
RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

RULES

Part I

**Ships Operating in Polar Waters,
Polar Class Ships and Ice Class Ships**

2023 AMENDMENT NO.1

Rule No.29 30 June 2023

Resolved by Technical Committee on 25 January 2023

An asterisk (*) after the title of a requirement indicates that there is also relevant information in the corresponding Guidance.

“Rules for the survey and construction of steel ships” has been partly amended as follows:

Part I SHIPS OPERATING IN POLAR WATERS, POLAR CLASS SHIPS AND ICE CLASS SHIPS

Chapter 3 SHIP STRUCTURE

3.3 Regulations (*Polar Code*, Part I-A, 3.3)

Paragraph 3.3.1 has been amended as follows.

3.3.1 Materials of Structures*

In order to comply with the functional requirements of **3.2.1(1)** above, materials of exposed structures in ships are to be approved by the Society taking into account **Annex 1 “Special Requirements for the Materials, Hull Structures, Equipment and Machinery of Polar Class Ships”**, ~~1.1.12 of 3.2.2.2, Part 1, Part C~~ or other standards offering an equivalent level of safety based on the polar service temperature.

Chapter 4 SUBDIVISION AND STABILITY

4.3 Regulations (*Polar Code*, Part I-A, 4.3)

Paragraph 4.3.2 has been amended as follows.

4.3.2 Stability in Damaged Conditions

In order to comply with the functional requirements of **4.2.1(2)**, ships of categories *A* and *B*, constructed on or after 1 January 2017, are to be able to withstand flooding resulting from hull penetration due to ice impact, of which the damage extent is to be in accordance with the following **(1) to (3)**. The residual stability following ice damage is to be such that the factor s_i , as defined in ~~4.2.3-1, 2.3.2.3, Part 1, Part C~~ or **4.2.3-1, Part CS**, is equal to one for all loading conditions used to calculate the attained subdivision index A in ~~4.2.1-2, 2.3.2.1, Part 1, Part C~~ or **4.2.1-2, Part CS**. However, for cargo ships that comply with subdivision and damage stability regulations, the residual stability criteria of that instrument is to be met for each loading condition.

- (1) the longitudinal extent is 0.045 times the upper ice waterline length if centred forward of the maximum breadth on the upper ice waterline, and 0.015 times the upper ice waterline length otherwise, and are to be assumed at any longitudinal position along the ship’s length;
- (2) the transverse penetration extent is 760 mm, measured normal to the shell over the full extent of the damage; and
- (3) the vertical extent is the lesser of 0.2 times the upper ice waterline draught or the longitudinal extent, and is to be assumed at any vertical position between the keel and 1.2 times the upper ice waterline draught.

Chapter 8 ICE CLASS SHIPS

8.4 Fundamental Requirements of Machinery

8.4.3 Rudders and Steering Arrangements*

Sub-paragraph -1 has been amended as follows.

1 The rudder scantlings of rudder post, rudder stock, pintles, steering gear, etc. are to comply with the requirements in ~~Chapter 3 of~~ **Chapter 13, Part 1, Part C** and **Chapter 15, Part D**. However, for *IA Super*, *IA*, *IB* and *IC* ice class ships, the maximum service speed of the ship to be used in these calculations is not to be taken less than that given in the **Table I8.13**.

ANNEX 1 SPECIAL REQUIREMENTS FOR THE MATERIALS, HULL STRUCTURES, EQUIPMENT AND MACHINERY OF POLAR CLASS SHIPS

Chapter 2 MATERIALS AND WELDING

2.1 Material

2.1.2 Material Classes and Grades*

Sub-paragraph -3 has been amended as follows.

3 For polar class ships designed base on a designated design temperature, the steels used for hull structures are to comply with the requirements in ~~1.1.12, Part C of the Rules~~ **3.2.2.2, Part 1, Part C**. However, regardless of the design temperature, the steel grades are not to be of lower than the steel grade provided in **Part I of the Rules**.

2.2 Welding

2.2.1 General

Sub-paragraph -2 has been amended as follows.

2 All fillet welding within ice-strengthened areas are to be of the double continuous type and their sizes are to be of *F2* or more as specified in ~~Table C1.4, Part C of the Rules~~ **Table 12.2.1-1, Part 1, Part C**.

Chapter 3 HULL STRUCTURE

3.2 Subdivision and Stability

Paragraph 3.2.2 has been amended as follows.

3.2.2 Stability in Damaged Condition

Ships are to be able to withstand flooding resulting from hull penetration due to ice impact, of which the damage extent is to be in accordance with the following (1) to (3). The residual stability following ice damage is to be such that the factor s_i , as defined in ~~4.2.3-1, 2.3.2.3-1, Part 1, Part C~~ or **4.2.3-1, Part CS**, is equal to one for all loading conditions used to calculate the attained subdivision index A in ~~4.2.1-2, 2.3.2.1-2, Part 1, Part C~~ or **4.2.1-2, Part CS**. However, for cargo ships that comply with subdivision and damage stability regulations, the residual stability criteria of that instrument is to be met for each loading condition.

- (1) the longitudinal extent is 0.045 times L_{UI} if centred forward of the maximum breadth on the upper ice waterline, and 0.015 times L_{UI} otherwise, and are to be assumed at any longitudinal position along the ship's length;
- (2) the transverse penetration extent is 760 mm, measured normal to the shell over the full extent of the damage; and
- (3) the vertical extent is the lesser of 0.2 times the upper ice waterline draught or the longitudinal extent, and is to be assumed at any vertical position between the keel and 1.2 times the upper ice waterline draught.

3.5 Longitudinal Strength

3.5.3 Design Vertical Shear Force

Sub-paragraph -2 has been amended as follows.

2 The applied vertical shear stress τ_a is to be determined along the hull girder in a similar manner as in ~~15.4.2-2, Part C of the Rules~~ **5.2.2.2, Part 1, Part C** by substituting the design vertical ice shear force for the design vertical wave shear force.

3.5.4 Design Vertical Ice Bending Moment

Sub-paragraph -2 has been amended as follows.

2 The applied vertical bending stress σ_a is to be determined along the hull girder in a similar manner as in ~~15.4.2-1, Part C of the Rules~~ **5.2.1.2, Part 1, Part C**, by substituting the design vertical ice bending moment for the design vertical wave bending moment. The ship still water bending moment is to be taken as the permissible still water bending moment in the sagging condition.

Note of Table 3.5.5-1 has been amended as follows.

Table 3.5.5-1 Longitudinal Strength Criteria

Failure Mode	Applied Stress	Permissible Stress when $\sigma_y / \sigma_u \leq 0.7$	Permissible Stress when $\sigma_y / \sigma_u > 0.7$
Tension	σ_a	$\eta \sigma_y$	$\eta \times 0.41 (\sigma_u + \sigma_y)$
Shear	τ_a	$\eta \sigma_y / \sqrt{3}$	$\eta \times 0.41 (\sigma_u + \sigma_y) / \sqrt{3}$
Buckling	σ_a	σ_c for plating and for web plating of stiffeners $\sigma_c / 1.1$ for stiffeners	
	τ_a	τ_c	

Notes:

σ_a : applied vertical bending stress (N/mm^2)

τ_a : applied vertical shear stress (N/mm^2)

σ_y : minimum upper yield stress of the material (N/mm^2)

σ_u : ultimate tensile strength of material (N/mm^2)

σ_c : critical buckling stress (N/mm^2) in compression, according to ~~15.4, Part C of the Rules~~ **5.3.3.1(1), Part 1, Part C**

τ_c : critical buckling stress (N/mm^2) in shear, according to ~~15.4, Part C of the Rules~~ **5.3.3.1(2), Part 1, Part C**

$\eta = 0.8$. However, for ships which are assigned the additional notation “Icebreaker” (abbreviated to ICB), $\eta = 0.6$.

EFFECTIVE DATE AND APPLICATION

1. The effective date of the amendments is 1 July 2023.
2. Notwithstanding the amendments to the Rules, the current requirements apply to the following ships:
 - (1) ships for which the date of contract for construction is before the effective date; or
 - (2) sister ships of ships subject to the current requirements for which the date of contract for construction is before 1 January 2025.