Agenda Item:  650-672

Title:  Delete References to Joint Efficiency Appendix V

Date:  01/13/09

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Purpose:  Delete references to Joint Efficiency in design of stiffeners for vacuum pressure

Source:  Bhana Mistry Email of 11/19/2008

Impact:  Cost saving in some cases.

Rationale:  There is no need to consider welded joint efficiency in the design of stiffeners or stiffener regions for vacuum pressure, since these elements are in compression under vacuum loading.

Proposal:  [Note to Reviewer: The following proposal deletes all references to Joint Efficiency in the nomenclature, equations and example problems in Appendix V. Existing text is shown in black font and proposed new wording is shown in red font.]

In Section V.3.1, Nomenclature:

1) Delete “JE b = Joint efficiency of bottom plate.  JEb = 1.0 for bottom joints”.
2) Delete “JE r = joint efficiency of roof plate.  Jer = 0.35 for single lap welds, 0.70 for double lap welds, and 1.0 for butt welds”.
3) Delete “JE s = joint efficiency of shell plate.  JEs = 1.0 for shell with full radiography, or 0.85 with spot radiography”.
4) Delete “JE st = Joint efficiency of splice of stiffener sections.  JEstiff = 1.0 for 100% radiography of all splice welds, 0.85 for spot radiography of selected splice welds, and 0.70 for no radiography”.

In Section V.7.2.5:
Change “JEstiff = Areqd-JEsts1Xshell-JEstconeXcone” to “A stiff = Areqd-ts1Xshell-tconeXcone”.

In Section V.7.3.5:
Change “JEstiff = Areqd-JEsts1Xshell-JErtdomeXdome” to “A stiff = Areqd-ts1Xshell-tdomeXdome”.

In Section V.8.2.3.3.2:
For cone roof top end stiffener:
Change “A stiff = Areqd-JE tconeXcone-JE ts1Xshell” to “A stiff = Areqd-tconeXcone-ts1Xshell”.

For dome or umbrella roof top end stiffener:
Change “A stiff = Areqd-JE ts1Xshell-JE tdomeXdome” to “A stiff = Areqd-ts1Xshell-tdomeXdome”.

For bottom end stiffener:
Change “A stiff = Areqd-JEbtbXbtm-JEstsnXshell” to “A stiff = Areqd-tbXbtm-tsnXshell”.

In Section V.10.2 External Pressure Calculations:

In Step 2, 4th sub-step beginning with “From V.7.3.5…” Change the following:
- Change “From V.7.3.5, the required area of the stiffener (assuming JEstiff = 1.0) is calculated as follows:” to “From V.7.3.5, the required area of the stiffener is calculated as follows:”
- Change “JE stA stiff = Areqd-JE tconeXcone-JE ts1Xshell” to “A stiff = Areqd-tconeXcone-ts1Xshell”.
- Change “(1.0)A stiff = 7.21 - (0.85)(0.3125)(7.21) – (0.85)(0.529)(11.7)” to “A stiff = 7.21 –(0.3125)(7.21) –(0.529)(11.7)”
• Change “\( A_{\text{stiff}} = 0.03 \text{ sq. in.}, \) Use a stiffener with an area > 0.03 sq. in.” to “\( A_{\text{stiff}} = -1.23 \text{ sq. in.}, \) Stiffener is not required.”

In Step 16, 5th sub-step beginning with “From V. 8.2.3.3.2…” Change the following formulas:

• Change “\( A_{\text{stiff}} = A_{\text{reqd}} - JE_{\text{stiff}} X_{\text{shell}} - JE_{\text{dome}} X_{\text{dome}} \)” to “\( A_{\text{stiff}} = A_{\text{reqd}} - t_{\text{stiff}} X_{\text{shell}} - t_{\text{dome}} X_{\text{dome}} \)”.

• Change “\( A_{\text{stiff}} = 1.80 - (0.85)(.395)(8.0) - (0.85)(0.529)(11.7) = -6.15 \text{ in.} \) The stiffener section area must be > 0.90 sq. in. (= \( \frac{1}{2} \times A_{\text{total}} \))” to “\( A_{\text{stiff}} = 1.80 - (.395)(8.0) - (0.529)(11.7) = -7.55 \text{ in.} \) The stiffener section area must be > 0.90 sq. in. (= \( \frac{1}{2} \times A_{\text{total}} \)).”

In Step 17, 4th sub-step beginning with “From V. 8.2.3.3.2…” Change the following formulas:

• Change “\( A_{\text{stiff}} = A_{\text{reqd}} - JE_{\text{stiff}} X_{\text{shell}} - JE_{\text{dome}} X_{\text{dome}} \)” to “\( A_{\text{stiff}} = A_{\text{reqd}} - t_{\text{stiff}} X_{\text{shell}} - t_{\text{dome}} X_{\text{dome}} \)”.

• Change “\( A_{\text{stiff}} = 1.80 - (0.85)(.395)(8.0) - (0.85)(0.375)(6.0) = -2.80 \text{ in.} \)” to “\( A_{\text{stiff}} = 1.80 - (.395)(8.0) - (0.375)(6.0) = -3.61 \text{ in.} \)”