# RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

## Part CSR-B&T Common Structural Rules for Bulk Carriers and Oil Tankers

**Rules for the Survey and Construction of Steel Ships**
**Part CSR-B&T 2017 AMENDMENT NO.1**

Rule No.29 1st June 2017
Resolved by Technical Committee on 30th January 2017
Approved by Board of Directors on 20th February 2017

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NIPPON KAIJI KYOKAI

Rule No.29 1st June 2017
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&T COMMON STRUCTURAL RULES FOR BULK CARRIERS AND OIL TANKERS

# Part 1 GENERAL HULL REQUIREMENTS

## Chapter 4 LOADS

### Section 4 HULL GIRDER LOADS

Symbols has been amended as follows.

**Symbols**

For symbols not defined in this section, refer to **Ch 1, Sec 4**.

$x$ : $X$ coordinate, in $m$, of the calculation point with respect to the reference coordinate system defined in **Ch 4, Sec 1, 1.2.1**.

$C_w$ : Wave coefficient, in $m$, to be taken as:

$$C_w = 10.75 - \left(\frac{300 - L_{CSR}}{100}\right)^{1.5} \quad \text{for } 90 \le L_{CSR} \le 300$$

$$C_w = 10.75 \quad \text{for } 300 < L_{CSR} \le 350$$

$$C_w = 10.75 - \left(\frac{L_{CSR} - 350}{150}\right)^{1.5} \quad \text{for } 350 < L_{CSR} \le 500$$

$f_\beta$ : Heading correction factor, to be taken as:

・For strength assessment:

$f_\beta = 1.05$ for *HSM* and *FSM* load cases for the extreme sea loads design load scenario.

$f_\beta = 0.8$ for *BSR* and *BSP* load cases for the extreme sea loads design load scenario.

$f_\beta = 1.0$ for ~~*HSM*~~, *HSA*, ~~*FSM*~~, *OST* and *OSA* load cases for the extreme sea loads design load scenario.

$f_\beta = 1.0$ for ballast water exchange at sea, harbour/sheltered water and accidental flooded design load scenarios.

・For fatigue assessment:

$f_\beta = 1.0$.

$f_{ps}$ : Coefficient, as defined in **Ch 4, Sec 3**.

*BSR*, *BSP*, *HSM*, *HSA*, *FSM*, *OST*, *OSA* : Dynamic load cases, as defined in **Ch 4, Sec 2**.

## Section 5 EXTERNAL LOADS

### 1. Sea Pressure

### 1.3 External dynamic pressures for strength assessment

Paragraph 1.3.2 has been amended as follows.

1.3.2 Hydrodynamic pressures for *HSM* load cases

The hydrodynamic pressures, $P_W$, for *HSM-1* and *HSM-2* load cases, at any load point, in $kN/m^2$, are to be obtained from **Table 2**. See also **Fig. 2** and **Fig. 3**.

Table 2 Hydrodynamic Pressures for *HSM* Load Cases

| | Wave pressure, in $kN/m^2$ | | |
|---|---|---|---|
| Load case | $z \le T_{LC}$ | $T_{LC} < z \le h_W + T_{LC}$ | $z > h_W + T_{LC}$ |
| *HSM-1* | $P_W = \max(-P_{HS}, \rho g(z - T_{LC}))$ | $P_W = P_{W,WL} - \rho g(z - T_{LC})$ | $P_W = 0.0$ |
| *HSM-2* | $P_W = \max(P_{HS}, \rho g(z - T_{LC}))$ | | |

where:

~~$P_{HS} = f_{ps}\ f_{nl}\ f_h\ k_a\ k_p\ f_{yz}\ C_w \sqrt{\frac{L_0 + \lambda - 125}{L_{CSR}}}$~~

$$P_{HS} = f_\beta f_{ps}\ f_{nl}\ f_h\ k_a\ k_p\ f_{yz}\ C_w \sqrt{\frac{L_0 + \lambda - 125}{L_{CSR}}}$$

(Omitted)

Paragraph 1.3.4 has been amended as follows.

1.3.4 Hydrodynamic pressures for *FSM* load cases

The hydrodynamic pressures, $P_W$, for *FSM-1* and *FSM-2* load cases, at any load point, in $kN/m^2$, are to be obtained from **Table 6**. See also **Fig. 2** and **Fig. 3**.

Table 6 Hydrodynamic Pressures for *FSM* Load Cases

| | Wave pressure, in $kN/m^2$ | | |
|---|---|---|---|
| Load case | $z \le T_{LC}$ | $T_{LC} < z \le h_W + T_{LC}$ | $z > h_W + T_{LC}$ |
| *FSM-1* | $P_W = \max(-P_{FS}, \rho g(z - T_{LC}))$ | $P_W = P_{W,WL} - \rho g(z - T_{LC})$ | $P_W = 0.0$ |
| *FSM-2* | $P_W = \max(P_{FS}, \rho g(z - T_{LC}))$ | | |

where:

$$\sout{P_{FS} = f_{ps}\ f_{nl}\ f_h\ k_a\ k_p\ f_{yz}\ C_w \sqrt{\frac{L_0 + \lambda - 125}{L_{CSR}}}}$$

$$P_{FS} = f_\beta\, f_{ps}\ f_{nl}\ f_h\ k_a\ k_p\ f_{yz}\ C_w \sqrt{\frac{L_0 + \lambda - 125}{L_{CSR}}}$$

(Omitted)

# Chapter 5 HULL GIRDER STRENGTH

## Section 1 HULL GIRDER YIELDING STRENGTH

Symbols has been amended as follows.

**Symbols**

For symbols not defined in this section, refer to **Ch 1, Sec 4**.

(Omitted)

$C_w$: Wave parameter defined in **Ch 4, Sec 4**.

$\rho$ : Seawater density, taken equal to 1.025 $t/m^3$.

$f_\beta$ : Heading correction factor, to be taken as:

$f_\beta = 1.05$ : for seagoing conditions.

$f_\beta = 1.0$ : for ballast water exchange at sea, harbour/sheltered water and accidental flooded design load scenarios.

Table 2 has been amended as follows.

Table 2 Normal Stress, $\sigma_L$

| Operation | Normal stress, $\sigma_L$ | | |
|---|---|---|---|
| | At any point located below $Z_{VD}$ | At bottom (1) | At deck (1) |
| Seagoing | ~~$\sigma_L = \frac{M_{SW} + M_{WV}}{Z_{A-n50}} 10^{-3}$~~<br>$\sigma_L = \frac{M_{SW} + f_\beta M_{WV}}{Z_{A-n50}} 10^{-3}$ | ~~$\sigma_L = \frac{M_{SW} + M_{WV}}{Z_{B-n50}} 10^{-3}$~~<br>$\sigma_L = \frac{M_{SW} + f_\beta M_{WV}}{Z_{B-n50}} 10^{-3}$ | ~~$\sigma_L = \frac{M_{SW} + M_{WV}}{Z_{D-n50}} 10^{-3}$~~<br>$\sigma_L = \frac{M_{SW} + f_\beta M_{WV}}{Z_{D-n50}} 10^{-3}$ |
| Harbour/sheltered water | $\sigma_L = \frac{M_{SW-p}}{Z_{A-n50}} 10^{-3}$ | $\sigma_L = \frac{M_{SW-p}}{Z_{B-n50}} 10^{-3}$ | $\sigma_L = \frac{M_{SW-p}}{Z_{D-n50}} 10^{-3}$ |
| Flooded condition at sea for bulk carriers having a length $L_{CSR}$ of 150*m* or above | $\sigma_L = \frac{M_{SW-f} + M_{WV}}{Z_{A-n50}} 10^{-3}$ | $\sigma_L = \frac{M_{SW-f} + M_{WV}}{Z_{B-n50}} 10^{-3}$ | $\sigma_L = \frac{M_{SW-f} + M_{WV}}{Z_{D-n50}} 10^{-3}$ |
| (1) The $\sigma_L$ values at bottom and deck, correspond to the application of formula given for any point, calculated at equivalent deck line and at baseline. | | | |

Table 3 has been amended as follows.

Table 3 Hull Girder Stresses at Baseline and Moulded Deck Line

| Operation | At baseline | At moulded deck line |
|---|---|---|
| Seagoing | ~~$\sigma_{bl} = \frac{\lvert M_{SW} + M_{WV} \rvert}{I_{y-n50}} z_n 10^{-3}$~~<br>$\sigma_{bl} = \frac{\lvert M_{SW} + f_\beta M_{WV} \rvert}{I_{y-n50}} z_n 10^{-3}$ | ~~$\sigma_{dk} = \frac{\lvert M_{SW} + M_{WV} \rvert}{I_{y-n50}} (z_{dk-S} - z_n) 10^{-3}$~~<br>$\sigma_{dk} = \frac{\lvert M_{SW} + f_\beta M_{WV} \rvert}{I_{y-n50}} (z_{dk-S} - z_n) 10^{-3}$ |
| Harbour/sheltered water | $\sigma_{bl} = \frac{\lvert M_{SW-p} \rvert}{I_{y-n50}} z_n 10^{-3}$ | $\sigma_{dk} = \frac{\lvert M_{SW-p} \rvert}{I_{y-n50}} (z_{dk-S} - z_n) 10^{-3}$ |
| Flooded condition at sea for bulk carriers having a length $L_{CSR}$ of 150*m* or above | $\sigma_{bl} = \frac{\lvert M_{SW-f} + M_{WV} \rvert}{I_{y-n50}} z_n 10^{-3}$ | $\sigma_{dk} = \frac{\lvert M_{SW-f} + M_{WV} \rvert}{I_{y-n50}} (z_{dk-S} - z_n) 10^{-3}$ |
| $z_{dk\text{-}s}$ : Distance from baseline to moulded deck line at side, in *m*. | | |

## 3. Hull Girder Shear Strength Assessment

### 3.3 Acceptance Criteria

Paragraph 3.3.1 has been amended as follows.

3.3.1 Permissible vertical shear force

The positive and negative permissible vertical shear forces are to comply with the following criteria:

- For seagoing operation:

  ~~$\lvert Q_{SW} \rvert \le Q_R - \lvert Q_{WV} \rvert$~~

  $\lvert Q_{SW} \rvert \le Q_R - \lvert f_\beta Q_{WV} \rvert$

- For harbour/sheltered water operation:

  $\lvert Q_{SW-p} \rvert \le Q_R$

- For flooded condition at sea of bulk carriers having a length $L_{CSR}$ of 150*m* or above:

  $\lvert Q_{SW-f} \rvert \le Q_R - \lvert Q_{WV} \rvert$

where:

$Q_R$: Total vertical hull girder shear capacity, in *kN*, as defined in **3.2.1**.

The shear force $Q_{wv}$, used in **2** above criteria is to be taken with the same sign as the considered shear forces $Q_{sw}$, and $Q_{sw\text{-}f}$ respectively.

## Section 2 HULL GIRDER ULTIMATE STRENGTH

### 2. Checking Criteria

### 2.2 Hull Girder Ultimate Bending Loads

Paragraph 2.2.1 has been amended as follows.

2.2.1

The vertical hull girder bending moment, *M* in hogging and sagging conditions, to be considered in the ultimate strength check is to be taken as:

~~$M = \gamma_S M_{sw-U} + \gamma_W M_{wv}$~~

$$M = \gamma_S M_{sw-U} + \gamma_W f_\beta M_{wv}$$

where:

$M_{sw-U}$: Permissible still water bending moment, in *kNm*, in hogging and sagging conditions at the hull transverse section considered as defined in **Table 1**.

$M_{wv}$: Vertical wave bending moment, in *kNm*, in hogging and sagging conditions at the hull transverse section considered as defined in **Ch 4, Sec 4, 3.1**.

$\gamma_S$ : Partial safety factor for the still water bending moment, as defined in **Table 2**.

$\gamma_W$ : Partial safety factor for the vertical wave bending moment, as defined in **Table 2**.

$f_\beta$ : Heading correction factor, as defined in **Sec 1, Symbols**.

# Chapter 9 FATIGUE

## Section 1 GENERAL CONSIDERATIONS

Table 3 has been amended as follows.

Table 3 Fraction of Time for Each Loading Condition of Bulk Carriers

| Ship length | Loading conditions | $\alpha_{(j)}$ | |
|---|---|---|---|
| | | *BC-A* | *BC-B*, *BC-C* |
| $L_{CSR} < 200\ m$ | Homogeneous | 0.60 | 0.70 |
| | Alternate | 0.10 | - |
| | Normal ballast | 0.15 | ~~0.15~~ 0.05 |
| | Heavy ballast[(1)] | 0.15 | ~~0.15~~ 0.25 |
| $L_{CSR} \geq 200\ m$ | Homogeneous | 0.25 | 0.50 |
| | Alternate | 0.25 | - |
| | Normal ballast | 0.20 | 0.20 |
| | Heavy ballast | 0.30 | 0.30 |

(1) For *BC-B* and *BC-C* without heavy ballast cargo hold, fraction of time $\alpha_{(j)}$ for normal ballast is 0.30 and for heavy ballast 0.

## Section 3 FATIGUE EVALUATION

Table 5 has been amended as follows.

Table 5 Time in Corrosive Environment, $T_C$

| Location of weld joint or structural detail | Time in corrosive environment $T_C$, in years |
|---|---|
| Water ballast tank | ~~5~~ 10 |
| Oil cargo tank | |
| Lower part [(1)] of bulk cargo hold and water ballast cargo hold | |
| Bulk cargo hold and water ballast cargo hold except lower part [(1)] | ~~2~~ 5 |
| Void space<br>Other areas | |

(1) Lower part means cargo hold part below a horizontal level located at a distance of 300 *mm* below the frame end bracket for holds of single side skin construction or 300 *mm* below the hopper tank upper end for holds of double side skin construction (see **Pt 2, Ch 1, Sec 2, Fig. 1**).

EFFECTIVE DATE AND APPLICATION

**1.** The effective date of the amendments is 1 July 2017.

**2.** Notwithstanding the amendments to the Rules, the current requirements apply to ships for which the date of contract for construction* is before the effective date.

* "contract for construction" is defined in the latest version of IACS Procedural Requirement (PR) No.29.

**IACS PR No.29** (Rev.0, July 2009)

**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.

Note:
This Procedural Requirement applies from 1 July 2009.