

3.2 Evaluation of hot spot stress

3.2.1

The hot spot stress in a very fine mesh is to be obtained using a linear extrapolation. The stresses located at 0.5 times and 1.5 times the net plate thickness are to be extrapolated at the hot spot location, as described in Fig 3 and Fig.4.

The principal stress at the hot spot location having an angle with the assumed fatigue crack greater than 45° is to be considered as the hot spot stress.

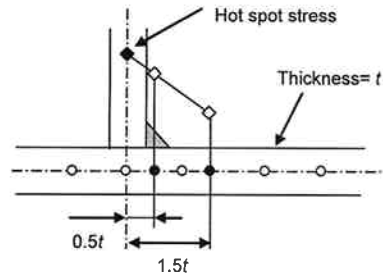


Figure 3: Definition of hot spot stress at an intersection of two plates

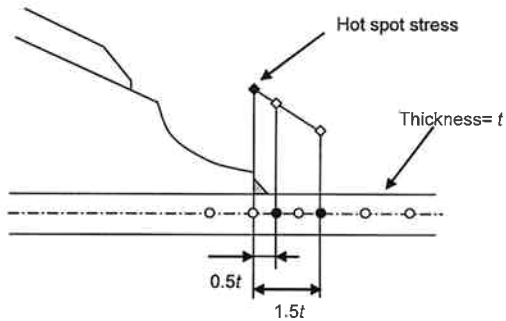


Figure 4: Definition of hot spot stress at an intersection of plating and bracket

3.2.2

The hot spot stress at the intersection of two plates, as obtained from [3.2.1], is to be multiplied by the correction factor λ defined below, considering the difference between the actual hot spot location and assumed location and the difference of stress gradient depending on the angle θ , in deg, between the two plates, to be measured between 0° and 90°.

- welded intersection between plane plates:
$$\lambda = \begin{cases} 0.8 & : \theta \leq 75 \\ 0.8 - \frac{0.2}{15}(\theta - 75) & : 75 < \theta \end{cases} \quad (1)$$

- welded intersection between bent plate and plane plate: $\lambda = 0.7$ (i.e. bend type bilge knuckle part) \geq

3.2.3

The hot spot stress in a non-welded area or along free edge is to be determined by extrapolating the principal stresses of the two adjacent elements, as shown in Fig 5.

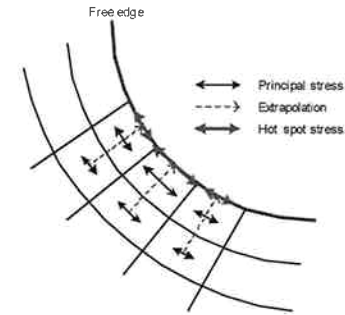


Figure 5: Definition of the hot spot stress along free edge

3.3 Simplified method for the bilge hopper knuckle part

3.3.1

At the bilge knuckle part, the hot spot stress $\sigma_{hotspot}$ may be computed by multiplying the nominal stress $\sigma_{nominal}$ with the stress concentration factor K_{gl} defined in [3.3.3].

$$\sigma_{hotspot} = K_{gl} \sigma_{nominal}$$

3.3.2

The nominal stress at the hot spot location is to be determined by extrapolating the membrane stresses located at 1.5 times and 2.5 times the frame spacing from the hot spot location, as shown in Fig 6.

