KC#1081

1. In CSR for Tankers, the critical shear stress τ_{cr} derived by the following formulas according to Case 6 of Table 10.3.1 takes into account reducing strength due to an effective cross sectional area reduction for shear in addition to the effects of a buckling strength reduction due to an opening.

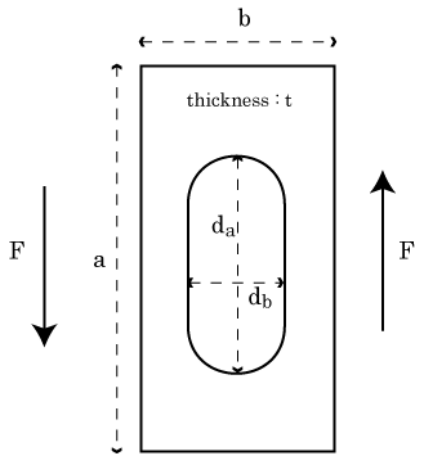
$$\tau_{cr} = C_\tau \frac{\sigma_{yd}}{\sqrt{3}}$$

$$C_\tau = \begin{cases} 1 & \lambda \le 0.84 \\ \dfrac{0.84}{\lambda} & \lambda > 0.84 \end{cases}$$

$$\lambda = \sqrt{\frac{\sigma_{yd}}{K\sigma_E}}$$

$$K = \left[5.34 + \frac{4}{\alpha^2}\right]\left(1 - \frac{d_a}{a}\right)\left(1 - \frac{d_b}{b}\right) \qquad \alpha = \frac{a}{b}$$

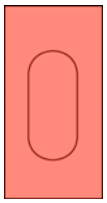
$$\sigma_E = 0.9E\left(\frac{t}{b}\right)^2$$



2. Therefore, if shear force F acts on panels with an opening, a working shear stress τ_{work1} calculated by the following formula should be compared with the critical shear stress τ_{cr}.

$$\tau_{cr} > \tau_{work1}$$

$$\tau_{work1} = \frac{F}{ta}$$

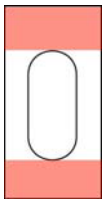


In this case, τ_{work1} is taken as the mean shear stress for the whole panel including the opening (red part).

3. However, in the common interpretation CI-T3, a shear stress correction taking into account the stress increase due to the opening in accordance with Table PR1 is required. This means that if shear force F acts on panels with an opening, the working shear stress τ_{work2} is derived by the following formula and is compared with the critical shear stress τ_{cr} in consideration of an effective cross sectional area reduction due to the opening.

$$\tau_{cr} > \tau_{work2}$$

$$\tau_{work2} = \frac{F}{t(a - d_a)}$$



In this case, τ_{work2} is taken as the mean shear stress for the red part where stress increases due to the opening.

We feel that the effective cross sectional area reduction due to an opening may be considered twice in the assessment procedure according to CI-T3 and this is too strict.

4. Our understanding is that working shear stress should be assessed by the assessment procedure in 2 above.

Please confirm.