

# Amendments of the Rules

(Circular)

Guidance on Strength Assessment of Container ships  
Considering the Whipping Effect



2025. 8.

Hull Rule Development Team

## – Major revisions –

### 1. Introduction of a simplified evaluation formula for the contribution of whipping.

- Present: The assessment of the whipping contribution is to be carried out using either the design wave method or the design sea state method based on hydro-elastic simulation.
- Reason for modification: In consideration of the time and effort required for hydro-elastic simulation, a simplified evaluation formula is introduced to reduce the cost of analysis.
- Amendment: A new simplified method is introduced for application to ships with a length of 350 m or less.

Present	Amendment	Note
<p style="text-align: center;"><b>CHAPTER 1 GENERAL</b></p> <p style="text-align: center;"><b>Section 1 General</b></p> <p><b>101. Application</b></p> <ol style="list-style-type: none"> <li>1. 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 <u>the ship which requires consideration of the whipping effect due to slamming load</u>, in accordance with <b>Pt 14, Ch 5, Sec 2, 2.4.1 of Rules for the Classification of Steel Ships</b>. Other ships may be applied in consultation with the Society. <i>(2022)</i></li> <li>2. The whipping phenomenon is a dynamic response induced by an impact load such as slamming on the ship, which can be superimposed on the load response component caused by the motion of the ship to increase the overall response. Therefore, it is necessary to sufficiently study the whipping phenomenon in ships having characteristics such as high speed and bow shape that can cause large slamming load and low natural frequency of the hull girder.</li> <li>3. In order to estimate the extreme load considering the whipping phenomenon, it is required to analyze hydro-elastic simulation and statistical analysis of the ship, and the program used for analysis should be approved by the Society.</li> <li>4. When considering the whipping effect by methods other than those provided in these guidances, sufficient data on the applied theory, program and verification should be provided and approved by the Society.</li> </ol> <p>&lt;newly added&gt;</p> <p><b>102. Class Notations</b></p> <p>Upon applicant's request, the Society may assign <b>"WHIP"</b> notations once review of compliance with <u>these regulations</u> is completed and satisfied to the Society.</p>	<p style="text-align: center;"><b>CHAPTER 1 GENERAL</b></p> <p style="text-align: center;"><b>Section 1 General</b></p> <p><b>101. Application</b></p> <ol style="list-style-type: none"> <li>1. 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 <u>container ships with a breadth greater than 32.26 m</u> in accordance with <b>Pt 14, Ch 5, Sec 2, 2.4.1 of Rules for the Classification of Steel Ships</b>. Other ships may be applied in consultation with the Society. <i>(2025)</i></li> <li>2. The whipping phenomenon is a dynamic response induced by an impact load such as slamming on the ship, which can be superimposed on the load response component caused by the motion of the ship to increase the overall response. Therefore, it is necessary to sufficiently study the whipping phenomenon in ships having characteristics such as high speed and bow shape that can cause large slamming load and low natural frequency of the hull girder.</li> <li>3. In order to estimate the extreme load considering the whipping phenomenon, it is required to analyze hydro-elastic simulation and statistical analysis of the ship, and the program used for analysis should be approved by the Society.</li> <li>4. When considering the whipping effect by methods other than those provided in these guidances, sufficient data on the applied theory, program and verification should be provided and approved by the Society.</li> <li>5. <u>For container ships with a length not exceeding 350 m, the whipping effect may be considered in accordance with Ch 4, Sec 2.</u> <i>(2025)</i></li> </ol> <p><b>102. Class Notations</b> <i>(2025)</i></p> <p>Upon applicant's request, the Society may assign <u>following</u> notations once review of compliance with <u>this guidance</u> is completed and satisfied to the Society.</p>	

Present	Amendment	Note
<p style="text-align: center;"><b>CHAPTER 2 SELECTION OF DESIGN WAVE AND DOMINANT SEA STATE</b> &lt;omitted&gt;</p> <p style="text-align: center;"><b>CHAPTER 3 HYDRO-ELASTIC SIMULATION</b> &lt;omitted&gt;</p> <p style="text-align: center;"><b>CHAPTER 4 EVALUATION OF HULL GIRDER STRENGTH CONSIDERING THE WHIPPING EFFECT</b></p> <p style="text-align: center;"><b>Section 1 General</b></p> <p><b>101. General</b></p> <p>1. This chapter deals with the evaluation of the ultimate strength of the hull considering the whipping effect on the vertical wave bending moment obtained by the design wave method and the design sea state method.</p> <p>2. In cases where methods other than those given in this chapter are to be applied, sufficient data on theory and program verification shall be submitted to the Society for approval.</p> <p>&lt;newly added&gt;</p>	<p style="text-align: center;"><b>CHAPTER 2 SELECTION OF DESIGN WAVE AND DOMINANT SEA STATE</b> &lt;same as the current Rules&gt;</p> <p style="text-align: center;"><b>CHAPTER 3 HYDRO-ELASTIC SIMULATION</b> &lt;same as the current Rules&gt;</p> <p style="text-align: center;"><b>CHAPTER 4 EVALUATION OF HULL GIRDER STRENGTH CONSIDERING THE WHIPPING EFFECT</b></p> <p style="text-align: center;"><b>Section 1 General</b></p> <p><b>101. General</b></p> <p>1. This chapter deals with the evaluation of the ultimate strength of the hull considering the whipping effect on the vertical wave bending moment obtained by <u>the simplified method</u>, the design wave method, and the design sea state method. <i>(2025)</i></p> <p>2. In cases where methods other than those given in this chapter are to be applied, sufficient data on theory and program verification shall be submitted to the Society for approval.</p> <p><u>3. The simplified method may be applied to container ships with a length of 350 m or less. (2025)</u></p>	

Present	Amendment	Note
<p><b>3.</b> The design wave method has the advantages of short computation time and simple procedure but the results could be rather conservative as the slamming load could be overestimated since the actual irregular sea state is calculated as a substitute of a single regular wave.</p> <p><b>4.</b> The design sea state method simulates the actual sea state and the irregular wave so that the slamming load can be approximated, therefore, the reliability of the result is high. However, compared with the design wave method, relatively longer analysis time is required, and it is difficult to ensure the reproducibility of the time series load response data. Therefore, statistical analysis based on multiple analysis data is required.</p> <p style="text-align: center;">(continued)</p>	<p><b>4.</b> The design wave method has the advantages of short computation time and simple procedure but the results could be rather conservative as the slamming load could be overestimated since the actual irregular sea state is calculated as a substitute of a single regular wave.</p> <p><b>5.</b> The design sea state method simulates the actual sea state and the irregular wave so that the slamming load can be approximated, therefore, the reliability of the result is high. However, compared with the design wave method, relatively longer analysis time is required, and it is difficult to ensure the reproducibility of the time series load response data. Therefore, statistical analysis based on multiple analysis data is required.</p> <p style="text-align: center;">(continued)</p>	

Present	Amendment	Note
<p>(newly added)</p>	<p style="text-align: center;"><b>Section 2 Estimation of Whipping Contribution by Simplified Method (2025)</b></p> <p><b>201. Application</b></p> <p><u>This method is to be used when an approximate estimation of the whipping contribution is intended based on the principal particulars of the ship.</u></p> <p><b>202. Estimation of extreme loads by the simplified method</b></p> <p><u>The vertical wave bending moment amidships including the effect of whipping, <math>M_{Whip}</math>, is given as follows:</u></p> $M_{Whip} = \max(M_{Rigid} + M_{Vib} \cdot 1.28 \cdot M_{Rigid})$ <p><u><math>M_{Rigid}</math> : Vertical wave bending moment without whipping effect.</u>  <u>In this case, the value <math>M_W</math> as specified in Pt 14, Ch 4, Sec 4, 3.2.1 of the Rules for the Classification of Steel Ships is to be used.</u></p> <p><u><math>M_{Vib}</math> : The vertical bending moment due to whipping, determined by the following equation:</u></p> $M_{Vib} = \sqrt{\frac{I_{y-n50}}{L}} \cdot \exp\{0.14 \cdot \ln(J_{Bow}) + 0.16 \cdot \ln(J_{Stern}) + 10.6\}$ <p><u><math>I_{y-n50}</math> : Net vertical moment of inertia of hull girder in accordance with Pt 14, Ch 5, Sec 1, 1.5.1 of the Rules for the Classification of Steel Ships.</u></p> <p><u><math>L</math> : Rule length in accordance with Pt 14, Ch 1, Sec 4, 3.1.1 of the Rules for the Classification of Steel Ships.</u></p> <p><u><math>J_{Bow}</math> : Impulse due to bow slamming (kN·s), determined by the following equation:</u></p> $J_{Bow} = 0.47 \cdot f_{Bow} \cdot (0.2L) \cdot B \cdot (V_{E, Bow} - 3.5)^2$ <p><u><math>f_{Bow}</math> : Bow flare shape coefficient in accordance with Pt 14, Ch 4, Sec 4, 3.2.1 of the Rules for the Classification of Steel Ships.</u></p> <p><u><math>B</math> : Moulded breadth in accordance with Pt 14, Ch 1, Sec 4, 3.1.3 of the Rules for the Classification of Steel Ships.</u></p>	

$V_{E, Bow}$  : Entry velocity for bow slamming (m/s), given as follows:

$$\underline{V_{E, Bow} = -0.013 \cdot L + 14.3}$$

$J_{Stern}$  : Impulse due to bow slamming (kN·s), determined by the following equation:

$$\underline{J_{Stern} = 1.2 \cdot f_{Stern} \cdot (0.1L) \cdot B \cdot (V_{E, Stern} - 3.5)^2}$$

$f_{Stern}$  : Transom shape coefficient, given as follows:

$$\underline{f_{Stern} = \sqrt{\frac{B}{D_{Tr}}}}$$

$D_{Tr}$  : Transom depth used for impulse estimation, defined as the vertical distance (m) measured from  $h_1$  to  $h_2$ , as illustrated in Fig. 4.1.

The height  $h_1$  (m) is defined as the lowest height of the outer shell plate on the centerline of the transom cross-section.

The height  $h_2$  (m) is defined as the lesser of the stern mooring deck height and the lowest height of the vertical side shell plate in the transom cross-section.

$V_{E, Stern}$  : Entry velocity for stern slamming (m/s), given as follows:

$$\underline{V_{E, Stern} = -0.005 \cdot L + 9.25}$$

Transom section

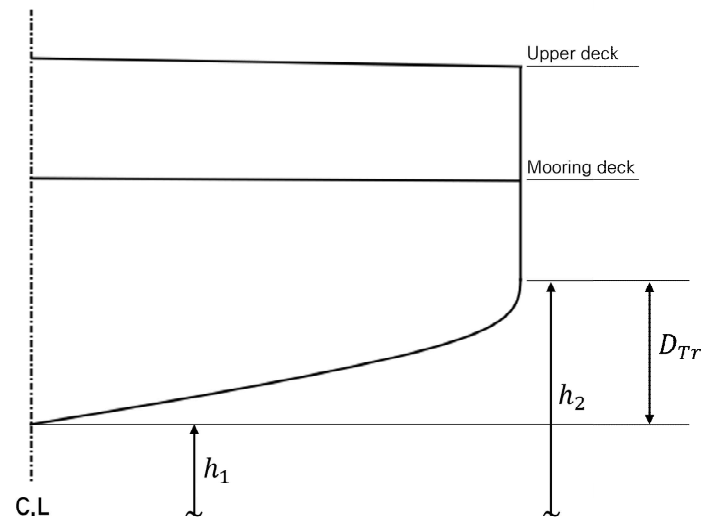
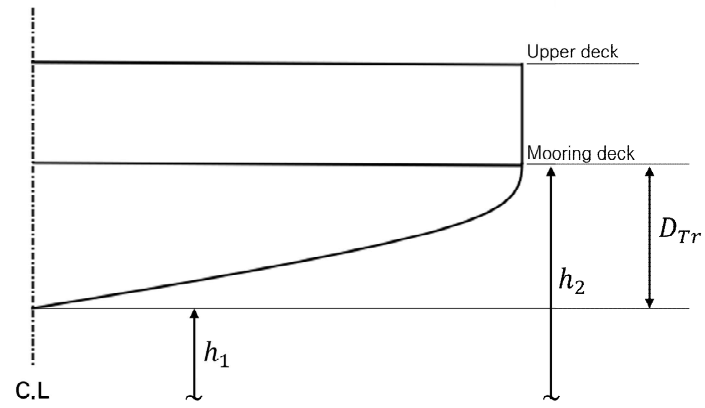


Fig 4.1 Transom depth used for impulse estimation

Present	Amendment	Note
<p>Section <b>2</b> Estimation of whipping contribution by design wave method</p> <p><b>201.</b> &lt;omitted&gt;</p> <p><b>202.</b> &lt;omitted&gt;</p>	<p>Section <b>3</b> Estimation of whipping contribution by design wave method</p> <p><b>301.</b> &lt;same as the current Rules&gt;</p> <p><b>302.</b> &lt;same as the current Rules&gt;</p>	
<p>Section <b>3</b> Estimation of whipping contribution by design sea state method</p> <p><b>301.</b> &lt;omitted&gt;</p> <p><b>302.</b> &lt;omitted&gt;</p> <p><b>303.</b> &lt;omitted&gt;</p> <p><b>304.</b> &lt;omitted&gt;</p>	<p>Section <b>4</b> Estimation of whipping contribution by design sea state method</p> <p><b>401.</b> &lt;same as the current Rules&gt;</p> <p><b>402.</b> &lt;same as the current Rules&gt;</p> <p><b>403.</b> &lt;same as the current Rules&gt;</p> <p><b>404.</b> &lt;same as the current Rules&gt;</p>	
<p>Section <b>4</b> Estimation of whipping contribution of vertical bending moment and ultimate hull girder strength</p> <p><b>401.</b> Calculation of whipping contribution of vertical bending moment <i>(2022)</i></p> <p>The whipping contributions defined in <b>Sec 2 and 3</b> can be rewritten as: &lt;omitted&gt;</p> <p><b>402.</b> &lt;omitted&gt;</p> <p>↓</p>	<p>Section <b>5</b> Estimation of whipping contribution of vertical bending moment and ultimate hull girder strength</p> <p><b>501.</b> Calculation of whipping contribution of vertical bending moment <i>(2025)</i></p> <p>The whipping contributions defined in <b>Sec 2, 3 and 4</b> can be rewritten as: &lt;same as the current Rules&gt;</p> <p><b>502.</b> &lt;same as the current Rules&gt;</p> <p>↓</p>	