Agenda Item: 650-SJE

Title: Use of Variable Joint Efficiencies

Date: August 24, 2006

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Purpose: To allow the use of variable joint efficiencies (i.e. 0.85 in lower courses and 0.7 in upper shell courses) in the design of shell courses for tanks designed to API 650 Appendix A and Appendix S.

Source: Technical Inquiry API 650 – I – 08/06

Revision: 1 (Changes made to wording in 3.6.1.5 and 8.1.1 (bold type))

Impact: Allows manufacturers to provide tanks at lower costs due to lower amounts of radiographic testing. Possible quality issues may arise.

Rationale: Tanks are allowed to be completely erected with a joint efficiency of 0.7, which means no radiographic examination is required. If tanks have relatively low stress levels in the upper courses, then tanks should be allowed to be designed with variable joint efficiencies to eliminate radiographic testing of the upper shell courses. This practice should be conveyed to the purchaser and indicated on the tank nameplate for future reference. Purchaser can still reserve the right to shoot radiographs, if so desired, at their cost. Quality of welding will remain the responsibility of the tank manufacturer.

Edit Legend: Strikethrough is deletion; underlining is addition; *italics* is explanation for ballot purposes.
Proposed Changes:

1. **Add to Section 3.6.1.5 an item “e”:**

3.6.1.5 The manufacturer shall furnish to the purchaser a drawing that lists the following for each course:

*add item “e”*

- (e) For Appendix-A and Appendix-S tanks, the joint efficiency utilized for each shell course (i.e. 1.0, 0.85, 0.7)

2. **Add text to Section 3.6.2.3:**

3.6.2.3 Appendix A permits an alternative shell design with a fixed allowable stress of 145 MPa (21,000 lbf/in.²) and a joint efficiency factor of 0.85 or 0.70. By agreement between the manufacturer and purchaser, various joint efficiencies may be utilized on adjacent shell courses throughout the tank shell. This design may only be used for tanks with shell thicknesses less than or equal to 12.5 mm (1/2 in.).

3. **Add text to Section 8.1.1 an item “p”:**

8.1.1 A tank made in accordance with…. o. the purchasers tank number.

*Add item “p”*

- p. For Appendix A and Appendix S tanks, when a joint efficiency other than 1.0 is utilized for design of a shell course, include a column for joint efficiency after “material” column.

4. **Add text to Appendix A Section A.3.4:**

A.3.4 The joint efficiency factor shall be 0.85 with a spot radiography required by A.5.3. By agreement between the purchaser and the manufacturer, the spot radiography may be omitted, and a joint efficiency factor of 0.70 shall be used. By agreement between the manufacturer and purchaser, various joint efficiencies may be utilized on adjacent shell courses throughout the tank shell. Extent of radiography for each shell course to be determined by joint efficiency utilized for that particular course.

5. **Add text to Appendix S, Table S-4-Joint Efficiencies:**

*Add footnote to Table S-4:*

Notes:
1. By agreement between the manufacturer and purchaser, various joint efficiencies may be utilized on adjacent shell courses throughout the tank shell. Extent of radiography for each shell course to be determined by joint efficiency utilized for that particular course.