

Survey and Construction of Steel Ships Part C

Amended Rules and Guidance

Rules for the Survey and Construction of Steel Ships Part C

Guidance for the Survey and Construction of Steel Ships Part C

Reason for Amendment

A comprehensively revised Part C of the Rules and Guidance for the Survey and Construction of Steel Ships (hereinafter referred to as “new Part C”) was adopted on 1 July 2022.

During the review phase of the application of new Part C, the Society received various feedback about its application from relevant industry members, including requests for clarification and suggestions for improvement. After reviewing this feedback, the Society decided to incorporate some of the suggestions made into relevant requirements.

Accordingly, relevant requirements are amended based on comments received from relevant industry members.

Outline of Amendment

- (1) Specifies minimum yield stresses for stainless steels and stainless clad steels in consideration of temperature effects.
- (2) Clarifies that slenderness requirements need not be applied where the buckling strength requirements to be applied to members are satisfied.
- (3) Clarifies the application of members to be assessed in the flooded condition.
- (4) Specifies thickness requirements for shell plating connected with stern frames based on requirements in Part CSR-B&T.
- (5) Specifies minimum requirements for webs and flanges of stiffeners attached to cars deck.

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

Part C HULL CONSTRUCTION AND EQUIPMENT

Part 1 GENERAL HULL REQUIREMENTS

Chapter 1 GENERAL

1.4 Symbols and Definitions

1.4.2 Primary Symbols and Units

1.4.2.3 Materials

Unless otherwise specified, the symbols of the materials and their units used in **Part C** are those defined in **Table 1.4.2-3**.

Table 1.4.2-3 has been amended as follows.

Table 1.4.2-3 Materials

Symbol	Meaning	Unit
E	Young’s modulus, to be taken as 206,000 N/mm^2	N/mm^2
G	Shear modulus, to be obtained from the following formula: $G = \frac{E}{2(1 + \nu)}$	N/mm^2
σ_Y	Specified minimum yield stress (<u>See 3.2</u>)	N/mm^2
τ_Y	Specified shear yield stress $\tau_Y = \frac{\sigma_Y}{\sqrt{3}}$	N/mm^2
ν	Poisson’s ratio, to be taken as 0.3	-
K	Material factor (<u>See 3.2-1.2</u>)	-
σ_m	Specified minimum tensile strength	N/mm^2

Chapter 3 STRUCTURAL DESIGN PRINCIPLES

3.2 Materials

3.2.1 General

3.2.1.4 Rolled Stainless Steel Members or Stainless Clad Steel Plates

Sub-paragraph -1 has been amended as follows.

1 The material factor K for stainless steels or stainless clad steels specified in **Chapter 3, Part K** is to be the value obtained from the following formulae. However, the factor (K) is to be rounded to three decimal places and not less than 0.63.

$$K = f_T \left\{ 8.81 \left(\sigma_{Y_SUS} / 1000 \right)^2 - 7.56 \left(\sigma_{Y_SUS} / 1000 \right) + 2.29 \right\} \quad (\text{for } \sigma_{Y_SUS} \leq 355 \text{ (N/mm}^2\text{)})$$

$$K = f_T f_C (235 / \sigma_{Y_SUS}) \quad (\text{for rolled stainless steel with } \sigma_{Y_SUS} > 355 \text{ (N/mm}^2\text{)})$$

f_C : Determined as follows:

$$f_C = 3.04 \left(\sigma_{Y_SUS} / 1000 \right)^2 - 1.09 \left(\sigma_{Y_SUS} / 1000 \right) + 1.09$$

σ_{Y_SUS} : The minimum value of yield strength or proof stress of stainless steel or stainless clad steel specified in **Chapter 3, Part K** (N/mm²)

f_T : Determined as follows:

$$f_T = 0.0025(T - 60) + 1.00$$

If T is more than 100 °C, the value of f_T is at the discretion of the Society.

T : The maximum temperature in (°C) of cargo in contact with the materials. If the temperature is less than 60 °C, T is to be taken as 60 °C.

2 In the application of -1 above, where deemed necessary by the Society, data corresponding to the standard of steels used (e.g. extent of use, location of structural members, section rigidity, buckling strength, minimum thickness, etc.) is to be submitted to the Society and approved.

Sub-paragraph -3 has been added as follows.

3 The specified minimum yield stress of stainless steel or stainless clad steel is specified as follows.

$$\sigma_Y = \sigma_{Y_SUS} / f_T$$

σ_{Y_SUS} and f_T : As specified in -1 above.

3.5 Minimum Requirements

3.5.2 Slenderness Requirements

3.5.2.1 Application

1 All structural members are to meet the slenderness requirements specified in **3.5.2**, except for those listed below:

- Bilge plates within the cylindrical part of the ship and the radius gunwale
- Structure members in superstructures and deck houses in cases where such members do not contribute to longitudinal strength.

Pillars in superstructures and deckhouses are to comply with the applicable slenderness and proportion requirements specified in **3.5.2**.

2 Where structural members are deemed by the Society as having an effectiveness equivalent to those compliant with **3.5.2**, such members are to be deemed compliant with **3.5.2**.

Sub-paragraph -3 has been amended as follows.

3 Notwithstanding -1 above, thickness of shell plating, deck, bulkhead and web of girder and stiffness of stiffener need not to comply with **3.5.2**, provided that buckling strength requirements specified in **5.3** and **8.6.2**, if applicable, are satisfied.

Chapter 6 LOCAL STRENGTH

6.2 Design Load Scenarios and Loads of the Ship to Be Assessed

6.2.2 Assessment Design Load Scenarios and Loads for Members to Be Assessed

6.2.2.1

Table 6.2.2-1 has been amended as follows.

Table 6.2.2-1 Assessment Design load scenarios and Loads for Members/Compartments to Be Assessed

Compartments or members to be assessed	Design load scenario	Load				
		Lateral load	Load type	Load component	Refer to the following:	
					Lateral load (P)	Hull girder load (M_{V-HG} , M_{H-HG})
Outer shell (including stiffeners)	Maximum load condition	External pressure	Seawater	Static + dynamic loads	4.4.2.2-1	4.4.2.9
Cargo tanks, ballast tanks, ballast holds and other tanks		Internal pressure	Liquid loaded	Static + dynamic loads	4.4.2.2-2	
Cargo holds ⁽¹⁾			Dry bulk cargoes	Static + dynamic loads		
Cargo holds ⁽²⁾			Others	Static + dynamic loads		
Weather decks (including stiffeners)		Others	Green sea, unspecified loads	Green sea load, static + dynamic loads	Greater of the pressures specified in 4.4.2.2-3 and -4	
Internal decks ⁽²⁾ (including stiffeners)			Cargoes	Static + dynamic loads	4.4.2.2-3	
Members constituting compartments subject to hydrostatic testing	Testing condition	Internal pressure	Seawater	Static loads	4.4.3.2	4.4.3.3
Compartments not carrying liquids ⁽³⁾ Transverse and longitudinal bulkheads	Flooded condition	Internal pressure	Seawater	-	4.4.4.1	4.4.4.2
(Notes)						
(1) For ships of single-side skin construction for carrying cargoes other than liquids, the outer shell (including stiffeners) may be excluded from the assessment.						
(2) For ships carrying cargoes other than bulk and liquid cargoes with the cargoes properly fastened or otherwise held in position so that the cargo loads can be deemed as acting only on the inner bottom plating and internal deck, the assessment may be performed only for the inner bottom plating and the internal deck.						
(3) Not required to be applied to shell plating, stiffeners attached to shell plating, weather deck plating and stiffeners attached to weather deck plating.						

Chapter 7 STRENGTH OF PRIMARY SUPPORTING STRUCTURES

7.2 Simple Girders

7.2.2 Assessment Conditions and Loads

7.2.2.2 Assessment Conditions and Loads for Members to Be Assessed

Table 7.2.2-1 has been amended as follows.

Table 7.2.2-1 Assessment Conditions and Loads for Members/Compartments to Be Assessed

Table 7.2.2-1 Assessment Conditions and Loads for Members/ Compartments to Be Assessed							
Compartments/members to be assessed	Typical members	Assessment condition	Loads				
			Lateral load	Load type	Load components	Refer to:	
						Load (P)	Hull girder load (M_{V-HG}, M_{H-HG})
Girders on shell plating	Web frames, side stringers (single side skin structure)	Maximum load condition	External pressure	Seawater	Static + dynamic loads	4.4.2.2-1	4.4.2.9
Cargo oil tanks, ballast tanks, ballast holds and other tanks	Stiffening girders, corrugated bulkheads		Internal pressure	Liquid loaded	Static + dynamic loads	4.4.2.2-2	
Cargo holds ⁽¹⁾	Stiffening girders, corrugated bulkheads			Dry bulk cargoes and others	Static + dynamic loads		
Single-bottomed cargo holds	Girders, floors			Unspecified cargoes	Static + dynamic loads		
Girders on deck	Deck girders, deck transverses		Others	Green sea (weather decks only), unspecified cargoes	Green sea load, static + dynamic loads	Greater of the pressures specified in 4.4.2.2-3 and -4	
Internal decks ⁽²⁾	Deck girders, deck transverses			Unspecified cargoes	Static + dynamic loads	4.4.2.2-3	
Members constituting compartments subject to hydraulic testing	Stiffening girders, corrugated bulkheads	Testing condition	Internal pressure	Seawater	Static loads	P_{ST-in1} as specified in 4.4.3.2	4.4.4.3
Compartments not carrying liquids ⁽³⁾ Transverse and longitudinal bulkheads	Stiffening girders, corrugated bulkheads	Flooded condition	Internal pressure	Seawater	-	4.4.4.1	4.4.4.2

(Notes)

- (1) For ships of a single side skin structure for carrying cargoes other than liquids, girders on the shell plating may be excluded from the assessment.
- (2) For ships carrying cargoes other than bulk and liquid cargoes with the cargoes properly fastened or otherwise held in position so that the cargo loads can be deemed as acting only on the inner bottom plating and internal deck, the assessment may be performed only for the inner bottom plating and the internal deck.
- (3) Not required for girders on shell plating and weather deck.

Chapter 8 STRENGTH ASSESSMENT BY CARGO HOLD ANALYSIS

8.2 Evaluation Area and Members to be Assessed

8.2.2 Members to be Assessed

Paragraph 8.2.2.2 has been amended as follows.

8.2.2.2 Members to be Assessed in Flooded Condition*

Where strength assessment is carried out in the flooded condition, the following members and locations are to satisfy the assessment criteria specified in this Chapter:

- (1) Watertight bulkhead structures at the boundaries of compartments not carrying liquids
- (2) Other members and locations as deemed necessary by the Society

Chapter 11 STRUCTURES OUTSIDE CARGO REGION

11.5 Stern Construction

11.5.2 Arrangements to Resist Panting Abaft of After Peak Bulkhead

Paragraph 11.5.2.5 has been added as follows.

11.5.2.5 Shell Plating connected with Stern Frame*

The structural continuity of connections between stern frame and shell plating is to be maintained.

Part 2-6 VEHICLES CARRIERS AND ROLL-ON/ROLL-OFF SHIPS

Chapter 3 STRUCTURAL DESIGN PRINCIPLES

3.1 Minimum Requirements

3.1.2 Car Deck

Paragraph 3.1.2.1 has been amended as follows.

3.1.2.1 Application

The car deck solely loaded with wheeled vehicles is to comply with the requirements of **3.1.2.2**.

Paragraph 3.1.2.1 has been amended as follows.

3.1.2.2 Minimum Thickness of the Car Deck

1 The gross thickness of the car deck is not to be less than *5 mm*.

2 The gross thickness of web and flange of stiffeners attached to the car deck is not to be less than *5 mm*.

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

Part C HULL CONSTRUCTION AND EQUIPMENT

Part 1 GENERAL HULL REQUIREMENTS

Chapter C1 has been added as follows.

C1 GENERAL

C1.2 Application

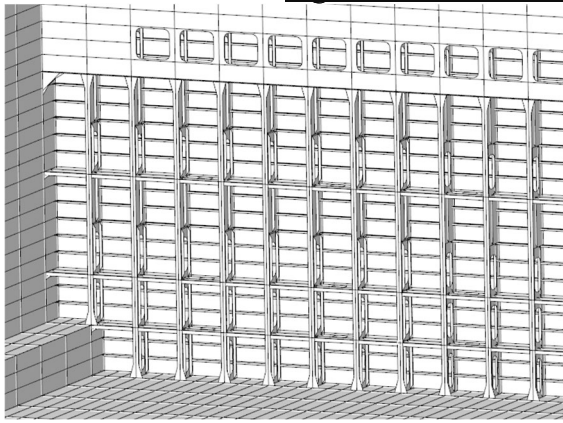
C1.2.2 Requirements

C1.2.2.4 Application of Strength Assessment Criteria to Primary Supporting Structures

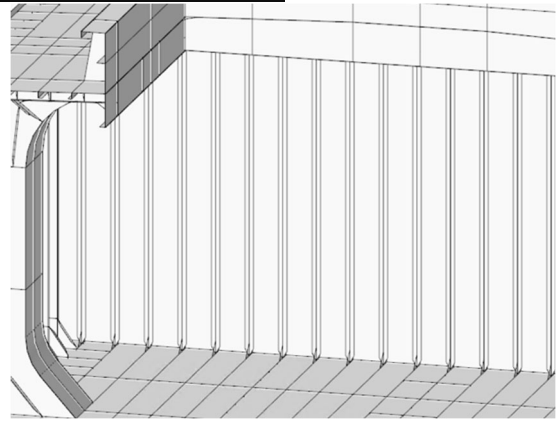
Where strength assessments are carried out in the flooded condition, the following (1) to (3) evaluation methods are considered to be standard:

- (1) For reciprocal-type bulkhead structures, Chapter 8, Part C of the Rules is to be applied.
- (2) For bulkhead structures supported solely by stiffeners, neither Chapter 7 nor Chapter 8, Part C of the Rules are to be applied.
- (3) For bulkhead structures excluding (1) and (2) above (e.g. corrugated bulkheads) and where Chapter 8, Part C of the Rules is not applied, relevant requirements in Chapter 7, Part C of the Rules are to be applied.

Fig. C1.2.2-1 Example of Bulkhead Structures



(a) Reciprocal-type bulkhead structure



(b) Bulkhead structure supported solely by stiffeners

C8 STRENGTH ASSESSMENT BY CARGO HOLD ANALYSIS

C8.2 Evaluation Area and Members to be Assessed

Paragraph C8.2.2 has been added as follows.

C8.2.2 Members to be Assessed

C8.2.2.2 Members to be Assessed in Flooded Condition

Watertight bulkhead structures for which the differences between internal and external pressures are small (e.g. longitudinal bulkheads and girder members that constitute double side structures) need not be assessed.

C11 STRUCTURES OUTSIDE CARGO REGION

C11.5 Stern Structure

Paragraph C11.5.2 has been added as follows.

C11.5.2 Arrangements to Resist Panting Aft of After Peak Bulkhead

C11.5.2.5 Shell Plating connected with Stern Frame

1 The thicknesses of shell plating connected with stern frames are not to be less than those obtained from the following formula:

$$t = 0.094(L_{C300} - 43) + 0.009b$$

b: Length (mm) of the shorter side of the plate panel

2 Notwithstanding -1 above, the thicknesses of bosses and heel plates are not to be less than those obtained from the following formula:

$$t = 0.105(L_{C300} - 47) + 0.011b$$

b: As specified in -1 above