate after 30.12.2049
2.2.1	Minimum speed	NRC, at the latest on issue or renewal of the Community Certificate after 30.12.2049
3.1.1	Manoeuvrability required by Chapter 2	NRC, at the latest on issue or renewal of the Community Certificate after 30.12.2049
3.1.4	Permanent lists and ambient temperatures	NRC, at the latest on issue or renewal of the Community Certificate after 30.12.2024
3.1.6	Penetration by rudder stock	NRC, at the latest on issue or renewal of the Community Certificate after 30.12.2029
3.16.1.10	Activating the second drive unit by means of a single operation	NRC, at the latest on issue or renewal of the Community Certificate after 01.01.2026
3.16.1.11	Manoeuvrability required by Chapter 2 ensured by second drive unit/manual service	NRC, at the latest on issue or renewal of the Community Certificate after 30.12.2049
3.16.2.1	Connection of other power consumers to the hydraulic steering apparatus drive unit	NRC, at the latest on issue or renewal of the Community Certificate after 30.12.2024
3.16.2.2	Separate hydraulic reservoirs	NRC, at the latest on issue or renewal of the Community Certificate after 30.12.2024
3.16.3.1	Wheel of manual drive not driven by powered drive unit	NRC, at the latest on issue or renewal of the Community Certificate after 30.12.2024
8.2.2.1; 8.2.3 to 8.2.7	Unobstructed view from the wheelhouse, except paragraph 8.2.2.2	NRC, at the latest on issue or renewal of the Community Certificate after 30.12.2049
8.2.2.2	Unobstructed view in the sightline of the helmsman	NRC, at the latest on issue or renewal of the Community Certificate after 30.12.2029
4.2.1; 4.2.3; 4.2.6 to 4.2.14; 4.4.1 to 4.4.5	Anchor equipment	NRC, at the latest on issue or renewal of the Community Certificate after 30.12.2024

Paragraph in *Part III*	Content	Deadline and comments
5.2.2	Certificate for mooring ropes made of steel wire or other materials	First cable to be replaced on the vessel: NRC, at the latest on issue or renewal of the Community Certificate after 30.12.2024. Second and third cables: 30.12.2029
13.2.1	Application of the European standard to dinghies	NRC, at the latest on issue or renewal of the Community Certificate after 30.12.2029
10.5.4	Equipment for outer edges of decks, side decks and work stations. Height of bulwarks or coamings	NRC, at the latest on issue or renewal of the Community certificate after 1.01.2020. NRC, at the latest on issue or renewal of the Community certificate after 1.01.2020
10.2.2; 10.2.4	Side decks	([1]) First issue or renewal of the Community Certificate after 30.12.2049, where width exceeds 7.30 m.
10.2.3	Clear width of side deck	NRC, at the latest on issue or renewal of the Community certificate after 1.0.1.2035, for craft exceeding 7.30 m in width
10.3.3	Access to workplaces	NRC, at the latest on issue or renewal of the Community Certificate after 30.12.2049
9.3.5; 10.3.1	Doors and accesses, exits and passageways where there is more than 0,50 m difference in floor level	NRC, at the latest on issue or renewal of the Community
10.3.1	Stairs in working spaces which are manned continuously	NRC, at the latest on issue or renewal of the Community Certificate after 30.12.2049
9.8.2	Exits and emergency exits	NRC, at the latest on issue or renewal of the Community Certificate after 30.12.2049
10.4.1	Ladders, steps and similar devices	NRC, at the latest on issue or renewal of the Community Certificate after 30.12.2049
10.4.4; 10.4.5	Ladders, steps and similar devices	NRC, at the latest on issue or renewal of the Community Certificate
9.4.2; 9.4.3	Hatch covers	NRC, at the latest on issue or renewal of the Community Certificate after 30.12.2024
10.1.1	Situation of floors	NRC, at the latest on issue or renewal of the Community Certificate after 30.12.2049
10.1.2	Headroom in accommodations	NRC, at the latest on issue or renewal of the Community Certificate after 30.12.2049
9.3.6	Size of doors	NRC, at the latest on issue or renewal of the Community Certificate after 30.12.2049
10.4.1.1; 10.4.1.2	Situation of stairs	NRC, at the latest on issue or renewal of the Community Certificate after 30.12.2049

Symbols and definitions in the table:
NRC – the provision does not apply to craft which are already operating, unless the parts concerned are replaced or converted, i.e. the requirement applies only to Newly-built craft and to the Replacement or Conversion of the parts or areas concerned. If existing parts are replaced by replacement parts using the same technology and of the same type, this does not constitute replacement ("R") within the meaning of the adjusting requirements.

"Issue or renewal of the Community Certificate" – the requirement shall be complied with by the time of the next issue or renewal of the Community Certificate after 30.12.2008. If the certificate expires between 30.12.2008 and the day before 30.12.2009, that requirement is, however, only mandatory from 30.12.2009.

([1]) The provision applies to vessels laid down after 31.12.1994 and to vessels in service with the following requirements:
The requirements of paragraphs 10.2.2 to 10.2.4 shall be complied with where the entire hold area is renewed.

Where a conversion modifying the clear width of the side deck covers the entire length of the side decks, then:
– requirements of paragraphs 10.2.2 to 10.2.4 shall be complied with, if the clear width of the side deck before the conversion to a height of 0.90 m, or if the clear width above that height is to be reduced;
– the clear width of the side deck before the conversion to a height of 0.90 m, or the clear width above that height shall be not lower than the measurements indicated in paragraphs 10.2.2 to 10.2.4.

6.3 Adjusting requirements for craft which were laid down before 01.01.1985

6.2.3 Craft which were laid down before 01.01.1985 shall be adapted to comply with requirements of paragraph 6.3.2 of the *Supplement*.

6.2.4 The adjusting requirements and the deadlines for rules with regard to hull equipment are given in the table 6.3.2. of the *Supplement*.

Table 6.3.2

Paragraph in *Part III*	Content	Deadline and comments
9.3.2	Openings in watertight bulkheads	NRC
3.1.4	Requirements of steering system	NRC
8.1.2	Maximum permissible sound pressure level in wheelhouse	NRC
8.3.2; 8.3.6; 8.4.7	Retractable wheelhouses	NRC

Symbols and definitions in the table:
NRC – the provision does not apply to craft which are already operating, unless the parts concerned are replaced or converted, i.e. the requirement applies only to Newly-built craft and to the Replacement or Conversion of the parts or areas concerned. If existing parts are replaced by replacement parts using the same technology and of the same type, this does not constitute replacement (“R”) within the meaning of the adjusting requirements.

7 RETROACTIVE REQUIREMENTS FOR SHIPS INTENDED TO CARRY DANGEROUS GOODS

7.1 General

Provisions of this chapter apply to ships intended to carry dangerous goods as described in Art.8 of ADN Agreement.

7.2 General retroactive requirements for general cargo vessels

Ships in service shall meet:
– the requirements in paragraphs mentioned in Table 7.2 within the period established therein;
– the requirements in paragraphs not mentioned in Table 7.2 on the day when the application of the Rules given in Chapter 16 will commence.

The construction and equipment of ships in service shall be maintained at least at the previous standard of safety.

Table 7.2

Paragraph in *Part III*	Subject	Time limit and comments
16.3.4.1	Gas-tight openings facing holds	N.R.M.
16.3.3	Air pipes 0.50 m above the deck	N.R.M.

N.R.M. – see definitions at Table 2.2.

7.3 General retroactive requirements for tankers

Ships in service shall meet:

– the requirements in paragraphs mentioned in Table 7.3 within the period established therein;
– the requirements in paragraphs not mentioned in Table 7.3 on the day when the date of application of the *Rules* in Chapter 16 will commence.

The construction and equipment of ships in service shall be maintained at least at the previous standard of safety.

Table 7.3

Paragraph in *Part III*	Subject	Time limit and comments
16.4.4.1	Distance of cargo tank openings above the deck	N.R.M.
16.6.4.2	Cargo tank openings minimum 0.50 m above the deck	Shall not apply to ships whose keels were laid before 1 January 1977.
16.4.3.2.1	Height of sills of hatches and openings above the deck	N.R.M. The following requirements apply on board vessels in service, with the exception of Type N open vessels: – this requirement may be met by fitting vertical protection walls not less than 0.50 m in height; – on board vessels in service less than 50.00 m long, the height of 0.50 m may be reduced to 0.30 m in passageways leading t the deck.
16.4.3.2.2	Height of sills of hatches and openings above the deck	N.R.M.
16.4.7	Dimensions of openings for access to spaces within the cargo area	N.R.M.
16.4.8	Openings of air pipes 0.50 m above the deck	N.R.M.
16.5.3.2.1	Height of sills of hatches and openings above the deck	N.R.M. The following requirements apply on board vessels in service, with the exception of Type N open vessels: – this requirement may be met by fitting vertical protection walls not less than 0.50 m in height; – on board vessels in service less than 50.00 m long, the height of 0.50 m may be reduced to 0.30 m in passageways leading to the deck.
16.5.3.2.2	Height of sills of hatches and openings above the deck	N.R.M.
16.5.7	Dimensions of openings for access to spaces within the cargo area	N.R.M.
16.5.8	Openings of air pipes 0.50 m above the deck	N.R.M.
16.6.3.2.1	Height of sills of hatches and openings above the deck	N.R.M. The following requirements apply on board vessels in service, with the exception of Type N open vessels: – this requirement may be met by fitting vertical protection walls not less than 0.50 m in height; – on board vessels in service less than 50.00 m long, the height of 0.50 m may be reduced to 0.30 m in passageways leading to the deck.
16.6.3.2.2	Height of sills of hatches and openings above the deck	N.R.M.
16.6.7	Dimensions of openings for access to spaces within the cargo area	N.R.M.
16.6.8	Openings of air pipes 0.50 m above the deck	N.R.M.

N.R.M. – see definitions at Table 2.2.

List of amendments effective as of 1 January 2017

Item	*Title/Subject*	*Source*
2.7.2	Addition of "as amended"	PRS Rules Users' remarks
3.2.2.2	Rudder blade torque	PRS Rules Users' remarks
3.16.3.6	Change of standard number	PRS Rules Users' remarks
11.1.1	Guard rails in way of deck edge	PN-EN 711:2016
11.1.2	New numbers of tables	PRS – correction of number-ing
11.2.1	Types of guard rails	PN-EN 711:2016
11.2.3	Aluminum guard rails	PRS Rules Users' remarks
11.2.4	Railing - Safety dimensions	PN-EN 711:2016
11.2.5	Railing - Sturdiness requirements	PN-EN 711:2016
11.2.6	Railing in specific areas	PN-EN 711:2016
14.3.1	Addition of "as amended"	PRS Rules Users' remarks
14.3.2	Addition of "as amended"	PRS Rules Users' remarks
15.7.1	Types of guard rails in passenger area	PN-EN 711:2016
15.7.5	Railing - Safety dimensions	PN-EN 711:2016
15,7.6	Railing - Sturdiness requirements	PN-EN 711:2016
15.7.7	Aluminum guard rails	PRS Rules Users' remarks