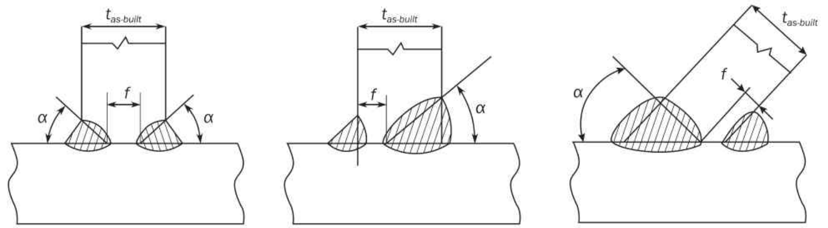
Amendments of the Rules / Guidance

(External review)

Pt.3 Hull Structures

2020. 09.

Hull Rule Development Team

Present	Amendment	Reason
⟨Rules⟩ # Chapter 1 General ## Section 1 ~ Section 4 ⟨Omitted⟩ ## Section 5 Weldings **1. General (2019)** 1. ~ 4. ⟨Omitted⟩ 5. ⟨New⟩	**⟨Rules⟩** # Chapter 1 General ## Section 1 ~ Section 4 ⟨Same as current⟩ ## Section 5 Weldings **1. General (2021)** 1. ~ 4. ⟨Same as current⟩ 5. (1) In areas with high tensile stresses or areas considered critical, full or partial penetration welds are to be used. In case of full penetration welding, the root face is to be removed, e.g. by gouging before welding of the back side. For partial penetration welds the root face, f, is to be taken between 3mm and $t_{as-built}/3$. The groove angle α made to ensure welding bead penetrating up to the root of the groove is usually from 40° to 60°. The welding bead of the full/partial penetration welds is to cover root of the groove. Example of partial penetration welds are given as follows.  **Figure 2 : Partial penetration welds** (2) For partial penetration welds, the leg length of fillet weld at the opposite side of the bevel is to satisfy F2. (3) The minimum extent of full/partial penetration welding from the reference point(i.e. intersection point of structural members, end of bracket toe, etc.) is not to be taken less than 300mm, unless otherwise specifically stated.	Reflection of request for revision of classification technical rules(HUC4100-1520-2020)

Present	Amendment	Reason
Section 6 ~ Section 8 〈Omitted〉 **Chapter 2 ~ Chapter 14 〈Omitted〉**	(4) Locations required for full penetration welding a) Floors to hopper/inner bottom plating in way of radiused hopper knuckle. b) Radiused hatch coaming plate at corners to deck. c) Crane pedestals and associated bracketing and support structure. d) Rudder horns and shaft brackets to shell structure. e) Connection of vertical corrugated bulkhead to the lower hopper plate and to the inner bottom plate within the cargo hold region, when the vertical corrugated bulkhead is arranged without a lower stool. f) Connection of vertical corrugated bulkhead to top plating of lower stool g) Abutting plate panels with as-built thickness less than or equal to 12mm, forming outer shell boundaries below the scantling draught, including but not limited to: sea chests, rudder trunks, and portions of transom. (5) Locations required for partial penetration welding a) Connection of hopper sloping plate to longitudinal bulkhead(inner hull). b) Abutting plate panels with as-built thickness greater than 12mm, forming outer shell boundaries below the scantling draught, including but not limited to: sea chests, rudder trunks, and portions of transom c) Corrugated bulkhead lower stool side plates to lower stool top plates d) Corrugated bulkhead lower stool side plates to inner bottom. e) Corrugated bulkhead lower stool supporting floors to inner bottom. f) Corrugated bulkhead gusset and shedder plates. g) Lower 15% of the length of built-up corrugation of vertical corrugated bulkhead h) Lower hopper plate to inner bottom Section 6 ~ Section 8 〈Same as current〉 **Chapter 2 ~ Chapter 14 〈Same as current〉**	Reflection of request for revision of classification technical rules(HUC4100-1520-2020)

<table>
<tr><th>Present</th><th>Amendment</th><th>Reason</th></tr>
<tr><td>

Chapter 15 Deep Tanks

Section 1 ~ Section 3 〈Omitted〉

Section 4 Weldings of Corrugated Bulkheads (2016)

401. General
1. The welding of corrugated bulkhead is to be in accordance with Table 3.15.5.
2. For the supporting members of corrugated bulkheads or stools, such as floors, girders or other primary supporting members and stiff-eners, fillet weld leg length is to be suitably increased or to be bevelled and welded. In cases where the angle between the side plating of a lower stool and inner bottom plating is relative small, the fillet weld leg lengths for supporting members to inner bottom plating are to be suitably increased taking into account such an angle.
3. In cases where stools are fitted, the fillet weld leg length for the top or bottom plating of stools to the side plating of stools as well as the side plating of stools to inner bottom plating is to be suitably increased or to be bevelled and welded.
4. In cases where gusset plates and shedder plates are fitted at the lower parts of corrugated bulkheads, the welding is to be in accord-ance with the requirements given in Pt 7, Ch 3, 1204.2.(1) (A)(a)(ii) and (b)(iv).

Chapter 16 ~ Chapter 19 〈Omitted〉

</td><td>

Chapter 15 Deep Tanks

Section 1 ~ Section 3 〈Same as current〉

Section 4 Weldings of Corrugated Bulkheads (2021)

401. General
1. The welding of corrugated bulkhead is to be in accordance with Table 3.15.5.
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4. In cases where gusset plates and shedder plates are fitted at the lower parts of corrugated bulkheads, the welding is to be in accord-ance with the requirements given in Pt 7, Ch 3, 1204.2.(1) (A)(a)(ii) and (b)(iv).

Chapter 16 ~ Chapter 19 〈Same as current〉

</td><td>Reflection of request for revision of classification technical rules</td></tr>
</table>

〈Present〉

Table 3.15.5 Welding of Corrugated Bulkheads

Type of Corrugated bulkhead		Application	Welding
Vertically Corrugated bulkhead	Without stool	Upper deck	Double continuous fillet welding with a fillet weld leg length that is not less than 0.7 times the thickness of the corrugated bulkhead
		Inner bottom	(1) For ships having a length, L of 150m and above • Full Penetration welds (2) For ships having a length, L, that is less than 150m • Full penetration welds for webs and flanges of the corrugated bulkhead that are within about 200mm from R ends of the corner of the corrugation(see Fig 3.15.2) • For other parts, double continuous fillet welding with a fillet weld leg length that is not less than 0.7 times the thickness of the corrugated bulkhead
		Corrugated bulkhead	Full penetration welds
	Lower stool	Top plate	(1) For ships having a length, L of 150m and above • Full Penetration welds (2) For ships having a length, L, that is less than 150m • Full penetration welds for webs and flanges of the corrugated bulkhead that are within about 200mm from R ends of the corner of the corrugation(see Fig 3.15.2) • For other parts, double continuous fillet welding with a fillet weld leg length that is not less than 0.7 times the thickness of the corrugated bulkhead.
	Upper stool	Bottom plate	Double continuous fillet welding with a fillet weld leg length that is not less than 0.7 times the thickness of the corrugated bulkhead
Horizontally Corrugated bulkhead		Upper deck, inner bottom, Corrugated bulkhead	Double continuous fillet welding with a fillet weld leg length that is not less than 0.7 times the thickness of the corrugated bulkhead

⟨Amendment⟩

Table 3.15.5 Welding of Corrugated Bulkheads

Type of Corrugated bulkhead		Application	Welding
Vertically Corrugated bulkhead	Without stool	Upper deck	Double continuous fillet welding with a fillet weld leg length that is not less than 0.7 times the thickness of the corrugated bulkhead
		Inner bottom, lower hopper plate	(1) For ships having a length, L of 150m and above • Full Penetration welds (2) For ships having a length, L, that is less than 150m • Full penetration welds for webs and flanges of the corrugated bulkhead that are within about 200mm from R ends of the corner of the corrugation(see Fig 3.15.2) • For other parts, double continuous fillet welding with a fillet weld leg length that is not less than 0.7 times the thickness of the corrugated bulkhead
		Corrugated bulkhead	Full penetration welds
	Lower stool	Top plate	(1) For ships having a length, L of 150m and above • Full Penetration welds (2) For ships having a length, L, that is less than 150m • Full penetration welds for webs and flanges of the corrugated bulkhead that are within about 200mm from R ends of the corner of the corrugation(see Fig 3.15.2) • For other parts, double continuous fillet welding with a fillet weld leg length that is not less than 0.7 times the thickness of the corrugated bulkhead.
	Upper stool	Bottom plate	Double continuous fillet welding with a fillet weld leg length that is not less than 0.7 times the thickness of the corrugated bulkhead
Horizontally Corrugated bulkhead		Upper deck, inner bottom, Corrugated bulkhead	Double continuous fillet welding with a fillet weld leg length that is not less than 0.7 times the thickness of the corrugated bulkhead

Amendments of the Rules / Guidance

(External review)

Pt.3 Hull Structures
Pt.7 Ships of Special Services
Pt.10 Hull Structure and Equipment of Small Steel Ships

KR
KOREAN REGISTER

2020. 09.

Hull Rule Development Team

<table>
<tr><th>Present</th><th>Amendment</th><th>Note</th></tr>
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〈Rules〉

CHAPTER 1 GENERAL

205. Equivalency

The equivalence of alternative and novel features which deviate from or are not directly applicable to the Rules is to be in accordance with <u>Pt 1, Ch 1</u> of Rules for the Classification of Steel Ships. *(2020)*

CHAPTER 4 PLATE KEELS AND SHELL PLATING

702. Thickness of sea chest 【See Guidance】

In case where a sea chest is provided in the shell plating for sea suction or discharge the thickness of sea chest is not to be less than that obtained from the following formula and to be suitably stiffened so as to provide sufficient rigidity as necessary. The thickness, however, is not to be less than the <u>thickness</u> of shell plating where the sea chest is installed.

CHAPTER 6 SINGLE BOTTOMS

101. Application

1. The requirements in this Chapter apply to the single bottoms of ships whose double bottom is omitted partially or wholly in accordance with the requirements in **Ch 7, 101.** <u>2 or 3.</u>

</td><td>

〈Rules〉

CHAPTER 1 GENERAL

205. Equivalency

The equivalence of alternative and novel features which deviate from or are not directly applicable to the Rules is to be in accordance with <u>Pt 1, Ch 1 105.</u> of Rules for the Classification of Steel Ships. *(2021)*

CHAPTER 4 PLATE KEELS AND SHELL PLATING

702. Thickness of sea chest 【See Guidance】

In case where a sea chest is provided in the shell plating for sea suction or discharge the thickness of sea chest is not to be less than that obtained from the following formula and to be suitably stiffened so as to provide sufficient rigidity as necessary. The thickness, however, is not to be less than the <u>required thickness</u> of shell plating where the sea chest is installed.

CHAPTER 6 SINGLE BOTTOMS

101. Application

1. The requirements in this Chapter apply to the single bottoms of ships whose double bottom is omitted partially or wholly in accordance with the requirements in **Ch 7, 101.** <u>3 or 4.</u>

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</table>

Present	Amendment	Note

Present

〈Guidance〉

CHAPTER 1 GENERAL

Table 3.1.1 Minimum dimension and lightening of the members

Items		Coastal services	Smooth water services	Minimum dimension
Section modulus of frame				

Amendment

〈Guidance〉

CHAPTER 1 GENERAL

Table 3.1.1 Minimum dimension and lightening of the members

Items		Coastal services	Smooth water services	Minimum dimension
Section modulus of frame (including bottom longitudinals)				

Note

Present	Amendment	Note

Present

CHAPTER 3 HULL STRUCTURES

Table 3.3.3 For the case of ships, loading manual and longitudinal loading instruments are to be installed *(2018)*

Application \ Kind of ship		Category 1-1		Category 1-2		Category 1-3		Category 2	
①	Omission								
②	Omission								
③	Ships under survey during (after) construction before 1993/5/1								
④	Ships under survey during (after) construction after 1998/7/1								
Omission									

CHAPTER 7 DOUBLE BOTTOMS

802. Definition 【See Rule】

In ships of which L and C_b are less than 150 m and 0.7 respectively and bow draught is less than $0.02L$ at the ballast condition, the area of strengthened bottom forward of the ship is to be expended as follows.

Amendment

CHAPTER 3 HULL STRUCTURES

Table 3.3.3 For the case of ships, loading manual and longitudinal loading instruments are to be installed *(2018)*

Application \ Kind of ship		Category 1-1		Category 1-2		Category 1-3		Category 2	
①	Omission								
②	Omission								
③	Ships under survey during (after) construction after 1993/5/1								
④	Ships contracted for construction after 1998/7/1								
Omission									

CHAPTER 7 DOUBLE BOTTOMS

802. Definition 【See Rule】

In ships of which L and C_b are less than 150 m and 0.7 respectively and bow draught is less than $0.025L$ at the ballast condition, the area of strengthened bottom forward of the ship is to be expended as follows.

Present	Amendment	Note
Annex 3-5 Guidance for structural members for ships intended to carry out the steel coils **4. Inner bottom longitudinals** For the steel coils are positioned without respect to the location of the inner bottom floors, the section modulus of inner bottom longitudinals is not to be less than that obtained from the following formula. In case where a strut specified in Pt 3, Ch 7, 404. is provided midway between floors, the section modulus of inner bottom longitudinals is not to be less than 0.75 times that of the following formula.	**Annex 3-5 Guidance for structural members for ships intended to carry out the steel coils** **4. Inner bottom longitudinals** For the steel coils are positioned without respect to the location of the inner bottom floors, the section modulus of inner bottom longitudinals is not to be less than that obtained from the following formula. In case where a strut specified in Pt 3, Ch 7, 404. is provided midway between floors, the section modulus of inner bottom longitudinals is not to be less than 0.6 times that of the following formula.	

Present	Amendment	Note
〈Rules〉	〈Rules〉	
CHAPTER 1 GENERAL	**CHAPTER 1 GENERAL**	
Section 2 General	**Section 2 General**	
206. Direct strength calculation 【See Guidance】	206. Direct strength calculation 【See Guidance】	
1. Where approved by the Society, scantlings of structural members may be determined basing upon direct strength calculation. Where the calculated scantlings based on direct strength calculation exceed the scantlings required in this Part, the former is to be adopted. **2.** Where the direct strength calculation specified in the preceding **Par 1** is carried out, the data necessary for the calculation are to be submitted to the Society.	**1.**,**2.** 〈same as current〉	
	3. The evaluations of direct strength and fatigue strength for hull structures are in accordance with **Appendix 3-2** 「**Guidelines for Direct Strength Assessment**」 and **Appendix 3-3** 「**Guidelines for Fatigue Strength Assessment of Hull Structures**」 respectively. *(2021)*	〈newly added〉
Section 7 Workmanship	**Section 7 Workmanship**	
701. General	701. General	
1. The workmanship is to be of the best quality. **2.** During the construction, the builder is to supervise and inspect in detail every job performed in shed or yard and prepare the necessary records. **3.** Any defect is to be rectified to the satisfaction of the surveyor before the material is covered with paint, cement or any other composition. **4.** Structural fabrication is to be carried out in accordance with IACS Recommendation No. 47 or with a recognised fabrication standard which has been accepted by the Society prior to the commencement of fabrication/construction.	**1.** ~ **4.** 〈same as current〉	
	5. In order to be assigned the hull construction monitoring notation **"SeaTrust (HCM)"**, the provisions in **Appendix 3-4** 「**Hull Drying Monitoring Procedures**」 should be followed. *(2021)*	〈newly added〉

Present	Amendment	Note
〈Rules〉 CHAPTER 7 DOUBLE BOTTOMS Section 1 General 101. Application 【See Guidance】 **8.** Double bottom structure of holds is to be subjected to special consideration, where intended to carry heavy cargoes or where the ratio of cargo weight per unit area (kN/m^2) of the inner bottom plating to d is less than 5.40 or where cargo loads can not be treated as even distributed loads. Where the value of cargo weight per unit area as given in t/m^2, the value in kN/m^2 should be obtained from the product of the value in t/m^2 and 9.81.	**〈Rules〉** CHAPTER 7 DOUBLE BOTTOMS Section 1 General 101. Application 【See Guidance】 **8.** 〈same as current〉 **9.** Scantlings of structural members for ships intended to carry out the steel coils are to be in accordance with **Annex 3-5 「Guidance for structural members for ships intended to carry out the steel coils」.** *(2021)*	- move from the Guidelines to the Rule
〈Guidance〉 CHAPTER 7 DOUBLE BOTTOMS Section 1 General 101. Application 【See Guidance】 **1. ~ 4.** 〈omit〉 **5.** Scantlings of structural members for ships intended to carry out the steel coils are to be in accordance with **Annex 3-5 "Guidance for structural members for ships intended to carry out the steel coils".** **6.** With respect to the provisions ~ 〈omit〉	**〈Guidance〉** CHAPTER 7 DOUBLE BOTTOMS Section 1 General 101. Application 【See Guidance】 **1. ~ 4.** 〈same as current〉 〈delete〉 **5.** With respect to the provisions ~ 〈same as current〉	- move from the Guidelines to the Rule - renumber

Amendments of Guidance

(Internal Review)

Pt. 3 Hull Structures

2021. 01.

Hull Rule Development Team

Present	Amendment	Reason
〈Guidance〉 **Annex 3-2 Guidance for the Direct Strength Assessment** I. General 〈omitted〉 II. Direct Global Structural Analysis 1.General 〈omitted〉 2. Hydrodynamic model 〈omitted〉 3. Structural model (1) Modeling of structure 〈omitted〉 (2) Boundary conditions The boundary conditions for the global structure model should reflect simple supporting. This is obtained through the example shown **Table 2** and **Fig 2.** The fixation points should be located far away from the areas of interest. 〈newly added〉	〈Guidance〉 **Annex 3-2 Guidance for the Direct Strength Assessment** I. General 〈same as the current Rules〉 II. Direct Global Structural Analysis 1.General 〈same as the current Rules〉 2. Hydrodynamic model 〈same as the current Rules〉 3. Structural model (1) Modeling of structure 〈same as the current Rules〉 (2) Boundary conditions The boundary conditions for the global structure model should reflect simple supporting. This is obtained through the example shown **Table 2** and **Fig 2.** The fixation points should be located far away from the areas of interest. However, when it is necessary to evaluate the area near the boundary condition, or in the case of wave load conditions in which reaction force occurs largely in the boundary condition, the boundary condition can be replaced by using the inertia relief method. In this case, data on the unbalanced force are to be submitted to the Society and discussed in order to confirm the accuracy of the load transfer.	

Table 2 Boundary condition

Location	Displacement		
	δx	δy	δz
Point A	1	1	1
Point B	0	1	1
Point C	0	1	0
(Notes) 1 : constrained 0 : Free			

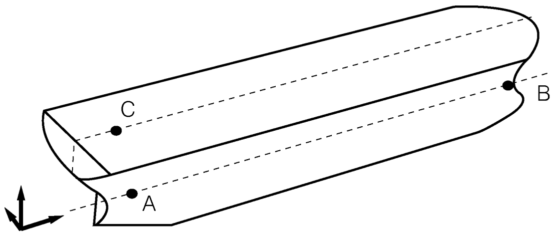

Fig 2 Boundary condition

III. Guidance for the Hold Analysis ⟨omitted⟩

IV. Buckling strength calculation ⟨omitted⟩ ⚓

Table 2 Boundary condition

Location	Displacement		
	δx	δy	δz
Point A	1	1	1
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(Notes) 1 : constrained 0 : Free			

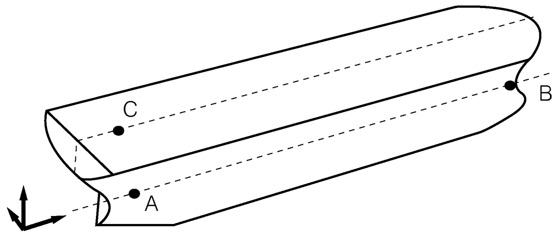

Fig 2 Boundary condition

III. Guidance for the Hold Analysis ⟨same as the current Rules⟩

IV. Buckling strength calculation ⟨same as the current Rules⟩ ⚓

<table>
<tr><th>Present</th><th>Amendment</th><th>Note</th></tr>
<tr><td>

〈Rules〉

CHAPTER 7 Double Bottoms

Section 8 Construction of Strengthened Bottom Forward

801., 803. 〈omit〉

804. Scantlings

1. 〈omit〉

$Z = 0.53KCPal^2$ (cm^3)

where:

l = spacing of solid floors (m).

a = $0.774l$. Where, however, the spacing of longitudinal shell stiffeners or bottom longitudinals <u>in</u> not more than $0.774l$, a is to be taken as the spacing.

C = coefficient obtained from the following formula:

〈omit〉

β = slope of the ship's bottom obtained from the following formula, but C_2/β need not be taken as greater than 11.43.

$$\beta = \frac{0.0025L}{b}$$

b = horizontal distance measured at the station $0.2L$ from the stem, from the center line of ship to the intersection of the horizontal line $0.0025L$ above the top of keel with the shell plating(m). (See Fig 3.7.2)

~~β = slope of the ship's bottom obtained from the following formula, but C_2/β need not be taken as greater than 11.43.~~

~~b = horizontal distance measured at the station $0.2L$ from the stem, from the center line of ship to the intersection of the horizontal line $0.0025L$ above the top of keel with the shell plating(m). (See Fig 3.7.2)~~

〈omit〉

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〈Rules〉

CHAPTER 7 Double Bottoms

Section 8 Construction of Strengthened Bottom Forward

801., 803. 〈same as the present Rule〉

804. Scantlings

1. 〈same as the present Rule〉

$Z = 0.53KCPal^2$ (cm^3)

where:

l = spacing of solid floors (m).

a = $0.774l$. Where, however, the spacing of longitudinal shell stiffeners or bottom longitudinals <u>is</u> not more than $0.774l$, a is to be taken as the spacing.

C = coefficient obtained from the following formula:

〈same as the present Rule〉

β = slope of the ship's bottom obtained from the following formula, but C_2/β need not be taken as greater than 11.43.

$$\beta = \frac{0.0025L}{b}$$

b = horizontal distance measured at the station $0.2L$ from the stem, from the center line of ship to the intersection of the horizontal line $0.0025L$ above the top of keel with the shell plating(m). (See Fig 3.7.2)

〈same as the present Rule〉

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- 오류수정 (TST4700-684-2020)

- β, b 중복항목 삭제 (TST4700-684-2020)

</td></tr>
</table>

Present	Amendment	Note

Present

CHAPTER 9 Web Frames and Side Stringers

Section 1 General

101. Application

1. The requirements in Sec 2 and 3 apply to the structures stiffened by side stringers supporting the transverse ordinary frames specified in Ch 8, 303. and web frames supporting side stringers.
2. The requirements in Sec 4 apply to the structures stiffened by side transverse supporting the longitudinal frames specified in Ch 7, 401.

CHAPTER 10 Beams

Section 2 Deck Load

Line	Position of deck	a			
		Beams(1), Deck plating	Pillars	Deck girders	b
I	〈omit〉	〈omit〉	〈omit〉	〈omit〉	〈omit〉
II	〈omit〉	〈omit〉	〈omit〉	〈omit〉	〈omit〉
III	〈omit〉	〈omit〉	〈omit〉	〈omit〉	〈omit〉
IV	〈omit〉	〈omit〉	〈omit〉	〈omit〉	〈omit〉

NOTE:
(1) 〈omit〉
(2) 〈omit〉
(3) n case of deck girders other than (2).

Amendment

CHAPTER 9 Web Frames and Side Stringers

Section 1 General

101. Application

1. The requirements in Sec 2 and 3 apply to the structures stiffened by side stringers supporting the transverse ordinary frames specified in Ch 8, 303. and web frames supporting side stringers.
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CHAPTER 10 Beams

Section 2 Deck Load

Line	Position of deck	a			
		Beams(1), Deck plating	Pillars	Deck girders	b
I	〈omit〉	〈omit〉	〈omit〉	〈omit〉	〈omit〉
II	〈omit〉	〈omit〉	〈omit〉	〈omit〉	〈omit〉
III	〈omit〉	〈omit〉	〈omit〉	〈omit〉	〈omit〉
IV	〈omit〉	〈omit〉	〈omit〉	〈omit〉	〈omit〉

NOTE:
(1) 〈omit〉
(2) 〈omit〉
(3) In case of deck girders other than (2).

Note

- 오류수정 (TST4700-684-2020)
- 오류수정 (TST4700-684-2020)

Present	Amendment	Note
CHAPTER 12 Pillars **Section 2 Scantling of Pillars** 201. Sectional area 【See Guidance】 1. The sectional area of pillars is not to be less than that obtained from the following formula: $A = \dfrac{0.223KW}{2.72 - \dfrac{l}{k_0\sqrt{K}}}$ (cm^2) where l = distance from the top of inner bottom, deck or other structures on which the pillars are based to the underside of beam or girder supported by the pillars (m). (See Fig 3.12.1) k_0 = minimum radius of gyration of the section of pillars (m). **CHAPTER 13 ARRANGEMENTS TO RESIST PANTING** **Section 2 Arrangements to Resist Panting forward the Collision Bulkhead**	**CHAPTER 12 Pillars** **Section 2 Scantling of Pillars** 201. Sectional area 【See Guidance】 1. The sectional area of pillars is not to be less than that obtained from the following formula: $A = \dfrac{0.223KW}{2.72 - \dfrac{l}{k_0\sqrt{K}}}$ (cm^2) where l = distance from the top of inner bottom, deck or other structures on which the pillars are based to the underside of beam or girder supported by the pillars (cm). (See Fig 3.12.1) k_0 = minimum radius of gyration of the section of pillars (cm).	- 오류수정 (TST4700-684-2020)

Present	Amendment	Note
# CHAPTER 13 Arrangements to Resist Panting ## Section 2 Arrangements to Resist Panting forward the Collision Bulkhead 203. Transverse framing 1. 〈omit〉 2. Transverse framing (1) 〈omit〉 (2) 〈omit〉 (3) Where transverse frames are supported by side stringers: (a) The scantlings of side stringers are not to be less than those obtained from the following formula: 〈omit〉 d_0 = depth of side stringers (mm). In the calculation of t_1, however, the depth of slot for longitudinals, if any, is to be deducted from the depth of side stringers. Where the depth of side stringers is divided by horizontal stiffeners, the divided depth may be taken as t_0 in the calculation of t_2.	# CHAPTER 13 Arrangements to Resist Panting ## Section 2 Arrangements to Resist Panting forward the Collision Bulkhead 203. Transverse framing 1. 〈omit〉 2. Transverse framing (1) 〈omit〉 (2) 〈omit〉 (3) Where transverse frames are supported by side stringers: (a) The scantlings of side stringers are not to be less than those obtained from the following formula: 〈omit〉 d_0 = depth of side stringers (mm). In the calculation of t_1, however, the depth of slot for transverse frames, if any, is to be deducted from the depth of side stringers. Where the depth of side stringers is divided by horizontal stiffeners, the divided depth may be taken as t_0 in the calculation of t_2.	- 오류수정 (TST470 0-684-2020)

Present	Amendment	Note
CHAPTER 15 Deep Tank **Section 1 General** 104. Minimum thickness 【See Guidance】 In wing tanks and hold tanks with the length or breadth which exceeds $0.1L+5.0$ (mm) and in topside tanks and hopper tanks, the thickness of girders, struts and the brackets and bulkhead plates is not to be less than that given by Table 3.15.1 in accordance with the length of ship. 〈omit〉 **Section 2 Bulkheads of Deep Tanks** 204. Girders supporting bulkhead stiffeners 【See Guidance】 1. 〈omit〉 2. 〈omit〉 3. The thickness of plates of web part is not to be less than that obtained from the following formulae, whichever is the greater: 〈omit〉 where: S, h and l = as specified in Par 1. S_1 = spacing of web stiffeners or the depth of girders, whichever is the <u>greater</u> (mm). d_1 = depth of the girder at the location considered, reduced by the depth of slots for stiffeners (mm) 〈omit〉	**CHAPTER 15 Deep Tank** **Section 1 General** 104. Minimum thickness 【See Guidance】 In wing tanks and hold tanks with the length or breadth which exceeds $0.1L+5.0$ (m) and in topside tanks and hopper tanks, the thickness of girders, struts and the brackets and bulkhead plates is not to be less than that given by Table 3.15.1 in accordance with the length of ship. 〈omit〉 **Section 2 Bulkheads of Deep Tanks** 204. Girders supporting bulkhead stiffeners 【See Guidance】 1. 〈omit〉 2. 〈omit〉 3. The thickness of plates of web part is not to be less than that obtained from the following formulae, whichever is the greater: 〈omit〉 where: S, h and l = as specified in Par 1. S_1 = spacing of web stiffeners or the depth of girders, whichever is the <u>smaller</u> (mm). d_1 = depth of the girder at the location considered, reduced by the depth of slots for stiffeners (mm) 〈omit〉	- 오류수정 (TST4700-684-2020)

Amendments of the Rules / Guidance

Pt. 3 Ship Structure
Pt. 7 Ships of Special Service-1 / -2

2020. 11

Hull Rule Development Team

개정의 배경 및 내용

1. 개정배경: 오류 수정

(1) 개정요청서(HUT4000-2683-2020)
: 규칙 3편 15장 207 파형격벽 관련 산식 영문 오류 수정

(2) 개정요청서(HUC4100-2335-2020)
: 적용지침 3편 1장 표3.1.1 영문 오류 수정

(3) 개정요청서(HUT4000-2688-2020)
: 적용지침 3편 2장 211 샤프트 스트럿 요건 추가

(4) 개정요청서(HUT4000-2677-2020)
: 적용지침 3편 7장 801. 2 슬래밍 압력 산식 오류 수정

(5) 개정요청서(TST4700-673-2020)
: 적용지침 7편 4장 1002. 3 (4) 컨테이너고박설비 제품검사 관련 (안전사용하중)

(6) 개정요청서(HUT4000-2680-2020)
: 적용지침 7편 7장 표7.7.1 영문 오류 수정

2. 개정내용: 신구대비표 참조

<table>
<tr><th>Present</th><th>Amendment</th><th>Note</th></tr>
<tr>
<td>

〈Rules〉

CHAPTER 15 DEEP TANK

Section 2 Bulkheads of Deep Tanks

201., 206. 〈omit〉

207. Corrugated bulkheads 【See Guidance】

1. 2, 〈omit〉

3. The thickness of plates at end parts for $0.2l$ in line with l is not to be less than that obtained from the following formulae :

Thickness of web part : $t = 41.7\frac{CKShl}{d_0} + 2.5$ (mm)

It is not to be less than that obtained from the following formula :

$t_{\min} = 0.174\sqrt[3]{\frac{CKShl}{d_0}} + 2.5$ (mm)

〈omit〉

where:

h = as specified in **203.**

C, l = as specified in **Par 2.**

S, d_0, a and b = as specified in **Ch 14, 304. 4.**

208., 209. 〈omit〉

</td>
<td>

〈Rules〉

CHAPTER 15 DEEP TANK

Section 2 Bulkheads of Deep Tanks

201., 206. 〈same as current〉

207. Corrugated bulkheads 【See Guidance】

1. 2, 〈same as current〉

3. The thickness of plates at end parts for $0.2l$ in line with l is not to be less than that obtained from the following formulae :

Thickness of web part : $t = 41.7\frac{CKShl}{d_0} + 2.5$ (mm)

It is not to be less than that obtained from the following formula :

$t_{\min} = 0.174\sqrt[3]{\frac{CShlb^2}{d_0}} + 2.5$ (mm)

〈same as current〉

where:

h = as specified in **203.**

C, l = as specified in **Par 2.**

S, d_0, a and b = as specified in **Ch 14, 304. 4.**

208., 209. 〈omit〉

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- 오류수정 (HUT4000-2683-2020)

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Present	Amendment	Note
⟨Guidance⟩ CHAPTER 1 GENERAL Section 2 General 201. Application 【See Rule】 ⟨omit⟩	⟨Guidance⟩ CHAPTER 1 GENERAL Section 2 General 201. Application 【See Rule】 ⟨same as current⟩	

Present

Table 3.1.1 Minimum dimension and lightening of the members

Items		⟨omit⟩	⟨omit⟩	⟨omit⟩
Longitudinal strength	Wave load(M_w & F_w)			
	$Z_{\min}$			
Shell plating (including plate keels)				
Min. thickness of deck				
Section modulus of frame				
Section modulus of deck beam				
Section modulus of girder under deck				
Plate thickness of double bottom				
Plate thickness. of single bottom				
Plate thickness of B.H.D of superstructure end and section modulus of B.H.D stiffeners				
Note: ⟨omit⟩				

Amendment

Table 3.1.1 Minimum dimension and lightening of the members

Items		⟨same	as	current⟩
Longitudinal strength	Wave load(M_w & F_w)			
	$Z_{\min}$			
Shell plating (including plate keels)				
Min. thickness of deck				
Section modulus of frame (including bottom longitudinal)				
Section modulus of deck beam				
Section modulus of girder under deck				
Plate thickness of double bottom				
Plate thickness. of single bottom				
Plate thickness of B.H.D of superstructure end and section modulus of B.H.D stiffeners				
Note: ⟨same as current⟩				

Note

- 오류 수정 (HUC4100-2335-2020)

Present	Amendment	Note
CHAPTER 2 STEMS AND STERN FRAMES **Section 2 Stern Frames** 210. 〈omit〉 211. 〈Newly added〉	**CHAPTER 2 STEMS AND STERN FRAMES** **Section 2 Stern Frames** 210. 〈same as the present Rule〉 211. Propeller shaft brackets 1. General (1) The following requirements are applicable to propeller shaft brackets having two struts to support the propeller tail shaft boss. The struts may be of solid or welded type. (2) The angle between the struts shall not be less than 50 degrees. 2. Arrangement (1) Solid struts shall be carried continuously through the shell plating and shall be given satisfactory support by the internal ship structure. (2) Welded struts may be welded to the shell plating. The shell plating shall be reinforced, and internal brackets in line with strut plating shall be fitted. If the struts are built with a longitudinal centre plate, this plate shall be carried continuously through the shell plating. The struts shall be well rounded at fore and aft end at the transition to the hull. (3) The propeller shaft boss shall have well rounded fore and aft brackets at the connection to the struts.	- 프로펠러 샤프트 브래킷 요건 신설 (HUT4000-2688-2020)

Present	Amendment	Note

3. Struts

(1) Solid or welded struts of propeller shaft brackets shall comply with the following requirements:

$h \geq 0.4\,d$

$A \geq 0.4\,d^2$

$W \geq 0.12\,d^3$

where:

$A =$ gross area of strut section in mm^2

$W =$ gross section modulus of section in mm^3. W shall be calculated with reference to the neutral axis as indicated on **Fig 3.2.8**

$h =$ the greatest thickness of the section in mm

$d =$ propeller shaft diameter in mm.

$$d = \max\left(d_{act},\, d_{req}\sqrt[3]{\frac{T+160}{590}}\right)$$

$d_{act} =$ actual propeller shaft diameter in mm

$d_{req} =$ diameter (mm) of propeller shaft specified in **Pt 5, Ch 3, 204.**

$T =$ Specified minimum tensile strength (N/mm2). For the tensile strength exceeding 600N/mm^2, T is to be taken as 600 N/mm^2.

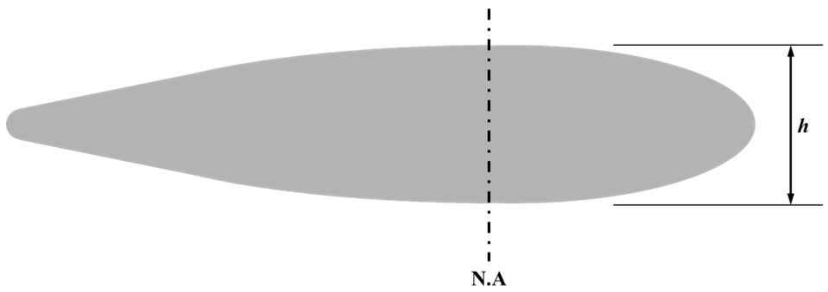

Fig. 3.2.8 Detail of Propeller shaft brackets

<table>
<tr><th>Present</th><th>Amendment</th><th>Note</th></tr>
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CHAPTER 7 DOUBLE BOTTOMS

Section 8 Construction of Strengthened Bottom Forward

801. 〈omit〉

802. Definition 【See Rule】

In ships of which L and C_b are less than 150 m and 0.7 respectively and bow draught is less than <u>0.02L</u> at the ballast condition, the area of strengthened bottom forward of the ship is to be expended as follows.

(1) The after end of strengthened area is to be extended the following distance a afterwards from the position required in **Table 3.7.11** of the Rules.

$a = 0,$ where $C_b = 0.7$

$a = 0.05L,$ where $C_b < 0.6$

For intermediate values of C_b, a is to be obtained by linear interpolation.

(2) In addition to (1) above, bottom areas of which tangential slope to the base line is less than 25° are required to be strengthened. (See **Fig 3.7.10**). ⚓

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CHAPTER 7 DOUBLE BOTTOMS

Section 8 Construction of Strengthened Bottom Forward

801. 〈same as current〉

802. Definition 【See Rule】

In ships of which L and C_b are less than 150 m and 0.7 respectively and bow draught is less than <u>0.025L</u> at the ballast condition, the area of strengthened bottom forward of the ship is to be expended as follows.

(1) The after end of strengthened area is to be extended the following distance a afterwards from the position required in **Table 3.7.11** of the Rules.

$a = 0,$ where $C_b = 0.7$

$a = 0.05L,$ where $C_b < 0.6$

For intermediate values of C_b, a is to be obtained by linear interpolation.

(2) In addition to (1) above, bottom areas of which tangential slope to the base line is less than 25° are required to be strengthened. (See **Fig 3.7.10**). ⚓

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- 오류 수정(HUT4000-2677-2020)

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Amendments of the Guidance

(External review)

Pt.3 Hull Structures

2020. 00.

Hull Rule Development Team

Present	Amendment	Note
Ch.2 STEMS AND STERN FRAMES **Section 1 〈omit〉** **Section 2 Stern Frames** 202.~ 207. 〈omit〉 210. Rudder trunk 1. **Materials, welding and connection to hull** ~~(1) This requirement applies to both trunk configurations (extending or not below stern frame).~~ (2), (3) 〈omit〉 (4) The weld at the connection between the rudder trunk and the shell or the bottom of the skeg is to be full penetration. The fillet shoulder radius r, in mm (see **Fig 3.2.7**) is to be as large as practicable and to comply with the following formulae: $r = 60$ (mm) when $\sigma \geq \frac{40}{K}$ $(\mathrm{N/mm^2})$ $r = 0.1 d_l$, without being less than 30 (mm) when $\sigma < \frac{40}{K}$ $(\mathrm{N/mm^2})$	**Ch.2 STEMS AND STERN FRAMES** **Section 1 〈same as current〉** **Section 2 Stern Frames** 202.~ 207. 〈same as current〉 210. Rudder trunk The requirements in this section 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** (1), (2) 〈same as current〉 (3) The weld at the connection between the rudder trunk and the shell or the bottom of the skeg is to be full penetration. The fillet shoulder radius r, in mm (see **Fig 3.2.7**) is to be as large as practicable and to comply with the following formulae: $r = 0.1 d_l$ without being less than: $r = 60$ (mm) when $\sigma \geq \frac{40}{K}$ $(\mathrm{N/mm^2})$ $r = 30$ (mm) when $\sigma < \frac{40}{K}$ $(\mathrm{N/mm^2})$	- renumber (2),(3),(4),(5) → (1),(2),(3),(4)

Present	Amendment	Note
Where: d_l = rudder stock ~ 〈omit〉 σ = bending stress in the rudder trunk in $(\mathrm{N/mm^2})$ K = material factor as given in **207. 3** 〈omit〉 (5) Rudder trunks comprising of materials other than steel are to be specially considered by the Society. **Fig 3.2.7 Fillet shoulder radius 〈omit〉** (1) ~~Where the rudder stock is arranged in a trunk in such a way that the trunk is stressed by forces due to rudder action,~~ the scantlings of the trunk are to be such that: - the equivalent stress due to bending and shear does not exceed $0.35\sigma_y$, - the bending stress on welded rudder trunk is to be in compliance with the following formula: $\sigma \leq \frac{80}{K} \quad (\mathrm{N/mm^2})$ With: σ =bending stress in the rudder trunk, as defined in **1 (4)** K = material factor for the rudder trunk as given in **207. 3**, not to be taken less than 0.7 σ_y = yield stress of the material used $(\mathrm{N/mm^2})$ (2) For calculation of bending stress, the span to be considered is the distance between the mid-height of the lower rudder stock bearing and the point where the trunk is clamped into the shell or the bottom of the skeg. ⚓	Where: d_l = rudder stock ~ 〈same as current〉 σ = bending stress in the rudder trunk in $(\mathrm{N/mm^2})$ K = material factor as given in **207. 3** 〈same as current〉 (4) Rudder trunks comprising of materials other than steel are to be specially considered by the Society. **Fig 3.2.7 Fillet shoulder radius 〈omit〉** (1) The scantlings of the trunk are to be such that: - the equivalent stress due to bending and shear does not exceed 0.35 R_{eH}, - the bending stress on welded rudder trunk is to be in compliance with the following formula: $\sigma \leq \frac{80}{K} \quad (\mathrm{N/mm^2})$ With: σ =bending stress in the rudder trunk, as defined in **1 (4)** K = material factor for the rudder trunk as given in **207. 3**, not to be taken less than 0.7 R_{eH} = specified minimum yield stress of the material used $(\mathrm{N/mm^2})$ (2) For calculation of bending stress, the span to be considered is the distance between the mid-height of the lower rudder stock bearing and the point where the trunk is clamped into the shell or the bottom of the skeg. ⚓	

Guidance Relating to Rules for the Classification of Steel Ships(Draft)

(Pt. 3 Annex 3-2)

- External Opinion Inquiry -

Hull Rule Development Team

- Main Amendments -

(1) Effective date : 1 July 2021

◉ Annex 3-2 III.6 Ro-Ro ship

<table>
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Pt 3 Hull Structures

Annex 3-2 Guidance for the Direct Strength Assessment

I ~ II. 〈Omitted〉

III. Guidance for the Hold Aanlysis
1~5 〈Omitted〉

6. Ro-Ro and car carrier
(1) General
(A) In case where scantlings of structural members of cargo hold in pure car and truck carrier are determined by direct strength calculation, necessary documents and data for its calculation are to be submitted to the Society for approval beforehand.
〈Omitted〉

(4) Load
(A) Applied load
The following load components are to be considered : cargo load, hydrostatic pressure, wave loads and ballast loads etc. as shown in Table 33 and 34.
(a) Cargo load
(i) Cargo loads are to be applied as the design uniform loads according to the car and truck expected to be loaded on each deck.
〈Omitted〉
</td><td>
Pt 3 Hull Structures

Annex 3-2 Guidance for the Direct Strength Assessment

I ~ II. 〈Omitted〉

III. Guidance for the Hold Aanlysis
1~5 〈Omitted〉

6. Ro-Ro ship
(1) General
(A) In case where scantlings of structural members of cargo hold in Ro-Ro ship are determined by direct strength calculation, necessary documents and data for its calculation are to be submitted to the Society for approval beforehand.
〈Omitted〉

(4) Load
(A) Applied load
The following load components are to be considered : cargo load, hydrostatic pressure, wave loads and ballast loads etc. as shown in Table 33 and 34.
(a) Cargo load
(i) Cargo loads are to be applied as the design uniform loads according to the vehicle, passenger, etc expected to be loaded on each deck.
〈Omitted〉
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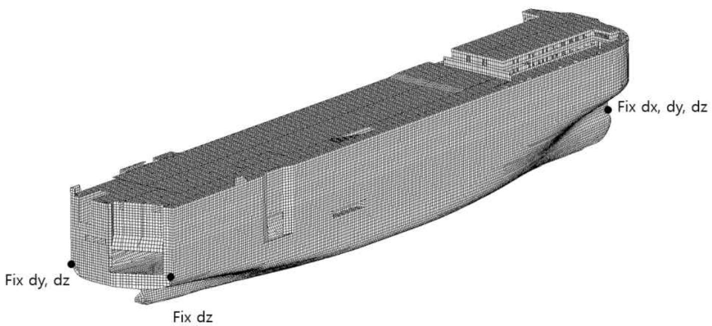
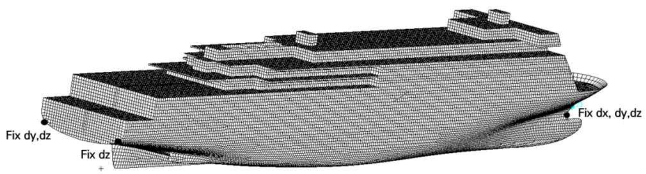
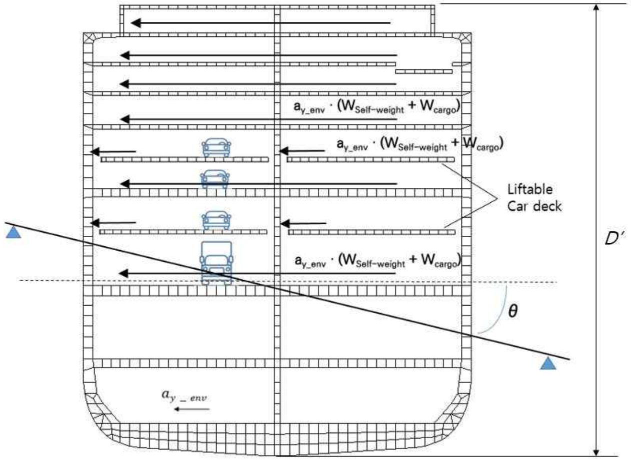
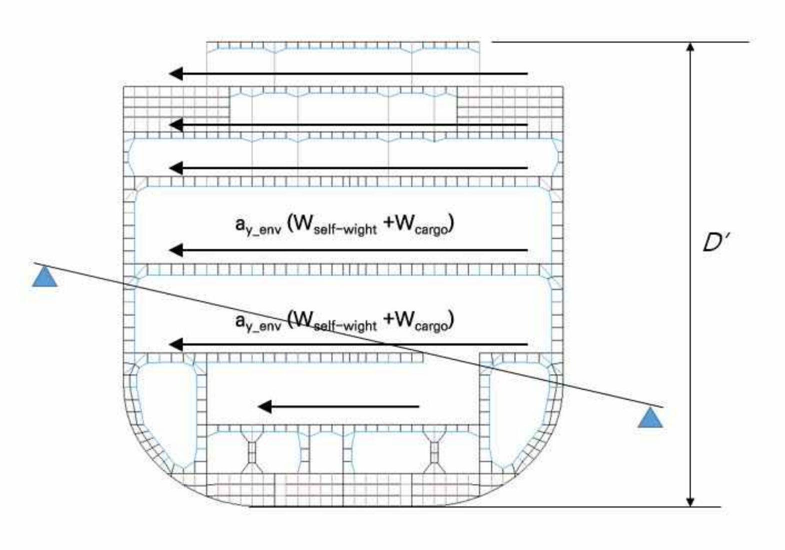
Change of ship type

Change of cargo definition
</td></tr>
</table>

Present	Amendment	Reason
(B) Loading conditions 6 types of loading cases are to be considered and corresponding members are to be assessed according to each loading condition. (a) Maximum cargo on lower part of section in upright condition (i) The load case may be decisive for the lower decks and pillars(where relevant) subject to design uniform load of cars and trucks on lower deck. 〈omitted〉 (b) Maximum cargo on upper part of section in upright condition (i) The load case may be decisive for the upper decks, double bottom and pillars(where relevant) subject to design uniform load of cars and trucks on upper deck. 〈omitted〉 (c) Ballast condition (i) Design uniform load of cars and trucks is not to be considered. However, the ballast water weight in the ballast tank is to be considered. 〈omitted〉 (d) Transversely unsymmetrical deck load (i) The load case may be decisive for the transverse deck girders subject to design uniform load of cars and trucks on one side deck only (port or starboard). 〈omitted〉 (e) Longitudinally unsymmetrical deck load (i) The load case may be decisive for the longitudinal deck girders subject to design uniform load of cars and trucks on deck between each piller only. 〈omitted〉 (5) ~ (6) 〈Omitted〉	(B) Loading conditions 6 types of loading cases are to be considered and corresponding members are to be assessed according to each loading condition. (a) Maximum cargo on lower part of section in upright condition (i) The load case may be decisive for the lower decks and pillars(where relevant) subject to design uniform load of vehicle, passenger, etc on lower deck. 〈omitted〉 (b) Maximum cargo on upper part of section in upright condition (i) The load case may be decisive for the upper decks, double bottom and pillars(where relevant) subject to design uniform load of vehicle, passenger, etc on upper deck. 〈omitted〉 (c) Ballast condition (i) Design uniform load of vehicle, passenger, etc is not to be considered. However, the ballast water weight in the ballast tank is to be considered. 〈omitted〉 (d) Transversely unsymmetrical deck load (i) The load case may be decisive for the transverse deck girders subject to design uniform load of vehicle, passenger, etc on one side deck only (port or starboard). 〈omitted〉 (e) Longitudinally unsymmetrical deck load (i) The load case may be decisive for the longitudinal deck girders subject to design uniform load of vehicle, passenger, etc on deck between each piller only. 〈omitted〉 (5) ~ (6) 〈Omitted〉	Change of cargo definition Change of cargo definition

Present	Amendment	Reason
	(7) Racking Assessment (A) Racking assessment in this Guidance is to be applied to car/truck carriers carrying over 6000 Car units, based on small car, and car ferries with Rule length over 130 m. (B) Racking assessment should be performed for full ship model in accordance with II.3 (refer to Fig 30-1). In case that hull section is asymmetry, racking assessment shall perform for each side of starboard and port side. (C) Racking load is to be assessed for full loading condition defined in Trim and Stability Booklet. Loads for racking assessment are followed as below; a) Vertical loads such as self-weight, liquid in tanks and cargo weight. b) Unsymmetrical external pressure based on center line considering heeling angle (θ), see Fig. 30-2. c) Horizontal load induced from deck self weight and cargo weight (vehicle, passenger, etc) considering horizontal acceleration (a_{y_env}) as below;   Fig. 30-1 Full ship model and boundary condition of Ro-Ro ship	newly added

Present	Amendment	Reason
	$$a_{j\_y\_env} = \sqrt{a_{sway}^2 + \left\{ g\sin\theta + a_{roll}\left(z_{j\_deck} - 0.41\frac{D'}{f_{\sec}}\right)\right\}^2} \quad (m/s^2),$$ horizontal acceleration at j-th deck where, $a_{sway} = 0.45\, a_0\, g \ (m/s^2)$, sway acceleration $a_0 = (1.58 - 0.244 f_{\sec})\left(\frac{2.4}{\sqrt{L}} + \frac{34}{L} + \frac{600}{L^2}\right) (m/s^2)$, basic acceleration, $a_{roll} = \frac{1.72}{f_{\sec}}\,\theta\,\frac{\pi}{180}\left(\frac{2\pi}{T_\theta}\right)^2 \quad (rad/s^2)$, roll acceleration z_{j_deck} : height of j-th deck from base line $f_{\sec} = \frac{\max(B,\ D')}{\min(B,\ D')}$ D' : height (m) between upper plane of cargo compartment and base line, see Fig. 30-2. $\theta = \frac{12150(1.25 - 0.025\,T_\theta)}{f_{\sec}(B+75)\pi} \quad (\mathrm{deg})$ $T_\theta = 2.3\pi\frac{kr}{\sqrt{gGM}} \quad (\mathrm{sec})$, roll period $kr = 0.42\,B \quad (m)$, inertia radius $GM = 0.05 f_{\sec}\, B \quad (m)$, transverse metacentric height	

Present	Amendment	Reason
	  Fig. 30-2 Racking loads in heeling	

<table>
<tr><th>Present</th><th>Amendment</th><th>Reason</th></tr>
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(D) For racking assessment, the harbour condition is to be applied without hull girder force balancing. However, the unbalance forces due to racking moment should be removed by using pair forces (F_i), see Fig. 30-3, on intersected location between side shell and upper deck. Racking moment can be calculated as below;

$$M_{xx} = \sum_{j}^{n_{decks}} (W_{j\_deck\_self} + W_{j\_deck\_cargo})\, \sigma_{j\_y\_env}\, (z_{j\_deck} - z_{bulkhead\_deck})$$

$$= \sum_{i}^{n_{web\,frames}} (F_i \bullet b_i)$$

where,

$W_{j\_deck\_self}$: self weight of j-th deck
$W_{j\_deck\_cargo}$: cargo weight of j-th deck
$a_{j\_y\_env}$: horizontal acceleration of j-th deck
z_{j_deck}, $z_{bulkhead\_deck}$: heights of j-th deck and bulkhead deck from base line
F_i : pair forces at i-th frame
b_i : half breadth of upper deck at i-th frame

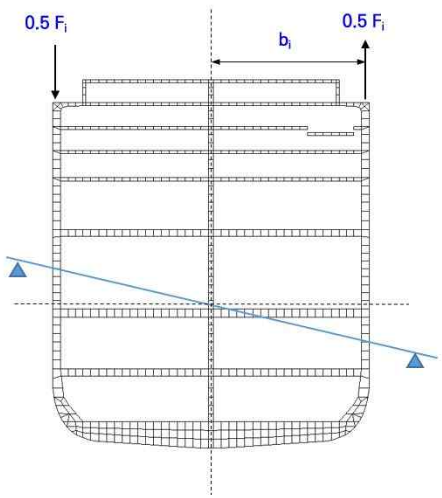

Fig. 30-3 Force balancing for racking moment

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</table>

Present	Amendment	Reason
	(F) Target structural members for racking assessment are as below; - connection of racking constraining structure such as vertical web frames to bulkhead deck and deck transverse - connection of transverse member, deck or inner bottom between pillar support - connection of staircase or ventilation ducts between primary support members - other high stress zones such as deep racking frames, partial bulkheads, engine room casing and stairway/lift casings (G) For racking assessment, the allowable stress of target structural members is to be 0.94 • (235/K) of equivalent stress defined in (5). (H) Fine-mesh analysis a) High stress concentrated areas where the stress concentration is more than 95% of the evaluation criteria defined in (G) need to be verified by fine mesh analysis with the criteria, 0.94 • β • (235/K). β : mesh density factor - 1.15 for less than or equal to 200 x 200 mm mesh size - 1.25 for less than or equal to 100 x 100 mm mesh size - 1.5 for less than or equal to 50 x 50 mm mesh size - 1.7 for less than or equal to 2t x 2t mesh size b) In the case of pure vehicle carrier, the following areas, regardless with (a), are to be modeled with 2t x 2t mesh size in order to check local stress concentration reflecting the shape of cruciform joints, back side supporting members in large structures, etc. The mesh density factor, β, is to be applied 1.35 for the element adjacent to weld and 1.53 for the element not adjacent to weld. - the below areas where the maximum stress from racking assessment in (G) is occurred at each deck;. • the area where the face plate of support members of pillar meets deck. • the area where the face plate of deck transverse (or floor) meets side transverse web frame, - the area where the fixed lamp meets forward wall of engine room.	