

KC ID #340 Question

Chapter 7 Direct strength assessment

Section 2 Global Strength FE analysis of cargo hold structures.

According to Ch.7 Sec.2 [3.2.3] “The reference stresses in FE model that does not include orthotropic elements, as specified in [2.2.4] are not to exceed $235/k \text{ N/mm}^2$ (..)”

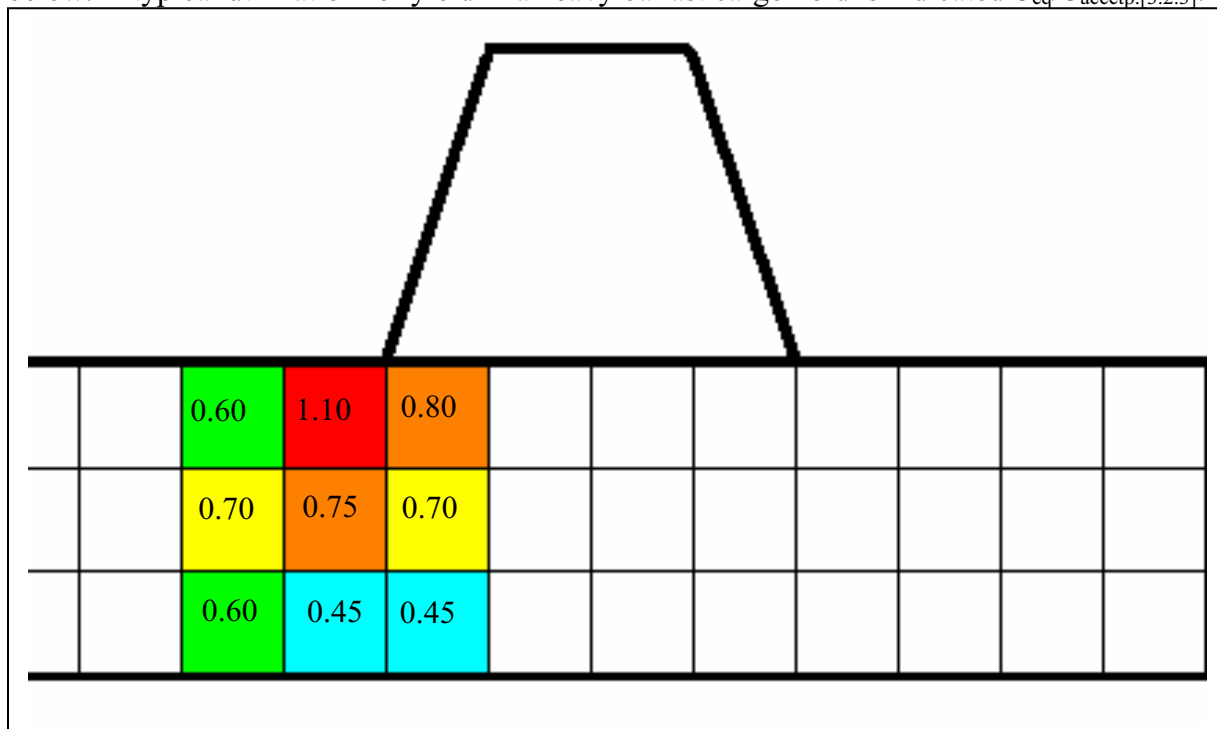
Q1: We assume item [3.2.3] is referring to membrane stress only. That is, local plate bending is neglected. Please confirm.

Q2: We assume the acceptance criteria of Ch. 7 Sec. 2 [3.2.3] is related to an element size of $S \times S$. That is:

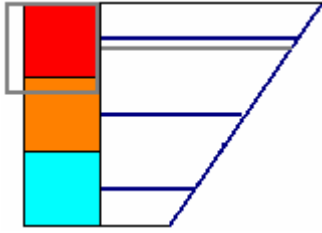
- all elements with size equal to the representative stiffener spacing $S \times S$ (as specified in sec. 2 [2.2.4]) is to be within the limit specified in [3.2.3]
- smaller elements when averaged over the representative stiffener spacing are to be within the limit specified in 3.2.3

Please advice

Q3: A typical connection of a longitudinal girder to the lower stool is shown in the figure below. A typical utilization for yield in a heavy ballast cargo hold is indicated $\sigma_{eq}/\sigma_{accetp.}[3.2.3]$.

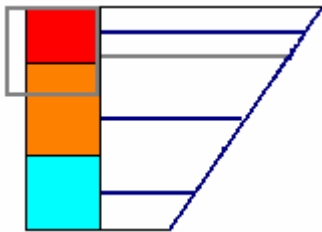


Assuming all 3 elements are equally sized over the height of the double bottom as indicated on the figure. What is the correct application of [3.2.3]?:



- a. Each individual element over the height has to be within the requirement of [3.2.3]. That is, the red element has to be reinforced until the utilization is < 1 . ?
or
- b. The results may be averaged over a typical stiffener spacing, $S_x S$, in the double bottom as indicated with grey in the below figure. The averaged utilization should be < 1 ?

Assuming the 3 elements are slightly different in size. What is the correct application of [3.2.2]?:



- c. Each individual element over the height has to be within the requirement of [3.2.3]. That is, the red element has to be reinforced until utilization is < 1 .?
or
- d. The results may be averaged over a typical stiffener spacing, $S_x S$, in the double bottom. The averaged utilization should be < 1 ?
or
- e. The results may be averaged based on an element size = $H_{dblBottom}/3$?