08-391

RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

Part CSR-B Common Structural Rules for Bulk Carriers

Rules for the Survey and Construction of Steel Ships
Part CSR-B 2008 AMENDMENT NO.2

Rule No.20 27th March 2008
Resolved by Technical Committee on 1st February 2008
Approved by Board of Directors on 26th February 2008

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NIPPON KAIJI KYOKAI

Rule No.20 27th March 2008
AMENDMENT TO THE RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

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

Part CSR-B Common Structural Rules for Bulk Carriers

Chapter 5 HULL GIRDER STRENGTH

Appendix 1 HULL GIRDER ULTIMATE STRENGTH

2. Criteria for the calculation of the curve *M-χ*

2.2 Load-end shortening curves *σ–ε*

Paragraph 2.2.4 has been amended as follows.

2.2.4 Beam column buckling

The equation describing the load-end shortening curve σ_{CR1}-ε for the beam column buckling of ordinary stiffeners composing the hull girder transverse section is to be obtained from the following formula (see **Fig. 3**):

$$\sigma_{CR1} = \Phi \sigma_{C1} \frac{A_{Stif} + 10 b_E t_p}{A_{Stif} + 10 s t_p}$$

where:

Φ: Edge function defined in **2.2.3**

A_{Stif} : Net sectional area of stiffener, in cm^2, without attached plating

σ_{C1}: Critical stress, in N/mm^2, equal to:

$$\sigma_{C1} = \frac{\sigma_{E1}}{\varepsilon} \quad \text{for} \quad \sigma_{E1} \le \frac{R_{eH}}{2}\varepsilon$$

~~$\sigma_{C1} = R_{eH}\left(1 - \frac{\Phi R_{eH}\varepsilon}{4\sigma_{E1}}\right)$~~ $\sigma_{C1} = R_{eH}\left(1 - \frac{R_{eH}\varepsilon}{4\sigma_{E1}}\right)$ for $\sigma_{E1} > \frac{R_{eH}}{2}\varepsilon$

ε : Relative strain defined in **2.2.3**

σ_{E1}: Euler column buckling stress, in N/mm^2, equal to:

$$\sigma_{E1} = \pi^2 E \frac{I_E}{A_E l^2} 10^{-4}$$

I_E: Net moment of inertia of ordinary stiffeners, in cm^4, with attached shell plating of width b_{E1}

b_{E1}: Effective width, in *m*, of the attached shell plating, equal to:

$$b_{E1} = \frac{s}{\beta_E} \quad \text{for} \quad \beta_E > 1.0$$

$b_{E1} = s$ for $\beta_E \le 1.0$

$$\beta_E = 10^3 \frac{s}{t_p}\sqrt{\frac{\varepsilon R_{eH}}{E}}$$

A_E : Net sectional area, in cm^2, of ordinary stiffeners with attached shell plating of width b_E

b_E: Effective width, in m, of the attached shell plating, equal to:

$$b_E = \left(\frac{2.25}{\beta_E} - \frac{1.25}{\beta_E^2}\right)s \qquad \text{for} \quad \beta_E > 1.25$$

$$b_E = s \qquad \text{for} \quad \beta_E \le 1.25$$

Paragraph 2.2.5 has been amended as follows.

2.2.5 Torsional buckling

The equation describing the load-end shortening curve σ_{CR2}-ε for the flexural-torsional buckling of ordinary stiffeners composing the hull girder transverse section is to be obtained according to the following formula (see **Fig. 4**).

$$\sigma_{CR2} = \Phi \frac{A_{Stif}\sigma_{C2} + 10st_p\sigma_{CP}}{A_{Stif} + 10st_p}$$

where:

Φ: Edge function defined in **2.2.3**

A_{Stif} : Net sectional area of stiffener, in cm^2, without attached plating

σ_{C2}: Critical stress, in N/mm^2, equal to:

$$\sigma_{C2} = \frac{\sigma_{E2}}{\varepsilon} \qquad \text{for} \quad \sigma_{E2} \le \frac{R_{eH}}{2}\varepsilon$$

~~$\sigma_{C2} = R_{eH}\left(1 - \frac{\Phi R_{eH}\varepsilon}{4\sigma_{E2}}\right)$~~ $\sigma_{C2} = R_{eH}\left(1 - \frac{R_{eH}\varepsilon}{4\sigma_{E2}}\right)$ for $\sigma_{E2} > \frac{R_{eH}}{2}\varepsilon$

σ_{E2}: Euler torsional buckling stress, in N/mm^2, defined in **Ch 6**, **Sec 3**, **4.3**

ε : Relative strain defined in **2.2.3**

σ_{CP}: Buckling stress of the attached plating, in N/mm^2, equal to:

$$\sigma_{CP} = \left(\frac{2.25}{\beta_E} - \frac{1.25}{\beta_E^2}\right)R_{eH} \qquad \text{for} \quad \beta_E > 1.25$$

$$\sigma_{CP} = R_{eH} \qquad \text{for} \quad \beta_E \le 1.25$$

β_E : Coefficient defined in **2.2.4**

Paragraph 2.2.7 has been amended as follows.

2.2.7 Web local buckling of ordinary stiffeners made of flat bars

The equation describing the load-end shortening curve σ_{CR4}–ε for the web local buckling of flat bar ordinary stiffeners composing the hull girder transverse section is to be obtained from the following formula (see **Fig. 5**):

$$\sigma_{CR4} = \Phi \frac{10st_P\sigma_{CP} + A_{Stif}\sigma_{C4}}{A_{Stif} + 10st_P}$$

where:

Φ: Edge function defined in **2.2.3**

A_{Stif} : Net sectional area of stiffener, in cm^2, without attached plating

σ_{CP}: Buckling stress of the attached plating, in N/mm^2, defined in **2.2.5**

σ_{C4}: Critical stress, in N/mm^2, equal to:

$$\sigma_{C4} = \frac{\sigma_{E4}}{\varepsilon} \qquad \text{for} \quad \sigma_{E4} \le \frac{R_{eH}}{2}\varepsilon$$

~~$\sigma_{C4} = R_{eH}\left(1 - \frac{\Phi R_{eH}\varepsilon}{4\sigma_{E4}}\right)$~~ $\sigma_{C4} = R_{eH}\left(1 - \frac{R_{eH}\varepsilon}{4\sigma_{E4}}\right)$ for $\sigma_{E4} > \frac{R_{eH}}{2}\varepsilon$

σ_{E4}: Local Euler buckling stress, in N/mm^2, equal to:

$$\sigma_{E4} = 160000\left(\frac{t_w}{h_w}\right)^2$$

ε : Relative strain defined in **2.2.3**.

Paragraph 2.2.8 has been amended as follows.

2.2.8 Plate buckling

The equation describing the load-end shortening curve σ_{CR5}-ε for the buckling of transversely stiffened panels composing the hull girder transverse section is to be obtained from the following formula:

~~$\sigma_{CR5} = \min\left\{\begin{matrix} R_{eH}\,\Phi \\ R_{eH}\left[\frac{s}{\ell}\left(\frac{2.25}{\beta_E} - \frac{1.25}{\beta_E^2}\right) + 0.1\left(1 - \frac{s}{\ell}\right)\left(\frac{1}{1+\frac{1}{\beta_E^2}}\right)^2\right] \end{matrix}\right.$~~

$$\sigma_{CR5} = \min\left\{\begin{matrix} R_{eH}\Phi \\ \Phi R_{eH}\left[\frac{s}{l}\left(\frac{2.25}{\beta_E} - \frac{1.25}{\beta_E^2}\right) + 0.1\left(1 - \frac{s}{l}\right)\left(1+\frac{1}{\beta_E^2}\right)^2\right] \end{matrix}\right.$$

where:

Φ: Edge function defined in **2.2.3**.

β_E : Coefficient defined in **2.2.4**.

EFFECTIVE DATE AND APPLICATION

1. The effective date of the amendments is 1 April 2008.

2. Notwithstanding the amendments to the Rules, the current requirements may apply to ships for which the date of contract for construction* is before the effective date.
*"contract for construction" is defined in IACS Procedural Requirement(PR) No.29 (Rev.4).

IACS PR No.29 (Rev.4)

1. The date of "contract for construction" of a vessel is the date on which the contract to build the vessel is signed between the prospective owner and the shipbuilder. This date and the construction numbers (i.e. hull numbers) of all the vessels included in the contract are to be declared to the classification society by the party applying for the assignment of class to a newbuilding.

2. The date of "contract for construction" of a series of vessels, including specified optional vessels for which the option is ultimately exercised, is the date on which the contract to build the series is signed between the prospective owner and the shipbuilder.
For the purpose of this Procedural Requirement, vessels built under a single contract for construction are considered a "series of vessels" if they are built to the same approved plans for classification purposes. However, vessels within a series may have design alterations from the original design provided:
(1) such alterations do not affect matters related to classification, or
(2) If the alterations are subject to classification requirements, these alterations are to comply with the classification requirements in effect on the date on which the alterations are contracted between the prospective owner and the shipbuilder or, in the absence of the alteration contract, comply with the classification requirements in effect on the date on which the alterations are submitted to the Society for approval.
The optional vessels will be considered part of the same series of vessels if the option is exercised not later than 1 year after the contract to build the series was signed.

3. If a contract for construction is later amended to include additional vessels or additional options, the date of "contract for construction" for such vessels is the date on which the amendment to the contract, is signed between the prospective owner and the shipbuilder. The amendment to the contract is to be considered as a "new contract" to which **1.** and **2.** above apply.

4. If a contract for construction is amended to change the ship type, the date of "contract for construction" of this modified vessel, or vessels, is the date on which revised contract or new contract is signed between the Owner, or Owners, and the shipbuilder.

Notes:
1. This Procedural Requirement applies to all IACS Members and Associates.
2. This Procedural Requirement is effective for ships "contracted for construction" on or after 1 January 2005.
3. Revision 2 of this Procedural Requirement is effective for ships "contracted for construction" on or after 1 April 2006.
4. Revision 3 of this Procedural Requirement was approved on 5 January 2007 with immediate effect.
5. Revision 4 of this Procedural Requirement was adopted on 21 June 2007 with immediate effect.