Amendments of the Rules

(For external opinion inquiry)

Guidance on Strength Assessment of Container ships Considering the Whipping Effect



2022. 2.

Hull Rule Development Team

- Major revisions -

- 1. Modification of the regulations referenced in this guidance to the Pt 14 (previous reference: Pt 7)
 - In this guidance, the regulation of vertical wave bending moment, etc. is referred to the "Pt 7 Ships of Special Service" rules.
 - As "Pt 14 Structural Rules for Container Ship" is applied to newly built container ships, the regulations referenced in this guidance are modified to Pt 14 rules.
- 2. Reduction of the partial safety factor for vertical wave bending moment including whipping effect
 - When evaluating the hull girder ultimate strength, a partial safety factor is applied to take into account the uncertainties related to the estimation of the vertical wave bending moment.
 - For container ships, the partial safety factor, γ_W , of 1.2 for the vertical wave bending moment is applied in accordance with UR S11A.
 - In this guidance, the uncertainties related to the vertical wave bending moment evaluation is resolved to some extent by taking into account whipping effect, so the partial safety factor γ_{Whip} is newly defined and taken as 1.05.

Present	Amendment	Note
CHAPTER 1 GENERAL	CHAPTER 1 GENERAL	
Section 1 General	Section 1 General	
101. Application	101. Application	
 Purpose of these guidances is to estimate the extreme load considering the whipping effect and to evaluate the structural integrity of the ship. It is applied to the ship which requires consideration of the whipping effect due to slamming load, in accordance with <u>Pt 7, Ch</u> <u>4</u>, 207. of Rules for the Classification of Steel Ships. Other ships may be applied in consultation with the Society. ~ 4. (omitted) 	 Purpose of these guidances is to estimate the extreme load considering the whipping effect and to evaluate the structural integrity of the ship. It is applied to the ship which requires consideration of the whipping effect due to slamming load, in accordance with Pt 14, Ch <u>5, Sec 2, 2.4.1 of Rules for the Classification of Steel Ships</u>. Other ships may be applied in consultation with the Society. ~ 4. (same as the current Rules) 	* For container ships contracted for new con- struction, "Pt 14 Structural Rules for Container Ships" is applied. Therefore,
102. Class Notations (omitted)	102. Class Notations (same as the current Rules)	the reference that was made based on "Pt 7 Ships of Special Service" was revised based on Pt 14.
Section 2 Analysis Procedure	Section 2 Analysis Procedure	
201. General (omitted)	201. General (same as the current Rules)	
202. Design Wave Method	202. Design Wave Method	
1. (omitted)	1. (same as the current Rules)	
 2. The amplitude of the design wave shall be calculated using the value of the vertical wave bending moment specified in <u>Pt 7, Ch 4, 202. 3</u> of the Rules for the Classification of Steel Ships. 3. ~ 5. (omitted) 	 2. The amplitude of the design wave shall be calculated using the value of the vertical wave bending moment specified in <u>Pt 14, Ch 4, Sec 4, 3.2.1 of the Rules for the Classification of Steel Ships</u>. 3. ~ 5. (same as the current Rules) 	*
203. Design Sea State Method 〈omitted〉	203. Design Sea State Method (same as the current Rules)	

Present	Amendment	Note
CHAPTER 2 Selection of design wave and dominant sea state	CHAPTER 2 Selection of design wave and dominant sea state	
Section 1 General (omitted)	Section 1 General 〈same as the current Rules〉	
Section 2 Design wave selection	Section 2 Design wave selection	
201. Long-term analysis value of vertical wave bending moment	201. Long-term analysis value of vertical wave bending moment	
 For container ships, use the linear wave bending moment as the long-term analysis value by excluding the non-linear correction factor f_{NL-Hog}, from the vertical wave bending moment for hogging M_{W-Hog}, in accordance with Pt 7, Ch 4, 202. 3 of the Rules for the Classification of Steel Ships. Ships other than container ships are to be decided in consultation with the Society. 	 For container ships, use the linear wave bending moment as the long-term analysis value by excluding the non-linear correction factor f_{NL-Hog}, from the vertical wave bending moment for hogging M_{wv-Hog}, in accordance with Pt 14, Ch 4, Sec 4, 3.2.1 of the Rules for the Classification of Steel Ships. Ships other than container ships are to be decided in consultation with the Society. 	*
202. Design wave selection (omitted)	202. Design wave selection (same as the current Rules)	
Section 3 Dominant sea state selection (omitted)	Section 3 Dominant sea state selection 〈same as the current Rules〉	
CHAPTER 3 Hydro-elastic simulation (omitted)	CHAPTER 3 Hydro-elastic simulation <same as="" current="" rules="" the=""></same>	

Present	Amendment	Note
CHAPTER 4 Evaluation of hull girder strength considering the whipping effect	CHAPTER 4 Evaluation of hull girder strength considering the whipping effect	
Section 1 General (omitted)	Section 1 General (same as the current Rules)	
Section 2 Estimation of whipping contribution by design wave method (omitted)	Section 2 Estimation of whipping contribution by design wave method (same as the current Rules)	
Section 3 Estimation of whipping contribution by design sea state method	Section 3 Estimation of whipping contribution by design sea state method	
301. ~ 302. 〈omitted〉	301. ~ 302. (same as the current Rules)	
303. Estimation of parameters of the probability distribution	303. Estimation of parameters of the probability distribution	
1. ~ 4. (omitted)	1. ~ 4. (same as the current Rules)	



Present	Amendment	Note
Section 4 Estimation of whipping contribution of vertical bending moment and ultimate hull girder strength	Section 4 Estimation of whipping contribution of vertical bending moment and ultimate hull girder strength	
401. Calculation of whipping contribution of vertical bending moment The whipping contributions defined in Sec 2 and 3 can be rewritten as:	401. Calculation of whipping contribution of vertical bending moment The whipping contributions defined in Sec 2 and 3 can be rewritten as:	
$\underline{\gamma_{whip}} = \frac{M_{whip}}{M_{rigid}}$	$f_{Whip} = \frac{M_{Whip}}{M_{Rigid}}$	* Modification of symbols
$\underline{\gamma_{whip}}$: Whipping contribution to vertical wave bending moment $\underline{M_{whip}}$: Vertical wave bending moment with whipping effect $\underline{M_{rigid}}$: Vertical wave bending moment without whipping effect	f_{Whip} : Whipping contribution to vertical wave bending moment M_{Whip} : Vertical wave bending moment with whipping effect M_{Rigid} : Vertical wave bending moment without whipping effect	
402. Hull girder ultimate strength assessment considering the whippi ng effectIn case of container ship, the hull girder ultimate strength of hogging condition considering whipping for amidship should satisfy the follow-ing criteria. Ships other than container ships are to be decided in consultation with the Society.	402. Hull girder ultimate strength assessment considering the whippi ng effectIn case of container ship, the hull girder ultimate strength of hogging condition considering whipping for amidship should satisfy the follow-ing criteria. Ships other than container ships are to be decided in consultation with the Society.	
$\frac{\gamma_S M_S + \gamma_W \gamma_{whip} M_W \le \frac{M_U}{\gamma_M \gamma_{DB}}}{$	$\frac{\gamma_S M_S + \gamma_{Whip} f_{Whip} M_W \le \frac{M_U}{\gamma_M \gamma_{DB}}}{$	* *
 M_S : Permissible still water vertical bending moment at hog- ging condition(kNm). 	M_S : Permissible still water vertical bending moment at hog- ging condition(kNm).	
M_W : Vertical wave bending moment in accordance with <u>Pt 7</u> , <u>Ch 4, 202. 3 of the Rules for the Classification of Steel</u> <u>Ships</u> (kNm).	M_W : Vertical wave bending moment in accordance with <u>Pt 14</u> , <u>Ch 4, Sec 4, 3.2.1 of the Rules for the Classification of Steel</u> <u>Ships</u> (kNm).	*
M_U : Vertical hull girder ultimate bending capacity in accordance with Pt 7, Ch 4, 206. 3 of the Rules for the	M_U : Vertical hull girder ultimate bending capacity in accordance with <u>Pt 14, Ch 5, Sec 2, 2.1.1</u> of the Rules for the	*

Present	Amendment	Note
Classification of Steel Ships(kNm). γ_S : Partial safety factor for the still water bending moment, to be taken as 1.0. γ_W : Partial safety factor for the vertical wave bending mo- ment, to be taken as 1.2. γ_{whip} : Whipping contribution to vertical wave bending moment, defined in 401. Ψ	Classification of Steel Ships(kNm). γ_S : Partial safety factor for the still water bending moment, to be taken as 1.0. γ_{Whip} : Partial safety factor for the vertical wave bending mo- ment (with whipping included), to be taken as 1.05. f_{Whip} : Whipping contribution to vertical wave bending moment, defined in 401. Ψ	Define the partial safety factor for the vertical wave bending moment including the whip- ping effect and set it to 1.05. *