GUIDE FOR

BUCKLING AND ULTIMATE STRENGTH ASSESSMENT FOR OFFSHORE STRUCTURES APRIL 2004

NOTICE NO. 1 – November 2011

The following Rule Changes become **EFFECTIVE AS OF 1 NOVEMBER 2011.**

(See http://www.eagle.org for the consolidated version of the Guide for Buckling and Ultimate Strength Assessment for Offshore Structures 2004, 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 – Offshore Units and Structures (Part 1).)

SECTION 3 PLATES, STIFFENED PANELS AND CORRUGATED PANELS

5 Stiffened Panels

(Add new Paragraph 3/5.7, as follows.)

5.7 Overall Buckling State Limit *(1 November 2011)*

The overall buckling strength of the entire stiffened panels is to satisfy the following equation with respect to the biaxial compression:

$$\left(\frac{\sigma_x}{\eta\sigma_{Gx}}\right)^2 + \left(\frac{\sigma_y}{\eta\sigma_{Gy}}\right)^2 \le 1$$

where

σ_x = calculated average compressive stress in the longitudinal direction, in N/cm^2 (kgf/cm^2, lbf/in^2)

σ_y = calculated average compressive stress in the transverse direction, in N/cm^2 (kgf/cm^2, lbf/in^2)

σ_{Gx} = critical buckling stress for uniaxial compression in the longitudinal direction, in N/cm^2 (kgf/cm^2, lbf/in^2)

$$= \begin{cases} \sigma_{Ex} & \text{if} \quad \sigma_{Ex} \le P_r\sigma_0 \\ \sigma_0\left[1 - P_r(1-P_r)\dfrac{\sigma_0}{\sigma_{Ex}}\right] & \text{if} \quad \sigma_{Ex} > P_r\sigma_0 \end{cases}$$

σ_{Gy} = critical buckling stress for uniaxial compression in the transverse direction, in N/cm^2 (kgf/cm^2, lbf/in^2)

$$= \begin{cases} \sigma_{Ey} & \text{if} \quad \sigma_{Ey} \le P_r \sigma_0 \\ \sigma_0 \left[1 - P_r(1 - P_r)\dfrac{\sigma_0}{\sigma_{Ey}}\right] & \text{if} \quad \sigma_{Ey} > P_r \sigma_0 \end{cases}$$

σ_{Ex} = elastic buckling stress in the longitudinal direction, in N/cm^2 (kgf/cm^2, lbf/in^2)

= $k_x \pi^2 (D_x D_y)^{1/2}/(t_x b^2)$

σ_{Ey} = elastic buckling stress in the transverse direction, in N/cm^2 (kgf/cm^2, lbf/in^2)

= $k_y \pi^2 (D_x D_y)^{1/2}/(t_y \ell^2)$

k_x = 4 for $\ell/b \ge 1$

= $\dfrac{1}{\phi_x^2} + 2\rho + \phi_x^2$ for $\ell/b < 1$

k_y = 4 for $b/\ell \ge 1$

= $\dfrac{1}{\phi_y^2} + 2\rho + \phi_y^2$ for $b/\ell < 1$

ϕ_x = $(\ell/b)(D_y/D_x)^{1/4}$

ϕ_y = $(b/\ell)(D_x/D_y)^{1/4}$

D_x = $EI_x/s_x(1 - \nu^2)$

D_y = $EI_y/s_y(1 - \nu^2)$

= $Et^3/12(1 - \nu^2)$ if no stiffener in the transverse direction

ρ = $[(I_{px} I_{py})/(I_x I_y)]^{1/2}$

t = thickness of the plate, in cm (in.)

ℓ, b = length and width of stiffened panel, respectively, in cm (in.)

t_x, t_y = equivalent thickness of the plate and stiffener in the longitudinal and transverse direction, respectively, in cm (in.)

= $(s_x t + A_{sx})/s_x$ or $(s_y t + A_{sy})/s_y$

s_x, s_y = spacing of stiffeners and girders, respectively, in cm (in.)

A_{sx}, A_{sy} = sectional area of stiffeners and girders, excluding the associated plate , respectively, in cm (in.)

I_{px}, I_{py} = moment of inertia of the effective plate alone about the neutral axis of the combined cross section, including stiffener and plate, in cm^4 (in^4)

I_x, I_y = moment of inertia of the stiffener with effective plate in the longitudinal or transverse direction, respectively, in cm^4 (in^4). If no stiffener, the moment of inertia is calculated for the plate only.

E = modulus of elasticity, 2.06×10^7 N/cm^2 (2.1×10^6 kgf/cm^2, 30×10^6 lbf/in^2) for steel

ν = Poisson's ratio, 0.3 for steel

P_r = proportional linear elastic limit of the structure, which may be taken as 0.6 for steel

σ_0 = specified minimum yield point of the material, in N/cm^2 (kgf/cm^2, lbf/in^2)

η = maximum allowable strength utilization factor, as defined in Subsection 1/11 and 3/1.7