Rules for the Classification of Steel Ships Revision

(Part 4 Hull Equipment)

- Main Amendments -

(1) Effective date : 1 July 2019 (Date of which contracts for construction)

Present	Amendment
CHAPTER 1 RUDDERS **Section 6 Rudder Plates, Rudder Frames and Rudder Main Pieces** **601.~ 602. <same as the present Rules>** **603. Rudder main pieces** **【See Guidance】** **1. ~ 2.** <same as the present Rules> **3.** The section modulus and the web area of a horizontal section of the main piece are to be such that bending stress, shear stress and equivalent stress will be accordance with the following stress values, respectively. $\sigma_b \le \frac{110}{K}$ (N/mm^2), $\tau \le \frac{50}{K}$ (N/mm^2), $\sigma_e = \sqrt{\sigma_b^2 + 3\tau^2} \le \frac{120}{K}$ (N/mm^2) where : K_m = material factor for the rudder main piece as given in **103.** **4.** In the cases of Type *A, D,* and *E* rudders~~, however,~~ the section modulus and the web area of a horizontal section of the main piece in way of cut-outs are to be such that bending stress, shear stress and equivalent stress not exceed the following stress values, respectively. $\sigma_b \le 75$ (N/mm^2), $\tau \le 50$ (N/mm^2), $\sigma_e = \sqrt{\sigma_b^2 + 3\tau^2} \le 100$ (N/mm^2) <hereafter, same as the present Rules>	**CHAPTER 1 RUDDERS** **Section 6 Rudder Plates, Rudder Frames and Rudder Main Pieces** **601.~ 602. <same as the present Rules>** **603. Rudder main pieces** **【See Guidance】** **1. ~ 2.** <same as the present Rules> **3.** In general, except in way of rudder recess sections where 4. applies, the section modulus and the web area of a horizontal section of the main piece are to be such that bending stress, shear stress and equivalent stress will be accordance with the following stress values, respectively. *(2019)* $\sigma_b \le \frac{110}{K}$ (N/mm^2), $\tau \le \frac{50}{K}$ (N/mm^2), $\sigma_e = \sqrt{\sigma_b^2 + 3\tau^2} \le \frac{120}{K}$ (N/mm^2) where : K_m = material factor for the rudder main piece as given in **103.** **4.** In the cases of Type *A, D,* and *E* rudders, the section modulus and the web area of a horizontal section of the main piece in way of cut-outs are to be such that bending stress, shear stress and equivalent stress not exceed the following stress values, respectively. *(2019)* $\sigma_b \le 75$ (N/mm^2), $\tau \le 50$ (N/mm^2), $\sigma_e = \sqrt{\sigma_b^2 + 3\tau^2} \le 100$ (N/mm^2) <hereafter, same as the present Rules>

Present	Amendment
605. Connections **[See Guidance]** **1.** Gudgeon in forged or cast steel, which house the rudder stock or the pintle, are ~~normally~~ to be provided with protrusions. These protrusions are not required when the web plate thickness is less than : (1) 10 mm for web plates welded to the gudgeon on which the lower pintle of a semi-spade rudder is housed and for vertical web plates welded to the gudgeon of the rudder stock coupling of spade rudders. (2) 20 mm for other web plates. **2.** The gudgeon are in general to be connected to the rudder structure by means of two horizontal web plates and two vertical web plates. <hereafter, same as the present Rules>	**605. Connections** **[See Guidance]** **1.** Gudgeon in forged or cast steel, which house the rudder stock or the pintle, are to be provided with protrusions, except where not required as indicated below. *(2019)* These protrusions are not required when the web plate thickness is less than : (1) 10 mm for web plates welded to the gudgeon on which the lower pintle of a semi-spade rudder is housed and for vertical web plates welded to the gudgeon of the rudder stock coupling of spade rudders. (2) 20 mm for other web plates. **2.** The gudgeon are in general to be connected to the rudder structure by means of two horizontal web plates and two vertical web plates. <hereafter, same as the present Rules>
Section 7 Couplings between Rudder Stocks and Main Pieces	**Section 7 Couplings between Rudder Stocks and Main Pieces**
701.~ 702. <same as the present Rules> **703. Cone couplings** **[See Guidance]** **1.** <same as the present Rules> **2.** Cone couplings with hydraulic arrangements (oil injection and hydraulic nut, etc.) for mounting and dismounting the coupling are to comply with the following requirements. (1) ~ (5) <same as the present Rules> (6) The push-up pressure is not to be less than the greater of the two following values: $P = \frac{2M_F}{d_m^2 \ell \pi \mu_0} 10^3 \quad (N/mm^2)$ or $P = \frac{6M_b}{\ell^2 d_m} 10^3 \quad (N/mm^2)$	**701.~ 702. <same as the present Rules>** **703. Cone couplings** **[See Guidance]** **1.** <same as the present Rules> **2.** Cone couplings with hydraulic arrangements (oil injection and hydraulic nut, etc.) for mounting and dismounting the coupling are to comply with the following requirements. (1) ~ (5) <same as the present Rules> (6) The push-up pressure is not to be less than the greater of the two following values: *(2019)* $P = \frac{2M_F}{d_m^2 \ell \pi \mu_0} 10^3 \quad (N/mm^2)$ or $P = \frac{6M_b}{\ell^2 d_m} 10^3 \quad (N/mm^2)$

Present	Amendment
M_F = design torsional moment (Nm) of rudder stock, as defined in **Par 1** (3) d_m = mean cone diameter (mm) (*See* **Fig 4.1.6**) ℓ = cone length (mm) μ_0 = frictional coefficient, equal to 0.15 M_b = bending moment in the cone coupling (e.g. in case of Type C, D and E rudders) (mm) 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 P_{perm} (N/mm²), is to be determined by the following formula: $P_{perm} = \frac{0.8R_{eH}(1-\alpha^2)}{\sqrt{3+\alpha^4}} \quad (N/mm^2)$ R_{eH} = minimum yield stress of the material of the gudgeon (N/mm^2) α = d_m/d_a d_a = outer diameter of the gudgeon ~~to be not less than $1.5d_m$ (mm)~~ (*See* **Fig 4.1.6**) (7) The push-up length l is to be accordance with as following. ~~However, the push up length is not be less then 2 mm.~~ $l_1 \le l \le l_2 \quad (mm)$ $l_1 = \frac{Pd_m}{E(\frac{1-\alpha^2}{2})c} + \frac{0.8R_{tm}}{c} \quad (mm)$ $l_2 = \frac{1.6R_{eH}d_m}{Ec\sqrt{3+\alpha^4}} + \frac{0.8R_{tm}}{c} \quad (mm)$	M_F = design torsional moment (Nm) of rudder stock, as defined in **Par 1** (3) d_m = mean cone diameter (mm) (*See* **Fig 4.1.6**) ℓ = cone length (mm) μ_0 = frictional coefficient, equal to 0.15 M_b = bending moment in the cone coupling (e.g. in case of Type C, D and E rudders) (mm) 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 P_{perm} (N/mm²), is to be determined by the following formula: $P_{perm} = \frac{0.95R_{eH}(1-\alpha^2)}{\sqrt{3+\alpha^4}} - P_b \quad (N/mm^2)$ $P_b = \frac{3.5\,M_b}{d_m l^2} 10^3$ R_{eH} = minimum yield stress of the material of the gudgeon (N/mm^2) α = d_m/d_a d_a = outer diameter of the gudgeon (*See* **Fig 4.1.6**) The outer diameter of the gudgeon in mm shall not be less than $1.25d_0$, with d_0 defined in **Fig 4.1.6**. (7) The push-up length l is to be accordance with as following. *(2019)* $l_1 \le l \le l_2 \quad (mm)$ $l_1 = \frac{Pd_m}{E(\frac{1-\alpha^2}{2})c} + \frac{0.8R_{tm}}{c} \quad (mm)$

Present	Amendment
P = push-up pressure as defined in (6) d_m = mean cone diameter (mm) (*See* **Fig 4.1.6**) R_{tm} = mean roughness taken equal to 0.01 E = $2.06 \times 10^5 (N/mm^2)$ c = taper on diameter (mm) according to (1) ~~R_{eH} = minimum yield stress of the material of the gudgeon (N/mm^2)~~ α = according to (6) <hereafter, same as the present Rules>	$l_2 = \dfrac{P_{perm} d_m}{E(\frac{1-\alpha^2}{2})c} + \dfrac{0.8 R_{tm}}{c} \quad (mm)$ P = push-up pressure as defined in (6) P_{perm} = permissible surface pressure as defined in (6) d_m = mean cone diameter (mm) (*See* **Fig 4.1.6**) R_{tm} = mean roughness taken equal to 0.01 E = $2.06 \times 10^5 (N/mm^2)$ c = taper on diameter (mm) according to (1) α = according to (6) <hereafter, same as the present Rules>
Section 8 Pintles **701. <same as the present Rules>** **703. Cone couplings** **【See Guidance】** **1. ~ 4.** <same as the present Rules> **5.** The required push-up pressure for pintle bearings (N/mm^2), is to be determined by the following formula. The push up length is to be calculated similarly as in **703. 2** (7), using required push-up pressure and properties for the pintle bearing. $P = 0.4 \dfrac{B d_p}{d_m^2 \ell} \quad (N/mm^2)$ B = Supporting force in the pintle bearing (N) d_m, ℓ = according to **703. 2** (6)	**Section 8 Pintles** **701. <same as the present Rules>** **703. Cone couplings** **【See Guidance】** **1. ~ 4.** <same as the present Rules> **5.** The required push-up pressure for pintle (N/mm^2), is to be determined by the following formula. The push up length is to be calculated similarly as in **703. 2** (7), using required push-up pressure and properties for the pintle. *(2019)* $P = 0.4 \dfrac{B d_p}{d_m^2 \ell} \quad (N/mm^2)$ B = Supporting force in the pintle (N) d_m, ℓ = according to **703. 2** (6)

Present	Amendment
CHAPTER 8 EQUIPMENT NUMBER AND EQUIPMENT	**CHAPTER 8 EQUIPMENT NUMBER AND EQUIPMENT**
Section 4 Chains	**Section 4 Chains**
401.~ 409. <same as the present Rules>	**401.~ 409. <same as the present Rules>**
410. Dimension tolerances	**410. Dimension tolerances**
The tolerances for chains and accessories are to comply with the following requirements in **Par 1** and **2** and the dimensions thereof are to be measured after the execution of a proof test.	The tolerances for chains and accessories are to comply with the following requirements in **Par 1** and **2** and the dimensions thereof are to be measured after the execution of a proof test.
1. Chain	**1. Chain**
(1) ~ (2) <same as the present Rules>	(1) ~ (2) <same as the present Rules>
(3) The maximum allowable tolerance on assembly measured over a length of 5 links are to be ±2.5 %, but not to be negative.(measured with the chain under tension after proof load test)	(3) The maximum allowable tolerance on assembly measured over a length of 5 links are to be ±2.5 %, but not to be negative(measured with the chain under tension after proof load test), the length of 5 links is based on the distance from the outer end of the internal bent portion of the link at one end of the chain to that at the other end of the chain. *(2019)*
<hereafter, same as the present Rules>	<hereafter, same as the present Rules>

Present	Amendment

Present

Section 5 Steel Wire Ropes

501.~ 503. <same as the present Rules>

504. Diameter of individual wires and steel wire ropes

1. The difference between the maximum and minimum diameters of the individual wires composing the strand of steel wire ropes is not to exceed the limits given in **Table 4.8.12.**

Table 4.8.12 Permissible variation in diameter of individual wires

Diameter of individual wire (mm)	Difference between maximum and minimum diameters (mm)
$0.20 < d \le 1.00$	0.06
$1.00 < d \le 2.24$	0.08
$2.24 < d \le 3.75$	0.12
$3.75 < d \le 4.50$	0.14

<hereafter, same as the present Rules>

Amendment

Section 5 Steel Wire Ropes

501.~ 503. <same as the present Rules>

504. Diameter of individual wires and steel wire ropes

1. The measuring result of the individual wires composing the strand of steel wire ropes is not to exceed the limits given in **Table 4.8.12.** *(2019)*

Table 4.8.12 Permissible variation in diameter of individual wires ***(2019)***

Nominal diameter of individual wire (mm)	Difference between maximum and minimum diameters (mm)
$0.20 < d \le 1.00$	0.06
$1.00 < d \le 2.24$	0.09
$2.24 < d \le 3.75$	0.12
$3.75 < d \le 4.50$	0.14

<hereafter, same as the present Rules>

(2) Effective date : 1 January 2019 (Date of which contracts for construction)

Present	Amendment

Present

CHAPTER 2 HATCHWAYS AND OTHER DECK OPENINGS

Section 5 Hatch cover details – Closing Arrangement, Securing Devices and Stoppers

501.~ 506. <same as the present Rules>

507. Hatch cover supports

1. ~ 4. <same as the present Rules>

Table 4.2.11 Permissible nominal surface pressure p_n

Support material	$p_n(\mathrm{N/mm^2})$ when loaded by	
	Vertical force	Horizontal force (on stoppers)
Hull structural steel	25	40
Hardened steel	35	50
Plastic materials	50	-

<hereafter, same as the present Rules>

Amendment

CHAPTER 2 HATCHWAYS AND OTHER DECK OPENINGS

Section 5 Hatch cover details – Closing Arrangement, Securing Devices and Stoppers

501.~ 506. <same as the present Rules>

507. Hatch cover supports

1. ~ 4. <same as the present Rules>

Table 4.2.11 Permissible nominal surface pressure p_n *(2019)*

Support material	$p_n(\mathrm{N/mm^2})$ when loaded by	
	Vertical force	Horizontal force (on stoppers)
Hull structural steel	25	40
Hardened steel	35	50
Lower friction materials	50	-

<hereafter, same as the present Rules>

Amended Guidance Relating to the Rules for the Classification of Steel Ships

(Part 4 Hull Equipment)

Present	Amendment
CHAPTER 1 RUDDERS	**CHAPTER 1 RUDDERS**
Section 4 Rudder Strength Calculation	**Section 4 Rudder Strength Calculation**
401. Rudder strength calculation	**401. Rudder strength calculation**
1. ~ 3. <same as the present Rules>	**1. ~ 3.** <same as the present Rules>
4. Spade rudder with trunk	**4. Spade rudder with trunk**
(1) <same as the present Rules>	(1) <same as the present Rules>
(2) For spade rudders with rudders trunks the moments and forces may be determined by the following formulae:	(2) For spade rudders with rudders trunks the moments and forces may be determined by the following formulae:
M_R is the greatest of the following values:	M_R is the greatest of the following values: *(2019)*
$M_R = F_{R2}(\ell_{10} - CG_{2Z})$ (N-m)	$M_{FR1} = F_{R1}(CG_{1Z} - \ell_{10})$ (N-m)
$M_R = F_{R1}(CG_{1Z} - \ell_{10})$ (N-m)	$M_{FR2} = F_{R2}(\ell_{10} - CG_{2Z})$ (N-m)
F_{R1} : Rudder force over the rudder blade area A_1	F_{R1} : Rudder force over the rudder blade area A_1
F_{R2} : Rudder force over the rudder blade area A_2	F_{R2} : Rudder force over the rudder blade area A_2
CG_{1Z} : Vertical position of the centre of gravity of the rudder blade area A_1	CG_{1Z} : Vertical position of the centre of gravity of the rudder blade area A_1 from base
CG_{2Z} : Vertical position of the centre of gravity of the rudder blade area A_2	CG_{2Z} : Vertical position of the centre of gravity of the rudder blade area A_2 from base
~~$M_B = F_{R2}(\ell_{10} - CG_{2Z})$ (N-m)~~	$F_R = F_{R1} + F_{R2}$ (N)
$B_2 = F_R + B_3$ (N)	$B_2 = F_R + B_3$ (N)
$B_3 = (M_B + M_{FR1})/(\ell_{20} + \ell_{30})$ (N)	$B_3 = (M_{FR2} - M_{FR1})/(\ell_{20} + \ell_{30})$ (N)

Present

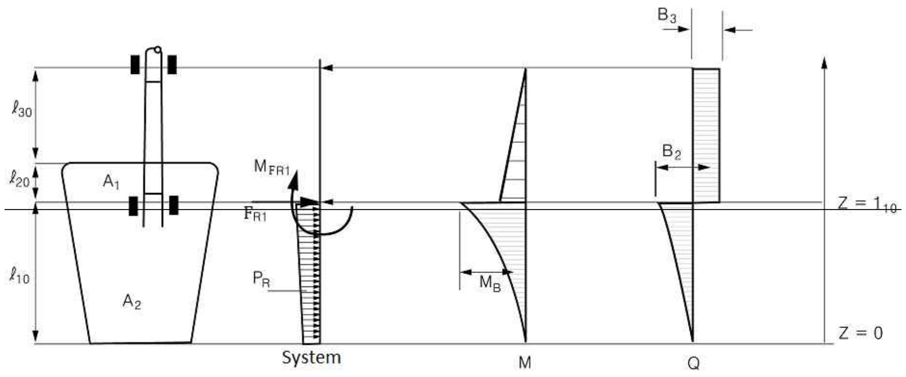

Fig 4.1.3 Spade rudder with trunk

<hereafter, same as the present Rules>

7. Type E rudders(Semi spade rudder with 2-conjugate elastic support)

(1) ~ (4) <same as the present Rules>

(5) Rudder horn shear stress calculation

The shear stress acting on the generic section of the rudder horn is to be obtained from the following formulae:

between the lower and upper rudder horn bearings:

$$\tau_S = \frac{F_{A1}}{A_H} \quad (\text{N/mm}^2)$$

above the rudder horn upper-bearing:

$$\tau_S = \frac{F_{A1} + F_{A2}}{A_H} \quad (\text{N/mm}^2)$$

F_{A1} and F_{A2} : Support forces (N)

A_H : Effective shear sectional area of the rudder horn in y-direction (mm^2)

Amendment

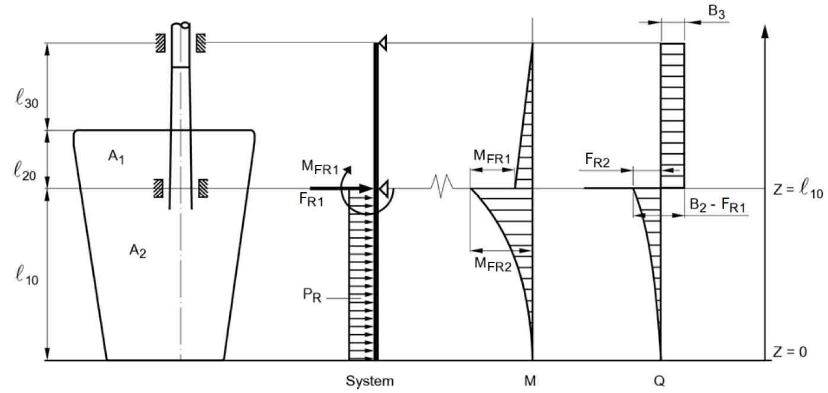

Fig 4.1.3 Spade rudder with trunk *(2019)*

<hereafter, same as the present Rules>

7. Type E rudders(Semi spade rudder with 2-conjugate elastic support)

(1) ~ (4) <same as the present Rules>

(5) Rudder horn shear stress calculation

The shear stress acting on the generic section of the rudder horn is to be obtained from the following formulae:

between the lower and upper rudder horn bearings:

$$\tau_S = \frac{F_{A1}}{A_H} \quad (\text{N/mm}^2)$$

above the rudder horn upper-bearing:

$$\tau_S = \frac{F_{A1} + F_{A2}}{A_H} \quad (\text{N/mm}^2)$$

F_{A1} and F_{A2} : Support forces (N)

A_H : Effective shear sectional area of the rudder horn in y-direction (mm^2)

Present	Amendment
The torsional stress to be obtained for hollow rudder horn from the following formula. For solid rudder horn, the torsional stress is to be considered by the Society on a case by case basis. $\tau_T = \frac{M_T 10^3}{2F_T t_H}$ (N/mm^2) M_T : Torque (N-m) F_T : Mean of areas enclosed by outer and inner boundaries of the thin walled section of rudder horn (m^2) t_H : Plate thickness of rudder horn (mm). For a given cross section of the rudder horn, the maximum value of τ_T is obtained at the minimum value of t_H. <hereafter, same as the present Rules>	The torsional stress to be obtained for hollow rudder horn from the following formula. For solid rudder horn, the torsional stress is to be considered by the Society on a case by case basis. $\tau_T = \frac{M_T 10^{-3}}{2F_T t_H}$ (N/mm^2) *(2019)* M_T : Torque (N-m) F_T : Mean of areas enclosed by outer and inner boundaries of the thin walled section of rudder horn (m^2) t_H : Plate thickness of rudder horn (mm). For a given cross section of the rudder horn, the maximum value of τ_T is obtained at the minimum value of t_H. <hereafter, same as the present Rules>

Present	Amendment
CHAPTER 4 BULWARKS, FREEING PORTS, SIDE SCUTTLES, RECTANGULAR WINDOWS, VENTILATORS AND PERMANENT GANGWAYS	**CHAPTER 4 BULWARKS, FREEING PORTS, SIDE SCUTTLES, RECTANGULAR WINDOWS, VENTILATORS AND PERMANENT GANGWAYS**
Section 2 Freeing Ports	**Section 2 Freeing Ports**
201. <same as the present Rules>	**201. <same as the present Rules>**
202. Freeing port area	**202. Freeing port area**
1. ~ 8. <same as the present Rules>	**1. ~ 8.** <same as the present Rules>
9. <newly added> ***(2019)***	**9.** For ships designed to carry cargo only on the deck , where coamings or other structures for retaining deck cargo form wells, adequate freeing ports are to be provided in accordance with **Ch 18, 301.** of Guidance for Steel Barges. *(2019)*
<hereafter, same as the present Rules>	<hereafter, same as the present Rules>

Present	Amendment
CHAPTER 8 EQUIPMENT NUMBER AND EQUIPMENT **Section 1 General** **101. General and application** **1. ~ 3.** <same as the present Rules> **4. Design of the anchoring equipment** ***(2018)*** (1) The anchoring equipment required herewith is intended for temporary mooring of a ship within a harbour or sheltered area when the ship is awaiting berth, tide, etc. IACS Recommendation No. 10 'Anchoring, Mooring and Towing Equipment' may be referred to for recommendations concerning anchoring equipment for ships in deep and unsheltered water. <hereafter, same as the present Rules>	**CHAPTER 8 EQUIPMENT NUMBER AND EQUIPMENT** **Section 1 General** **101. General and application** **1. ~ 3.** <same as the present Rules> **4. Design of the anchoring equipment** ***(2018)*** (1) The anchoring equipment required herewith is intended for temporary mooring of a ship within a harbour or sheltered area when the ship is awaiting berth, tide, etc. **Annex 4-3** may be referred to for recommendations concerning anchoring equipment for ships in deep and unsheltered water. *(2019)* <hereafter, same as the present Rules>

Present	Amendment
CHAPTER 10 SHIPBOARD EQUIPMENT, FITTINGS AND SUPPORTING HULL STRUCTURES ASSOCIATED WITH TOWING AND MOORING	**CHAPTER 10 SHIPBOARD EQUIPMENT, FITTINGS AND SUPPORTING HULL STRUCTURES ASSOCIATED WITH TOWING AND MOORING**
Section 1 Definitions and Scope of Application	**Section 1 Definitions and Scope of Application**
101. Application	**101. Application**
In application of **Pt 4, Ch 10, 101. 3** of the Rules, the details are as follows.	In application of **Pt 4, Ch 10, 101. 7** of the Rules, the details are as follows. *(2019)*
1. <same as the present Rules>	**1.** <same as the present Rules>
2. Design and specification of material	**2. Design and specification of material**
(1) Forward chain stoppers	(1) Forward chain stoppers
(A) ~ (F) <same as the present Rules>	(A) ~ (F) <same as the present Rules>
(G) Where the chain stopper is bolted to a seating welded to the deck, the bolts are to be satisfied with the following strength criteria. However, in such condition, efficient thrust chocks capable of withstanding a horizontal force equal to 2.0 times the required working strength are to be installed.	(G) Where the chain stopper is bolted to a seating welded to the deck, the bolts are to be satisfied with the following strength criteria. However, in such condition, efficient thrust chocks capable of withstanding a horizontal force equal to 2.0 times the required working strength are to be installed.
$\sigma_{VM} \le \sigma_y$	$\sigma_{VM} \le \sigma_y$
Where,	Where,
σ_{VM} : The equivalent stress in the equipment components(bolts, etc.) induced by the loads.	σ_{VM} : The equivalent stress in the equipment components(bolts, etc.) induced by the loads.
σ_y : Permissible stress, to be taken, in N/mm^2, as the lower of 0.67 R_{eH} and 0.4 R_m	σ_y : Permissible stress, to be taken, in N/mm^2, (= R_{eH}) *(2019)*
R_{eH} : Minimum yield stress, in N/mm^2, of the material	R_{eH} : Minimum yield stress, in N/mm^2, of the material
~~R_m : Tensile strength, in N/mm^2, of the material~~	
<hereafter, same as the present Rules>	<hereafter, same as the present Rules>

Present	Amendment
6. Installation inspection of mooring equipment of SPM on board **<same as the present Rules>** (1) ~ (2) <same as the present Rules> (3) Supporting hull structures (A) ~ (B) <same as the present Rules> (C) Deck structures in way of bow chain stoppers, including deck seatings and deck connections, are to be suitably reinforced to resist a horizontal load equal to 2 times the required safe working load and, in such condition, to meet the strength criteria specified in **Par 2** (1) (G). <hereafter, same as the present Rules>	**6. Installation inspection of mooring equipment of SPM on board** **<same as the present Rules>** (1) ~ (2) <same as the present Rules> (3) Supporting hull structures (A) ~ (B) <same as the present Rules> (C) Deck structures in way of bow chain stoppers, including deck seatings and deck connections, are to be suitably reinforced to resist a horizontal load equal to 2 times the required safe working load and, in such condition, to meet the strength criteria(based on net thickness) specified in **Par 2** (1) (G). *(2019)* <hereafter, same as the present Rules>

Present	Amendment
Annex 4-3 Anchoring in Deep and Unsheltered Waters <newly added>	**Annex 4-3 Anchoring in Deep and Unsheltered Waters *(2019)***

1. Application

(1) The requirements in this Annex are applicable to anchoring equipment for ships with a rule length of not less than 135 m in deep and unsheltered water.

(2) Assumed conditions are as follows:

(A) water depth up to 120 m

(B) current up to 1.54 m/s, wind up to 14 m/s, waves with significant height of up to 3 m

2. Equipment Number for deep and unsheltered water

Anchors and chain cables are to be in accordance with **Table 1** and based on the Equipment Number E_1 obtained from the following equation:

$$E_1 = 0.628\left[a\left(\frac{E}{0.628}\right)^{1/2.3} + b(1-a)\right]^{2.3}$$

$a = 1.83 \cdot 10^{-9}L^3 + 2.09 \cdot 10^{-6}L^2 - 6.21 \cdot 10^{-4}L + 0.0866$

$b = 0.156L + 8.372$

L : Rule length (m), as specified in **Pt 3, Ch 1, 102.** of the Rules

E : Equipment Number calculated in compliance with **Ch 8, 201.** of the Rules

Present	Amendment
<newly added>	Table 1 **Anchoring equipment for ships in unsheltered water with depth up to 120 m**

Equipment Number E_1		High holding power stockless bower anchor		Stud link chain cable for bower anchors		
		Number	Mass per anchor (kg)	Length (m)	Min. diameter	
Exceeding	Not exceeding				Grade 2 (mm)	Grade 3 (mm)
	1790	2	14150	1017.5	105	84
1790	1930	2	14400	990	105	84
1930	2080	2	14800	990	105	84
2080	2230	2	15200	990	105	84
2230	2380	2	15600	990	105	84
2380	2530	2	16000	990	105	84
2530	2700	2	16300	990	105	84
2700	2870	2	16700	990	105	84
2870	3040	2	17000	990	105	84
3040	3210	2	17600	990	105	84
3210	3400	2	18000	990	105	84
3400	3600	2	18300	990	105	84
3600	3800	2	19000	990	107	87
3800	4000	2	19700	962.5	107	87
4000	4200	2	20300	962.5	111	90
4200	4400	2	21100	962.5	114	92
4400	4600	2	22000	962.5	117	95
4600	4800	2	22900	962.5	120	97
4800	5000	2	23500	962.5	124	99
5000	5200	2	24000	935	127	102
5200	5500	2	24500	907.5	132	107
5500	5800	2	25000	907.5	132	107
5800	6100	2	25500	880	137	111
6100	6500	2	25700	880	142	114
6500	6900	2	26000	852.5	142	117

Present	Amendment
<newly added>	Table 1 **Anchoring equipment for ships in unsheltered water with depth up to 120 m (continued)**

Equipment Number E_1		High holding power stockless bower anchor		Stud link chain cable for bower anchors		
		Number	Mass per anchor (kg)	Length (m)	Min. diameter	
Exceeding	Not exceeding				Grade 2 (mm)	Grade 3 (mm)
6900	7400	2	26500	852.5	147	117
7400	7900	2	27000	825	152	122
7900	8400	2	27500	825	-	127
8400	8900	2	28000	797.5	-	127
8900	9400	2	28900	770	-	132
9400	10000	2	29400	770	-	137
10000	10700	2	29900	770	-	142
10700	11500	2	30600	770	-	142
11500	12400	2	31500	770	-	147
12400	13400	2	33200	770	-	152
13400	14600	2	35000	770	-	157
14600		2	38000	770	-	162

Present	Amendment
<newly added>	**3. Anchors** (1) The bower anchors are to be connected to their chain cables and positioned on board ready for use. (2) Anchors are to be of the stockless high holding power (H.H.P.) type. (3) The mass of the head of a stockless anchor, including pins and fittings, is not to be less than 60% of the total mass of the anchor. The requirements for H.H.P. anchors are given in **Ch 8, 304. 2.** of the Rules and **Ch 8, 304.** of the Guidance. (4) The mass, per anchor, of bower anchors given in **Table 1** is for anchors of equal mass. The mass of individual anchors may vary to 7% of the tabular mass, but the total mass of anchors shall not be less than that recommended for anchors of equal mass. (5) For manufacture and testing of the anchors is to be in accordance with the requirements of **Ch 8** of the Rules. **4. Chain cables for bower anchors** (1) Bower anchors shall be accompanied with stud link chain cables of Grade 2 or Grade 3 quality. The total length of chain cable, as given in **Table 1**, shall be reasonably divided between the two bower anchors. The proof and breaking loads of stud link chain cables shall be in accordance with **Ch 8, Table 4.8.8** of the Rules. (2) For manufacture and installation of the chain cables is to be in accordance with the requirements of **Ch 8** of the Rules. **5. Anchor windlass and chain stopper** (1) Anchor windlass design and testing and the chain stopper design is to be in accordance with **Pt 5, Ch 8** of the Rules. (2) In addition to the requirements according to **Pt 5, Ch 8** of the Rules, the windlass unit prime mover is to be able to supply for at least 30 minutes a continuous duty pull Zcont, in N, given by: $Z_{cont} = 35d^2 + 13.4m_A$ d : chain diameter, in mm, as per **Table 1** m_A : H.H.P. anchor mass, in kg, as per **Table 1**. (3) In addition to the requirements according to **Pt 5, Ch 8** of the Rules, as far as practicable, for testing purpose the speed of the chain cable during hoisting of the anchor and cable is to be measured over 37.5 m of chain cable and initially with at least 120 m of chain

Present	Amendment
<newly added>	and the anchor submerged and hanging free. The mean speed of the chain cable during hoisting of the anchor from the depth of 120 m to the depth of 82.5 m is to be at least 4.5 m/min. (4) Hull supporting structure of anchor windlass and chain stopper is to be in accordance with **Ch 8, 101. 4.** (6) of the Rules.