CHINA CLASSIFICATION SOCIETY

CCS Rule Change Notice For:

Rules for Construction of Ocean-going Steel Fishing Vessels

Version: 2024RCN No.1

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Beijing

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PART 1 HULL

CHAPTER 2 HULL STRUCTURE

Section 15 SUPERSTRUCTURES AND RAISED QUARTERDECKS

2.15.2 End bulkheads

It is amended to：

2.15.2.1 The design pressure head h for end bulkheads of exposed superstructures is to be obtained as follows and not less than the minimum value in Table 2.15.2.1:

$$h = \alpha\delta(\beta\lambda - \gamma) \quad \text{m}$$

Where:α、β、λ and δ —— coefficients, to be determined respectively according to 2.15.2.2, 2.15.2.3, 2.152.4 and 2.15.2.5 of this Section

γ —— vertical distance, in m, measured from summer load waterline to mid-span of stiffener or mid-point of panel.

The pressure head **Table 2.15.2.1**

Length of ship L（m）	Pressure head h_{min}（m）	
	Lowest tier of unprotected fronts	Elsewhere
L≤50	3.0	1.5
50＜L＜90	0.01L+2.5	0.005L+1.25

2.15.2.2 Coefficient α is to be determined as follows:

α=0.0083L+2.0, lowest tier of unprotected fronts

α=0.0083L+1.0, second tier of unprotected fronts

α=0.0067L+0.5, third tier of unprotected fronts and above, protected fronts

α=0.001L-0.8(X/L)+0.7, aft ends of all tiers where aft of amidships

α=0.001L-0.4(X/L)+0.5, aft ends of all tiers where forward of amidships

where: L —— length of ship, in m;

X —— distance, in m, between bulkhead considered and A.P.

2.15.2.3 Coefficient β is to be determined as follows:

$$\beta = 1.0 + \left(\frac{X/L - 0.45}{C_b + 0.2}\right)^2 \qquad 当 X/L \le 0.45$$

$$\beta = 1.0 + 1.5\left(\frac{X/L - 0.45}{C_b + 0.2}\right)^2 \qquad 当 X/L > 0.45$$

where: L —— length of ship, in m;

X —— see 2.15.2.2;

C_b —— block coefficient, where C_b < 0.6, to be taken as 0.6; where C_b > 0.8, to be taken as 0.8; where the aft end bulkhead of the superstructure is forward of amidships, C_b used in determining the value β for the aft end bulkhead is not to be taken as less than 0.8.

2.15.2.4 Coefficient λ is to be determined as follows:

$$\lambda = \frac{L}{10}e^{-L/300} - \left[1-(\frac{L}{150})^2\right]$$

where: L —— length of ship, in m;

2.15.2.5 Coefficient δ is to be taken as 1 for superstructures.

2.15.2.6 The thickness t of end bulkhead plating of superstructures is not to be less than:

$$t = 3s\sqrt{h} \quad \text{mm}$$

$$t_{\min} = (0.01L + 5.0) \quad \text{mm, for lowest tie r}$$
$$t_{\min} = (0.01L + 4.0) \quad \text{mm, for upper tier s, and not less than 5 mm}$$

For ships with L<65m, The minimum thickness t_{min} is not to be less than:

t_{min}=5mm, for the lowest unprotected front

t_{min}=4mm, for all other cases

where: s —— spacing of stiffeners, in m;

h —— design pressure head, in m, to be calculated according to 2.15.2.1~215.2.5 of this Section;

L —— length of ship, in m.

2.15.2.7 The section modulus W of end bulkhead stiffeners of superstructures is not to be less than:

$$W = 3.5shl^2 \quad \text{cm}^3$$

where: s —— spacing of stiffeners, in m;

l —— span of stiffener, in m; to be taken as height of deckhouse, but not less than 2.0 m in any case;

h —— design pressure head, in m, are the same as that in 2.15.2.6 of this Section.

The section modulus of end stiffeners is not to be less than 10cm^3, but not necessary to be greater than the section modulus of the main frame.

Both ends of the front bulkhead stiffeners are to be connected by brackets. The scantlings of the brackets are to comply with the provisions of 1.2.5 of this PART. Both ends of the rear bulkhead stiffeners are to be welded to the deck.

Section 16 DECKHOUSE AND MACHINERY CASINGS

2.16.2 Boundary bulkhead

It is amended to：

2.16.2.1 The design pressure head h for boundary bulkheads (end and side bulkheads) of exposed deckhouses is to be calculated according to 2.15.2 of this Chapter. Where the coefficient δ is to be determined as follows:

$$\delta = 0.7\frac{b}{B_1} + 0.3, \text{ and not less than } 0.475$$

where： b —— breadth of deckhouse at the position considered, in m;

B_1 —— actual maximum breadth of ship on the exposed weather deck at the position considered, in m. For machinery casings and deckhouses protecting pump room openings, δ is to be taken as 1.

When calculating the plating thickness of the sides of all tiers, coefficient α is to be determined as follows:

$$\alpha=0.0067L+0.5$$

where: L —— length of ship, in m;

X —— distance, in m, between bulkhead considered and A.P. The deckhouse is to be subdivided into parts of approximately equal length, not exceeding 0.15L each and X is to be taken as the distance between A.P. and the centre of each part considered.

2.16.2.2 The thickness t of boundary bulkheads plating of deckhouse is to be calculated according to 2.15.2.6 of this Chapter. The section modulus W of boundary bulkhead stiffeners of deckhouse is to be calculated according to 2.15.2.7 of this Chapter, and is not to be less than 10cm^3.

CHAPTER 3 OUTFITS

Section 1 RUDDERS

3.1.1 General requirements

3.1.1.2 Design considerations

(3) In rudder trunks which are open to the sea, a seal or stuffing box is to be fitted above the deepest load waterline, to prevent water from entering the steering gear compartment and the lubricant from being washed away from the rudder carrier. If the top of the rudder trunk is below the ~~deepest~~ waterline at scantling draught (without trim), two separate watertight seals/stuffing boxes are to be provided.

3.1.1.4 Welding and design details

(3) Welds in the rudder side plating subjected to significant stresses from rudder bending and welds between plates and heavy pieces (solid parts in forged or cast steel or very thick plating) are to be made as full penetration welds. In way of highly stressed areas e.g. cut-out of semi-spade rudder and upper part of spade rudder, cast or welding on ribs is to be arranged. Two sided full penetration welding is normally to be arranged. Where back welding is impossible welding is to be performed against ceramic backing bars or equivalent. Steel backing bars may be used and are to be fitted with continuous~~ly~~ weld~~ed~~ on one side to the ~~heavy piece~~bevelled edge, see Figure 3.1.1.4. The bevel angle is to be at least 15 °for one sided welding.

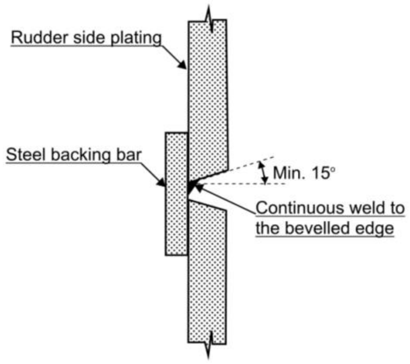


Figure 3.1.1.4 Use of steel backing bar in way of full penetration welding of rudder side plating

3.1.2 Rudder force and rudder torque

3.1.2.1 Rudder blades without cut-outs

(1) The rudder force C_R upon which the rudder scantlings are to be based is to be determined from the following formula:

$$C_R = 132 K_1 K_2 K_3 A V^2 \quad \text{in N}$$

Where: C_R—rudder force, in N;

A—area of rudder blade, in m^2;

V—maximum service speed, in knots. When the speed is less than 10 kn, V is to be replaced by the following:

$$V_{min} = (V + 20) / 3$$

For astern condition the maximum astern speed V_{astern} [1] is to be useed, however, in no case taken less than:

$$V_{astern} = 0.5\ V$$

K_1—factor depending on the aspect ratio λ of the rudder area;

$K_1 = (\lambda + 2) / 3$, with λ not to be taken greater than 2;

$$\lambda = b^2/A_t;$$

b—mean height of rudder area, in m. The mean rudder breadth and mean height of rudder are calculated according to the coordinate system in Figure 3.1.2.1;

A_t—sum of rudder blade area A and area of rudder post or rudder horn, if any, within the height b, in m^2;

K_2—coefficient depending on the type of the rudder and the rudder profile according to Table 3.1.2.1; data may be provided by tests with approval of CCS;

K_3—factor, taken as follows:

= 0.8 for rudders outside the propeller jet;

= 1.15 for rudders behind a fixed propeller nozzl;

= 1.0 otherwise.

3.1.4 Rudder stock scantlings

3.1.4.2 Rudder stock scantlings due to combined loads

If the rudder stock is subjected to combined torque and bending, the equivalent stress in the rudder stock is not to exceed 118 / K,N/mm^2.*K*is material factor for the rudder stock as given in 3.1.1.3(5).

The equivalent stress σ_c is to be determined by the formula:

$$\sigma_c = \sqrt{\sigma_b^2 + 3\tau_t^2}\ \text{N/mm}^2$$

Where: bending stress $\sigma_b = 10.2M/d_c^3 \times 10^3$, in N/mm^2

torsional stress:$\tau_t = 5.1Q_R/d_c^3 \times 10^3$, in N/mm^2.

The rudder stock diameterD_p is not to be less than that obtained from the following formula:

$$\cancel{d_c = d_t \sqrt[6]{1 + (M/Q_R)^2\ 4/3}\ \text{mm}}$$

$$d_c = d_t \sqrt[6]{1 + \frac{4}{3}\left(\frac{M}{Q_R}\right)^2}\qquad \text{mm}$$

Where: *M*—bending moment, in N•m, at the station of the rudder stock considered.

For a spade rudder with trunk extending inside the rudder, the rudder stock scantlings shall be checked against the two cases defined in Annex III 2.2.

3.1.5 Rudder blade

[1] Maximum astern speed is the speed which it is estimated the ship can attain at the designed maximum astern power at the deepest sea-going draught

3.1.5.2 Rudder plating

The thickness t of the rudder side, top and bottom plating are not to be less than the values obtainted from the following formula:

$$\cancel{t = 5.5 s \beta \sqrt{K} \sqrt{d + C_R 10^{-4} / A} + 2.5 \quad \text{mm}}$$

$$t = 5.5 s \beta \sqrt{K} \sqrt{T_{sc} + C_R 10^{-4} / A} + 2.5$$

Where: T_{sc} ~~d — summer~~ scantling ~~load waterline~~ draught, in m;

C_R—rudder force, in N, see 3.1.2.1 in this Section;

A—area of rudder blade, in m^2;

$\beta = \sqrt{1.1 - 0.5(s/b)^2}$, if $b/s \geq 2.5$, maximum value for β is taken *as* 1;

s—smallest unsupported width of plating, in m;

b—greatest unsupported width of plating, in m;

K—material factor of rudder blade, see 3.1.1.3 (2) of this Section.

The thickness of the nose plate of rudder blades is not to be less than 1.2 times that of rudder side plating, but need not be greater than 22 mm. The thickness of web plates is not to be less than the greater of 70% of the rudder side plating thickness and 6 mm.

The rudder plating in way of the solid part is to be of increased thickness per 3.1.5.3 (4).

3.1.6 Rudder stock couplings

(1) Tapering and coupling length

Cone couplings without hydraulic arrangements for mounting and dismounting the coupling are to have a taper c on diameter of 1:8 − 1:12.

Where，$c = (d_0 - d_u) / l_c$，see Figure 3.1.6.3(a) and Figure 3.1.6.3(c). The diameters d_0 (mm) and du (mm) are shown in Figure 3.1.6.3(a) and the cone length lc (mm) is defined in Figure 3.1.6.3(c).

The cone coupling is to be secured by a slugging nut. The nut is to be secured, e.g. by a securing plate as shown in Figure 3.1.6.3(a).

The cone shapes are to fit exactly. The coupling length l (mm) is to be, in general, not less than $1.5d_0$.

3.1.6.4 Cone couplings with special arrangements for mounting and dismounting the couplings

(2) Push-up pressure

The push-up pressure is not to be less than the greater of the two following values:

$$p_{req1} = \frac{2Q_F \times 10^3}{d_m{}^2 l \pi \mu_0} \quad \text{N/mm}^2$$

$$\cancel{p_{req2} = \frac{6M_b \times 10^3}{l^2 d_m} \quad \text{N/mm}^2}$$

$$p_{req2} = \frac{6M_C \times 10^3}{l^2 d_m} \quad \text{N/mm}^2$$

where：Q_F —design yield moment of rudder stock, as defined in 3.6.3.2 of this Section, in N m;

d_m —mean cone diameter, in mm, see Figure 3.1.6.3(a);

l —coupling length, in mm;

μ_0—frictional coefficient, equal to 0.15;

M_{bc}—bending moment in rudder stock at the top of the cone coupling (e.g. in case of spade rudders), in N m.

For a spade rudder with trunk extending inside the rudder, the rudder stock scantlings shall be checked against the two cases defined in Annex Ⅲ 2.2.

It has to be proved by the designer that the push-up pressure does not exceed the permissible surface pressure in the cone. The permissible surface pressure, in N/mm², is to be determined by the following formula:

$$\xcancel{p_{perm} = \frac{0.8R_{eH}(1-\alpha^2)}{\sqrt{3+\alpha^4}} \quad \text{N/mm}^2}$$

$$p_{perm} = \frac{0.95R_{eH}(1-\alpha^2)}{\sqrt{3+\alpha^4}} - p_b \qquad \text{N/mm}^2$$

式中： $$p_b = \frac{3.5M_C \times 10^3}{l^2 d_m} \qquad \text{N/mm}^2$$

where： R_{eH} —specified minimum yield stress of the material of the gudgeon, in N/mm²;

$\alpha = d_m / d_a$;

d_m—diameter, in mm, see Figure 3.1.6.3(a);

d_a—outer diameter of the gudgeon to be not less than 1.25 d_0, in mm, see Figure 3.1.6.3 (a) and 3.1.6.3(b). (The least diameter is to be considered).

3.1.7 Pintles

3.1.7.2 Couplings

(2) Push-up pressure for pintle

The required push-up pressure for pintle in case of dry fitting, in N/mm², is to be determined by p_{req1} as given below.

The required push-up pressure for pintle in case of oil injection fitting, in N/mm², is to be determined by the maximum pressure of p_{req1} and p_{req2} as given below ~~following formula~~:

$$\xcancel{p_{req} = 0.4\frac{B_1 d_0}{d_m^2 l} \quad \text{N/mm}^2}$$

$$p_{req1} = \frac{0.4Bd_0}{d_m^2 l} \qquad \text{N/mm}^2$$

$$p_{req2} = \frac{6\times10^3 M_{bp}}{l^2 d_m} \qquad \text{N/mm}^2$$

where： B~~1~~ —Supporting force in the pintle, in N;

d_0 —Pintle diameter, in mm, see Figure 3.1.7.2~~3.1.6.3(a)~~;

M_{bp} —bending moment in the pintle cone coupling to be determined by:

$$M_{bp} = Bl_\alpha \qquad \text{N}\cdot\text{m}$$

l_α —length between middle of pintle-bearing and top of contact surface between cone coupling and pintle in m, see Figure 3.1.7.2.

The required push up length Δl_1 is to be calculated similarly as in 3.1.6.4(3) of this Section, using the required push-up pressure as defined above, and properties for the pintle.

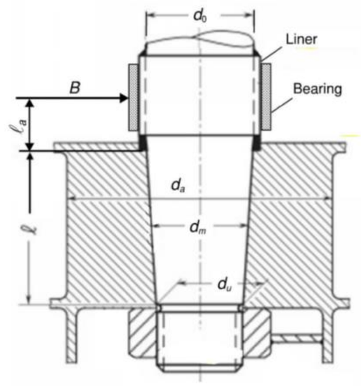


图 3.1.7.2 pintle cone coupling indicating l_α

3.1.8 Rudder stock bearing, rudder shaft bearing and pintle bearing

3.1.8.1 Liners and bushes

(1) Rudder stock bearing

Liners and bushes are to be fitted in way of bearings. For rudder stocks and pintles having diameter less than 200 mm, liners in way of bushes may be provided optionally. The minimum thickness of liners and bushes t_{min} is to be equal to:

t_{min}=8mm for metallic materials and synthetic material;

t_{min}=22mm for lignum material.

3.1.9 Strength of rudder horns and rudder trunk

3.1.9.2 Rudder trunk

The requirements in this paragraph apply to trunk configurations which are extended below stern frame and arranged in such a way that the trunk is stressed by forces due to rudder action.

(1) Materials, welding and connection to hull

The steel used for the rudder trunk is to be of weldable quality, with a carbon content not exceeding 0.23% on ladle analysis or a carbon equivalent C_{EQ} not exceeding 0.41%.

Plating materials for rudder trunks are in general to meet the requirements in 1.3.2 of this PART.

The weld at the connection between the rudder trunk and the shell or the bottom of the skeg is to be full penetration.

For rudder trunks extending below shell or skeg, the fillet shoulder radius r, in mm (see Figure 3.1.9.2) is to be as large as practicable and to comply with the following formulae:

$r=0.1d_c/K$， without being less than:

r=60 mm， when $\sigma \geq 40/K$， N/mm^2

30 mm when $\sigma < 40/K$， N/mm^2

where： d_c—rudder stock diameter axis as defined in 3.1.4.2;

σ—bending stress in the rudder trunk, in N/mm^2;

K—material factor for the rudder trunk as given in 3.1.1.3(2) or 3.1.1.3(5) of this Section.

Section 2 ANCHORING AND MOORING EQUIPMENT

3.2.2 Anchors

3.2.2.6 As an alternative, the anchors and chains to be fitted to the vessel can be determined by the anchoring equipment for fishing vessels are to be provided in accordance with the direct force calculations of the mooring equipment in Appendix IV to this chapter.

3.2.5 Cables replacement

3.2.5.5 Where the anchor chains is replaced by wire rope:

(1) A short length of chain cable is to be fitted between the wire rope and the anchor, having a length equal to 12.5 m or the distance from the anchor in the stowed position to the winch, whichever is the lesser.

(2) All surfaces being in contact with the wire need to be rounded with a radius of not less than 10 times the wire rope diameter (including stem).

APPENDIX III GUIDELINES FOR CALCULATION OF BENDING MOMENT AND SHEAR FORCE DISTRIBUTION

2 The force on rodder-rudder stock

2.1 Spade rudder

Data for the analysis

l_{10}~ l_{30}—length of the individual girders of the system, in m;

I_{10}~ I_{30}—moment of inertia of these girders, in cm^4.

Load of rudder body

$$P_R = C_R / (l_{10} 10^3) \quad \text{kN/m}$$

Moments and forces

The moments and forces may be determined by the following formula

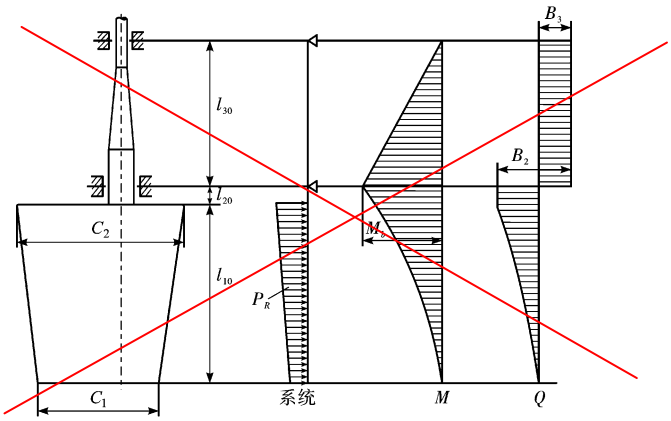
$$M_b = C_R (l_{20} + (l_{10}(2c_1 + c_2)/3(c_1 + c_2))) \quad \text{N m}$$

$$B_3 = M_b / l_{30} \quad \text{N}$$

$$B_2 = C_R + B_3 \quad \text{N}$$

Where: C_R—rudder force, in N.

The maximum moment, M_C, in top of the cone coupling as shown in Figure 2.1 is applicable for the connection between the rudder and the rudder stock.



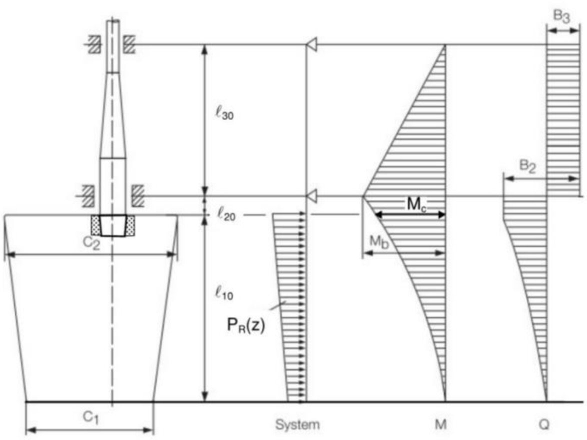


图 2.1　悬挂舵

2.2　Spade rudder with trunk

Data for the analysis

l_{10}~ l_{30}—length of the individual girders of the system, in m;

I_{10}~ I_{30}—moment of inertia of these girders, in cm^4.

Load of rudder body

$$P_R = C_R / \left((l_{10} + l_{20})\, 10^3 \right) \text{ kN/m}$$

Moments and forces

For spade rudders with rudders trunks the moments, and forces may be determined by the following formula. The moments and forces for the two cases defined above may be according to Figure 2.2(1) and (2), respectively.

(1) pressure applied on the entire rudder area, see figure 2.2(1):

rudder force: $C_R=C_{R1}+C_{R2}$

rudder torque: $Q_R=Q_{R1}+Q_{R2}$

rudder stock bending moment: $M_b=M_{CR2}-M_{CR1}$

(2) pressure applied only on rudder area below the middle of neck bearing, see figure 2.2(2):

rudder force acting at rudder blade area A_2: C_{R2}

rudder torque acting at rudder blade area A_2: Q_{R2}

rudder stock bending moment: $M_b=M_{CR2}$

~~M_R is the greatest of the following values:~~

$$M_{CR1}=C_{R1}(C_{G1}-l_{10}) \text{ N m}$$

$$M_{CR2}=C_{R2}(l_{10}-C_{G2}) \text{ N m}$$

Where: C_{R1}—rudder force over the rudder blade area A_1,in N;

C_{R2}—rudder force over the rudder blade area A_2, in N;

C_{G1}—Vertical position of the gravity of rudder blade area A_1, in m;

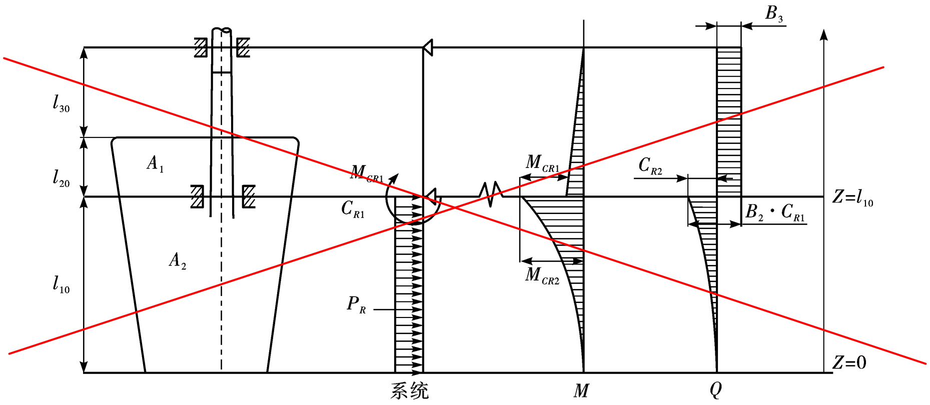
C_{G2}—Vertical position of the gravity of rudder blade area A_2, in m;

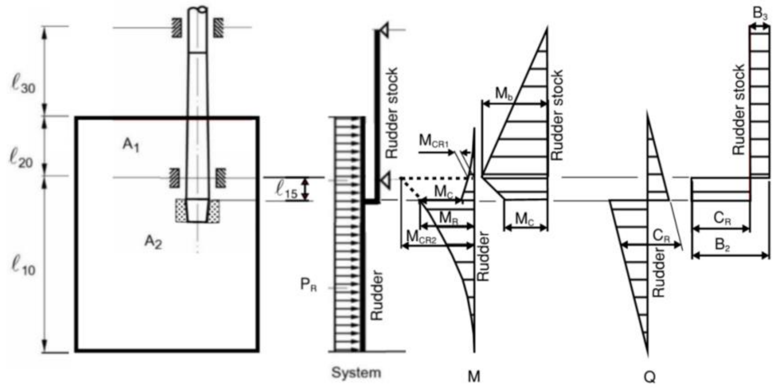
$$C_R=C_{R1}+C_{R2} \qquad \text{N}$$

$$B_3=(M_{CR2}-M_{CR1})/(l_{20}+l_{30}) \qquad \text{N}$$

$$B_2=C_R+B_3 \qquad \text{N}$$

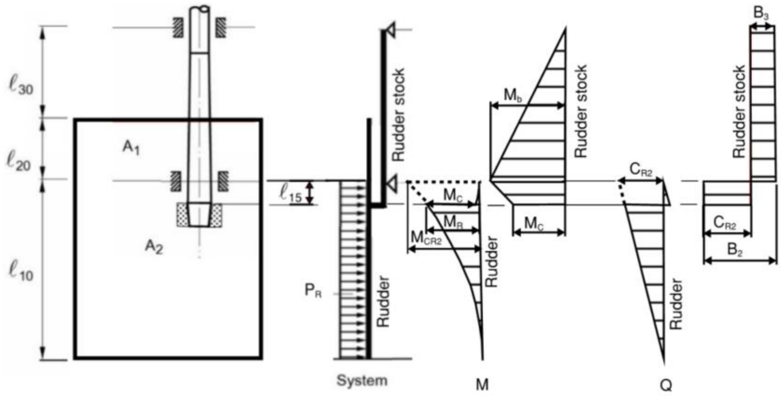
Where: C_R—rudder force, in N.





ℓ_{30}
ℓ_{20}
ℓ_{10}
ℓ_{15}
A1
A2
PR
System
Rudder stock
Rudder
MCR1
Mb
MC
MR
MCR2
M
CR
Q
B3
B2

图 2.2(1)



ℓ_{30}
ℓ_{20}
ℓ_{10}
ℓ_{15}
A1
A2
PR
System
Rudder stock
Rudder
Mb
MC
MR
MCR2
M
CR2
Q
B3
B2

图 2.2(2)

APPENDIX IV Direct force calculation for anchoring equipment

1 General

1.1 As an alternative to the prescriptive approach described in 3.2.2 of Chapter 2, the direct force calculation of this Appendix may be performed to determine the necessary anchoring equipment.

2 Force calculation

2.1 Total force F_{EN}

The total force (static+dynamic)F_{EN}, induced by wind and current acting on the hull in anchoring condition is calculated according to the following formula:

$$F_{EN} = 2\,(F_{SLPH}+F_{SH}+F_{SS}) \quad \text{KN}$$

where: F_{SLPH}——static force on wetted part of the hull due to current, as calculated according to 2.2;

F_{SH}——static force on hull due to wind, as calculated according to 2.3;

F_{SS}——static force on superstructures due to wind, as calculated according to 2.4;.

2.2 Static force on wetted part of hull F_{SLPH}

The theoretical static force induced by current applied on the wetted part of the hull, is calculated according to the following formula:

$$F_{SLPH} = \frac{1}{2}\rho C_f S_m V_c^2 10^{-3} \quad \text{KN}$$

where: ρ ——water density, equal to 1025 kg/m^3;

C_f——coefficient equal to:

$$C_f = (1+k)\frac{0.075}{(\log R_e - 2)^2}$$

With R_e, Reynolds number, are calculated according to the following formula:

$$R_e = \frac{(V_c L_{WL})}{1.054\times 10^{-6}}$$

k coefficient, are calculated according to the following formula:

$$k = 0.017 + 20\frac{C_{bWL}}{L_{WL}^2 T^{-0.5} B_{WL}^{-1.5}}$$

With C_{bWL}, block coefficient at waterline, are calculated according to the following formula:

$$C_{bWL} = \frac{\Delta}{1.025 L_{WL} B_{WL} T}$$

With Δ, moulded displacement at waterline, in m^3. L_{WL}(m)、B_{WL}(m)、T(m) are the length, width and draft at the corresponding waterline, respectively.

S_m——total wetted surface of the part of the hull under draught, in m^2. The value of S_m is to be given by the Designer. When this value is not available, S_m may be taken equal to $6\Delta^{2/3}$.

V_C——speed of the current, in m/s.

2.3 Static force on the upper part of the F_{SH}

The theoretical static force induced by wind applied on the upper part of the hull, in kN, is calculated according to the following formula:

$$F_{SH}=\frac{1}{2}\rho\left(C_{hfr}S_{hfr}+0.02S_{hlat}\right)V_W^2 10^{-3} \qquad \text{KN}$$

where: ρ ——air density, equal to 122 kg/m^3;

V_W——speed of the wind, in m/s;

S_{hfr}——front surface of hull and bulwark if any, in m^2, projected on a vertical plane of the ship situated aft of the aft end of the ship and perpendicular to the longitudinal axis of the ship;

S_{hlat}——Partial lateral surface of one single side of the hull and bulwark if any, in m^2, through the overall length of the ship, projected on a vertical plane parallel to the longitudinal axis of the ship and delimited according to figure 1;

C_{hfr}—— 0.8sinα, with a defined in figure 1. In figure 1, B is the breadth of the hull, in m.

The upper part of the hull is the part extending from side to side to the uppermost continuous deck extending over the ship length.

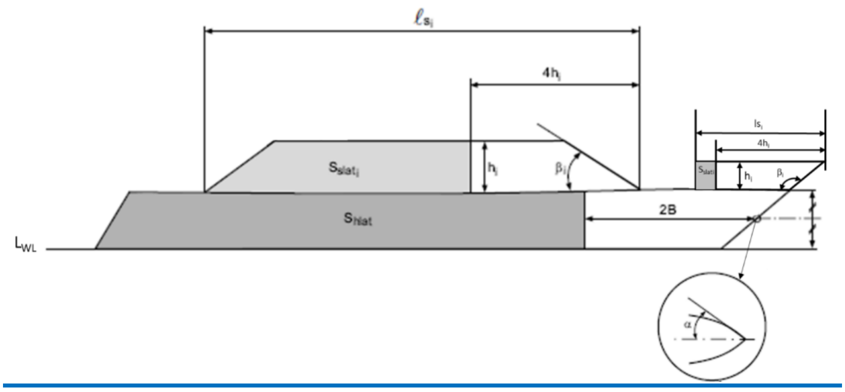


Figure 1

2.4 Static forces F_{SS} on superstructures and deckhouses

(1) General case

The theoretical static force induced by wind applied on the superstructures and deckhouses, in kN, is defined as the sum of the forces applied to each superstructure and deckhouse tier according to the following formula:

$$F_{SS}=\frac{1}{2}\rho\sum\left(C_{sfr_i}S_{sfr_i}+0.08S_{slat_i}\right)V_W^2\, 10^{-3} \qquad \text{KN}$$

where: ρ ——air density, equal to 122 kg/m^3;

V_W ——speed of the wind, in m/s;

S_{sfri}——front surface of tier i (superstructure or deckhouse, including bulwark if any), in m^2, projected on a vertical plane of the ship situated aft of the aft end of the ship and perpendicular to the longitudinal axis of the ship;

S_{slati}——partial lateral surface of one single side of tier i (superstructure or deckhouse, including bulwark if any), in m^2, projected on a vertical plane parallel to the longitudinal axis of the ship and delimited according to figure 1. When $4h_i \geqslant l_{si}$, S_{lati} is to be taken equal to 0.

C_{sfri}—— 0.8sinβ, with β defined in figure 1 without being greater than 90 °.

(2) Superstructures in the forward part of the ship

When superstructures are located in the front of the hull with front and side walls of superstructures in the continuity of the side shell, the static force induced by wind applied on these superstructures, in KN, is defined as the sum of the forces applied to each superstructure tier according to the following formula:

$$F_{SS} = \frac{1}{2}\rho \sum \left(C_{hfr_i} S_{hfr_i} + 0.08 S_{slat_i}\right) V_W^2\, 10^{-3} \qquad \text{KN}$$

where: S_{hfri}——front surface of tier i of the superstructure, in m^2, projected on a vertical plane of the ship situated aft of the aft end of the ship and perpendicular to the longitudinal axis of the ship;

C_{sfri}—— 0.8sinα_S, with a_s as defined for a in figure 1 and measured at mid height of the superstructure tier located in the front of the hull.

ρ 、V_W、S_{slati}——as defined in (1) above.

The static force is to be added to the static force calculated for the other superstructures and deckhouses according to (1) above.

3 Anchor weight

3.1 The individual mass of anchor, is to be at least equal to:

for ordinary anchor: $P=(F_{EN}/7)\times 10^2$ kg

for high holding power anchor: $P=(F_{EN}/10)\times 10^2$ kg

for very high holding power: $P=(F_{EN}/15)\times 10^2$ kg

4 Chain cable

4.1 Stud link chain cable scantling

Chain cable diameters are to be selected from Table 4.1.2, based on the minimum breaking load BL and proof load PL of steel grades according to Table 4.1.1:

The minimum breaking load BL and proof load PL of steel grades Table 4.1.1

Load(KN)	CCS 1	CCS 2	CCS 3
BL	$6F_{EN}$	$6.8F_{EN}$	$7.5F_{EN}$
PL	0.7BL	0.7BL	0.7BL

The chain cable scantling is to be consistent with the mass of the associated anchor. In case the anchor on board is heavier by more than 7% from the mass calculated in article 3 of this appendix, the value of F_{EN} to take into account in the present Article for the calculation of BL and PL is to be deduced from the actual mass of the anchor according to the formulae in article 3 of this appendix.

Test load values for stud link chain cables Table 4.1.1

Chain cable diameter (mm)	CCS 1		CCS 2		CCS 3	
	Proof load (PL) (kN)	Breaking load(BL) (kN)	Proof load (PL) (kN)	Breaking load(BL) (kN)	Proof load (PL) (kN)	Breaking load(BL) (kN)
20.5	123	175	175	244	244	349
22	140	200	200	280	280	401
24	167	237	237	332	332	476
26	194	278	278	389	389	556
28	225	321	321	449	449	642
30	257	368	368	514	514	735
32	291	417	417	583	583	833
34	328	468	468	655	655	937
36	366	523	523	732	732	1050
38	406	581	581	812	812	1160
40	448	640	640	896	896	1280
42	492	703	703	981	981	1400
44	538	769	769	1080	1080	1540
46	585	837	837	1170	1170	1680
48	635	908	908	1270	1270	1810
50	686	981	981	1370	1370	1960
52	739	1060	1060	1480	1480	2110
54	794	1140	1140	1590	1590	2270
56	851	1220	1220	1710	1710	2430
58	909	1290	1290	1810	1810	2600
60	969	1380	1380	1940	1940	2770
62	1030	1470	1470	2060	2060	2940
64	1100	1560	1560	2190	2190	3130
66	1160	1660	1660	2310	2310	3300
68	1230	1750	1750	2450	2450	3500
70	1290	1840	1840	2580	2580	3690
73	1390	1990	1990	2790	2790	3990
76	1500	2150	2150	3010	3010	4300
78	1580	2260	2260	3160	3160	4500
81	1690	2410	2410	3380	3380	4820
84	1800	2580	2580	3610	3610	5160
87	1920	2750	2750	3850	3850	5500
90	2050	2920	2920	4090	4090	5840
92	2130	3040	3040	4260	4260	6080
95	2260	3230	3230	4510	4510	6440
97	2340	3340	3340	4680	4680	6690
100	2470	3530	3530	4940	4940	7060
102	2560	3660	3660	5120	5120	7320
105	2700	3850	3850	5390	5390	7700
107	2790	3980	3980	5570	5570	7960
111	2970	4250	4250	5940	5940	8480
114	3110	4440	4440	6230	6230	8890
117	3260	4650	4650	6510	6510	9300
120	3400	4850	4850	6810	6810	9720
122	3500	5000	5000	7000	7000	9990
124	3600	5140	5140	7200	7200	10280
127	3750	5350	5350	7490	7490	10710
130	3900	5570	5570	7800	7800	11140
132	4000	5720	5720	8000	8000	11420
137	4260	6080	6080	8510	8510	12160

142	4520	6450	6450	9030	9030	12910
147	4790	6840	6840	9560	9560	13660
152	5050	7220	7220	10100	10100	14430
157	5320	7600	7600	10640	10640	15200
162	5590	7990	7990	11170	11170	15970

4.2 Length of individual chain cable

The length of chain cable L_{cc}(m), linked to each anchor is to be at least equal to:

When P<180, $L_{cc}=30\ln(P)-42$

When P≥180, L_{cc} to be selected according to Table 3.2.1.1 of Chapter 3, Section 2.

Where, P is anchor weight, in kg, defined in article 3 of this appendix for an ordinary anchor according to the considered case.

CHINA CLASSIFICATION SOCIETY

CCS Rule Change Notice For:

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Version: 2024RCN No.1

PART 2 ENGINE AND FISHING MACHINERY EQUIPMENT

CHAPTER 5   DIESEL ENGINES

Section 6   SCAVENGING AND SUPERCHARGING ARRANGEMENTS

5.6.10   Containment

5.6.10.4   Containment tests are to be performed at ~~working temperature.~~ a temperature which is not lower than the maximum allowable temperature of the turbocharger to be specified by the manufacturer.

5.6.10.5   Manufacturers are to determine whether cases more critical than those defined in 5.6.10.3 and 5.6.10.4 exist with respect to containment safety. Where such a case is identified, evidence of containment safety shall also be provided for that case.

5.6.10.6~~5~~   A numerical analysis (such as Finite Element Method) ~~(simulation)~~ of sufficient containment integrity of the casing based on calculations by means of a simulation model may be accepted in lieu of the practical containment test, provided that:

(1) The numerical simulation model has been tested and its suitability/accuracy has been proven by direct comparison between calculation results and the practical containment test for a reference application (reference containment test). This test is to be performed at least once by the manufacturer for acceptance of the numerical simulation method in lieu of tests;

(2) The corresponding numerical simulation for the containment is performed for the same speeds as specified for the containment test;

(3) Material properties for high-speed deformations are to be applied in the numeric simulation. The correlation between normal properties and the properties at the pertinent deformation speed are to be substantiated;

(4) The design of the turbocharger regarding geometry and kinematics is similar to the turbocharger that was used for the reference containment test. In general, totally new designs will call for a new reference containment test.

Note: A generic range means a series of turbocharger which are of the same design, but scaled to each other.

5.6.10.7   In cases where a totally new design is adopted for a turbocharger for which an application for type approval certification has been requested, new reference containment tests are to be performed.

Note: Totally new design means the principal differences between a new turbocharger and previous ones are related to geometry and kinematics. The turbochargers are to be regarded as having a totally new design if the structure and/or material of the turbocharger casings are changed, or any of, but not limited to, the following items is changed from the previous design.

(1) Maximum permissible exhaust gas temperature

(2) Number of bearings

(3) Number of turbine blades

(4) Number of turbine wheels and/or compressor wheels

(5) Direction of inlet air and/or exhaust gas (e.g., axial flow orientation, radial flow orientation)

(6) Type of the turbocharger drive (e.g., axial turbine type, radial turbine type, mixed flow turbine type)

5.6.11 **Type testing**

5.6.11.2 Turbochargers for the low, medium, and high-speed engines are to be subjected to at least 500 load cycles at the limits of operation. This test may be waived if the turbocharger together with the engine is subjected to this kind of low cycle testing.