GUIDE FOR

SLAMMING LOADS AND STRENGTH ASSESSMENT FOR VESSELS MARCH 2011

NOTICE NO. 1 – July 2013

The following Rule Changes were approved by the ABS Rules Committee on 31 May 2013 and become **EFFECTIVE AS OF 1 JULY 2013.**

(See http://www.eagle.org for the consolidated version of the Guide for Slamming Loads and Strength Assessment for Vessels, 2011, with all Notices and Corrigenda incorporated.)

Notes - The date in the parentheses means the date that the Rule becomes effective for new construction based on the contract date for construction. (See 1-1-4/3.3 of the ABS Rules for Conditions of Classification (Part 1).)

SECTION 8 DIRECT STRENGTH ASSESSMENT

3 Shell Plating

3.1 Bowflare Slamming *(1 July 2013)*

(Revise definition of f_1, as follows.)

f_1 = $0.90 S_m f_y$ for side shell plating in the region forward of $0.125L$, from the forward perpendicular, in N/cm^2 (kgf/cm^2, lbf/in^2)

= $0.75 S_m f_y$ for side shell plating in the region between $0.125L$ and $0.25L$, from the forward perpendicular

5 Shell Longitudinals and Stiffeners

(Revise Paragraph 8/5.1, as follows.)

5.1 Bowflare Slamming *(1 July 2013)*

The net section modulus of the shell longitudinal (or frame), including the associated effective plating, is not to be less than that obtained from the following equation:

$SM = M/f_b$ cm^3 (in^3)

$M = p_s s \ell^2 10^3/k$ N-cm (kgf-cm, lbf-in)

where

k = 16 (16, 111.1)

p_s = design slamming pressure as described in Subsection 7/3, in N/cm^2 (kgf/cm^2, lbf/in^2)

s = spacing of longitudinal or transverse frames, in mm (in.)

ℓ = unsupported span of the frame, in m (ft)

f_b = $0.9S_m f_y$ for transverse and longitudinal frames in the region forward of $0.125L$ from the FP, in N/cm^2 (kgf/cm^2, lbf/in^2)

= $0.8S_m f_y$ for transverse and longitudinal stiffeners in the region between $0.125L$ and $0.25L$, measured from the FP, in N/cm^2 (kgf/cm^2, lbf/in^2)

= $0.95S_m f_y$ for stern slamming, in N/cm^2 (kgf/cm^2, lbf/in^2)

S_m and f_y are defined in Subsection 8/3.

The associated effective breadth of plating is to be taken as spacing of longitudinal or transverse frames or 20% of the unsupported span, whichever is less.

(Revise Paragraph 8/5.3 and add new Figure 1, as follows.)

5.3 Bottom and Stern Slamming *(1 July 2013)*

In case of bottom or stern slamming, an ultimate strength approach considering plasticity may be employed to estimate section modulus to the corresponding slamming pressure.

The net plastic section modulus, SM_{pl}, of each individual stiffener, is not to be less than:

$$SM_{pl} = \frac{kp_s s\ell^2}{f_{bdg} C_a f_y} \quad \text{cm}^3\ (\text{in}^3)$$

where

k = 1000 (1000, 144)

p_s = slamming pressure as described in Subsection 7/3, in N/cm^2 (kgf/cm^2, lbf/in^2)

s = spacing of longitudinal or transverse frames, in mm (in.)

ℓ = unsupported span of the frame, in m (ft)

f_{bdg} = bending moment factor

= $8\left(1 + \frac{n_s}{2}\right)$

n_s = 2.0 for continuous stiffeners or where stiffeners are bracketed at both ends

C_a = permissible bending stress coefficient

= 0.9

f_y = minimum specified yield point of the material, in N/cm^2 (kgf/cm^2, lbf/in^2)

The associated effective breadth of plating may be taken as the spacing of longitudinal or transverse frames.

The net plastic section modulus can be calculated using the following formulae.

When the cross-sectional area of the attached plate exceeds the cross-sectional area of the stiffener to which the plate flange is attached, the actual net plastic section modulus, Z_p, in cm^3 (cm^3, in^3) is given by:

$$Z_p = A_{pn}\, t_{pn}/(2\, c_4) + \frac{h_w^2\ t_{wn} \sin \varphi_w}{2 \cdot c_4^3} + A_{fn}(h_{fc} \sin \varphi_w - b_w \cos \varphi_w)/c_4$$

where

A_{pn} = net cross-sectional area of the attached plate, in cm^2 (cm^2, in^2)

t_{pn} = net attached plate thickness, in mm (mm, in.)

h_w = height of stiffener web, in mm (mm, in.), see Section 8, Figure 1

A_{fn} = net cross-sectional area of stiffener flange, in cm^2 (cm^2, in^2)

h_{fc} = height of stiffener measured to center of the flange area, mm (mm, in.), see Section 8, Figure 1

b_w = distance from mid thickness plane of stiffener web to the center of the flange area, in mm (mm, in.), see Section 8, Figure 1

c_4 = 10 (10, 1)

h = height of stiffener, in mm (mm, in.), see Section 8, Figure 1

t_{wn} = net web thickness, in mm (mm, in.)

= $t_w - t_c$

t_w = gross web thickness, in mm (mm, in.), see Section 8, Figure 1

t_c = corrosion deduction, in mm (mm, in.), to be subtracted from the web and flange thickness

φ_w = smallest angle between attached plate and stiffener web, measured at the midspan of the stiffener, see Section 8, Figure 1. The angle φ_w may be taken as 90 degrees provided the smallest angle is not less than 75 degrees.

s = spacing of longitudinal or transverse frames, in m (m, in.)

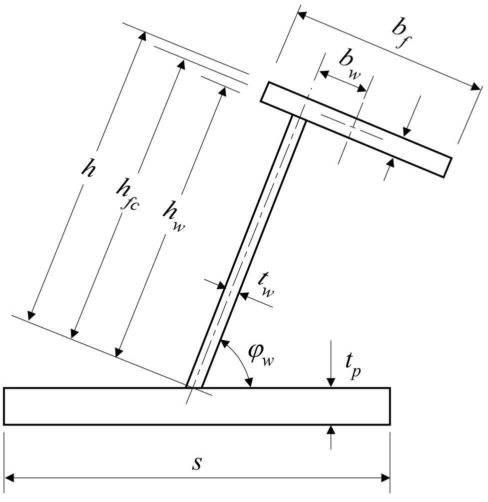
When the cross-sectional area of the stiffener exceeds the cross-sectional area of the attached plate, the plastic neutral axis is located a distance z_{na}, in mm (mm, in.), above the attached plate, given by:

$$z_{na} = (\,c_4^2\ A_{fn} + h_w\,t_{wn} - c_4^3\ t_{pn}\,s)/(2\,t_{wn})$$

and the net plastic section modulus, Z_p, in cm^3 (cm^3, in^3) is given by:

$$Z_p = t_{pn}\,s(z_{na} + t_{pn}/2)\sin\varphi_w + \left[\frac{\left[(h_w - z_{na})^2 + z_{na}^2\right]t_{wn}\sin\varphi_w}{2\cdot c_4^3} + A_{fn}\left[(h_{fc} - z_{na})\sin\varphi_w - b_w\cos\varphi_w\right]/\,c_4\right]$$

FIGURE 1
Stiffener Geometry *(1 July 2013)*



(Renumber subsequent figures in Section 8 accordingly.)

7 Slot Connections *(1 July 2013)*

(Revise Subsection 8/7, as follows.)

Each slot connection under the design slamming pressure is to be verified using the following formulae:

$\sigma_{fb} = P_1/A_s < S_m f_y$

$\tau_{dc} = P_2/A_c < 0.42 S_m f_y$

where

σ_{fb} = flat bar mean stress, in N/cm^2 (kgf/cm^2, lbf/in^2)

τ_{dc} = direct collar plate mean stress, in N/cm^2 (kgf/cm^2, lbf/in^2)

P_1 = load transmitted through flat bar stiffener, in N (kgf, lbf)

= $p_s s \ell \left(1 - \frac{s}{2\ell}\right)\left(\frac{4 f_c A_s}{4 f_c A_s + A_c} - \frac{s}{\ell}\right)$ if the flat bar stiffener is connected to the longitudinal stiffener

= 0 if flat bar stiffener is not connected to the longitudinal stiffener

P_2 = load transmitted through shear connection, in N (kgf, lbf)

= $p_s s \ell \left(1 - \frac{s}{2\ell}\right)\left(\frac{A_c}{4 f_c A_s + A_c} + \frac{s}{\ell}\right)$ if the flat bar stiffener is connected to the longitudinal stiffener

= $p_s s \ell \left(1 - \frac{s}{2\ell}\right)$ if flat bar stiffener is not connected to the longitudinal stiffener

p_s = slamming pressure as described in Subsection 7/3, in N/cm^2 (kgf/cm^2, lbf/in^2)

s = spacing of longitudinal/stiffener, in cm (in.)

ℓ = spacing of transverses, in cm (in.)

A_s = net attached area of the flat bar stiffener, in cm^2 (in^2)

A_c = effective net shear sectional area of the support or of both supports for double-sided support, in cm^2 (in^2)

= $A_{lc} + A_{ld}$

A_{ld} = net shear connection area excluding lug plate, in cm^2 (in^2)

= $\ell_d t_{tw}$

ℓ_d = length of direct connection between longitudinal stiffener and transverse member (see Section 8, Figure 2), in cm (in.)

t_{tw} = net thickness of transverse member (see Section 8, Figure 2), in cm (in.)

A_{lc} = net shear connection area of lug plate, in cm^2 (in^2)

= $f_1 \ell_c t_c$

ℓ_c = length of connection between longitudinal stiffener and lug plate (see Section 8, Figure 2), in cm (in.)

t_c = net thickness of lug plate (see Section 8, Figure 2), not to be taken greater than the thickness of adjacent transverse member, in cm (in.)

f_1 = shear stiffness coefficient

= 1.0 for stiffener of symmetrical cross section

= $14/W\,(5.5/W) \le 1.0$ for stiffener of asymmetrical cross section

W = width of the cut-out for an asymmetrical stiffener, measured from the cut-out side of the stiffener web (see Section 8, Figure 2), in cm (in.)

f_c = collar load factor

- *For intersecting of symmetrical stiffeners*

  for A_s in cm^2

  = 1.85 for $A_s \le 14$

  = $1.85 - 0.0441(A_s - 14)$ for $14 < A_s \le 31$

  = $1.1 - 0.013(A_s - 31)$ for $31 < A_s \le 58$

  = 0.75 for $A_s > 58$

  for A_s in in^2

  = 1.85 for $A_s \le 2.2$

  = $1.85 - 0.2883(A_s - 2.2)$ for $2.2 < A_s \le 4.8$

  = $1.1 - 0.0836(A_s - 4.8)$ for $4.8 < A_s \le 9.0$

  = 0.75 for $A_s > 9.0$

- *For intersecting of asymmetrical stiffeners*

  = $0.68 + 0.0172\ \ell_d/A_s$ for ℓ_d in cm and A_s in cm^2

  = $0.68 + 0.00677\ \ell_d/A_s$ for ℓ_d in inches and A_s in in^2

If the length of direct and shear connections are different, their mean value is to be used instead of ℓ_d, and in case of a single lug, the value is ℓ_c.

S_m and f_y are as defined in Subsection 8/3.

For flat bar stiffener with soft-toed brackets, the brackets may be included in the calculation of A_s.