

Agenda Item 620-2061

Title: Sidewall-to-Bottom Vacuum Box for Annexes Q and R

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Revision: 0

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Purpose: Permit vacuum box examination of sidewall-to-bottom welds that are not full penetration.

Source: David Thonn (CB&I) email to Doug Miller on May 2, 2022

Impact: Expanded NDE options

Discussion: There is no reason why vacuum box examination should not be allowed for partial penetration shell to bottom welds in 620 R and Q. By way of comparison, this is clearly allowed in API 650, 7.2.4. API 620 basic, Oddly, 620, 7.18.2.4 has rules for leak testing joints between bottom plates, but actually has no rules for the sidewall-to-bottom joint.

While composing this agenda item other editorial improvements were identified:

- Make reference to 7.15.7 for vacuum box technique. That makes Q and R more concise and its references more complete rules.
- Eliminate redundant wording in Annex R to make it more concise and to make Q and R wording match.

Proposed Changes in API 620 (changes from current published 12th ed, Add. 3)

Q.5.8 Examination for Tightness of Welds in Liquid, Product Vapor, Purge Gas, and Membrane Tank Outer Containers

Q.5.8.1 All welded joints in all bottoms and all complete penetration and complete fusion sidewall-to-bottom welds shall be examined by the vacuum box method in accordance with 7.15.7. applying a solution film to the welds and pulling a partial vacuum of at least 3 lbf/in.² gauge above the welds by means of a vacuum box with a transparent top. This includes those components in primary liquid containers, secondary liquid container, purge gas containers, warm vapor containers, and membrane tank outer containers.

Q.5.8.2 When any sidewall-to-bottom weld in Q.5.8.1 does not have complete penetration and complete fusion, the joint shall be examined by one of the following methods:

- a) The initial weld passes, inside and outside of the shell, shall have all slag and nonmetals removed from the surface of the welds and the welds examined visually. After completion of the inside and outside fillet or partial penetration welds, the welds shall be tested by pressurizing the volume between the inside and outside welds with air pressure to 15 lbf/in.² gauge and applying a solution film to both welds. To ensure that the air pressure reaches all parts of the welds, a sealed blockage in

the annular passage between the inside and outside welds must be provided by welding at one or more points. Additionally, a small pipe coupling on the outside weld and communicating with the volume between the welds must be welded on each side of and adjacent to the blockages. The air supply must be connected at one end and a pressure gauge connected to a coupling on the other end of the segment under test.

- b) The initial weld pass shall be made inside the shell and have all slag and nonmetals removed from its surface prior to visual examination. After visual examination, the initial pass shall be examined by the vacuum box method in accordance with 7.15.7.
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R.5.9 Examination for Tightness of Welds in Primary Liquid, Product Vapor, Purge Gas, and Membrane Tank Outer Containers

Welds which are not examined for tightness during the hydrostatic or pneumatic test shall be examined as required by R.5.9.1 through R.5.9.6.

R.5.9.1 All welded joints in all the bottoms and all complete penetration and complete fusion sidewall-to-bottom welds of the tank shall be examined by the vacuum box method in accordance with 7.15.7. applying a solution film to the welds and pulling a partial vacuum of at least 3 lbf/in.2 gauge above the welds by means of a vacuum box with a transparent top. This includes those components in primary liquid containers, secondary liquid container, purge gas containers, and warm vapor containers and membrane tank outer containers.

R.5.9.2 Complete penetration and complete fusion welds that join the cylindrical wall to the tank bottom shall be examined by applying a solution film to the welds and pulling a partial vacuum of at least 3 lbf/in.2 gauge above the welds by means of a vacuum box with a transparent top. This includes these components in primary liquid containers, secondary liquid container, purge gas containers, warm vapor containers, and membrane tank outer containers.

R.5.9.2. R.5.9.3 When any sidewall-to-bottom weld in R.5.9.1 the weld in R.5.9.2 does not have complete penetration and complete fusion, the joint shall be examined by one of the following methods:

- a. The the initial weld passes, inside and outside of the shell, shall have all slag and nonmetals removed from the surface of the welds and the welds examined visually. After completion of the inside and outside fillet or partial penetration welds, the welds shall be tested by pressurizing the volume between the inside and outside welds with air pressure to 15 lbf/in.2 gauge and applying a solution film to both welds. To ensure that the air pressure reaches all parts of the welds, a sealed blockage in the annular passage between the inside and outside welds must be provided by welding at one or more points. Additionally, a small pipe coupling communicating with the volume between the welds must be welded on each side of, and adjacent to, the blockages. The air supply must be connected at one end and a pressure gauge connected to a coupling on the other end of the segment under test.
- b. The initial weld pass shall be made inside the shell and have all slag and nonmetals removed from its surface prior to visual examination. After visual examination, the initial pass shall be examined by the vacuum box method in accordance with 7.15.7.

Staff renumber rest of section R.5.9 accordingly