Agenda Item: 653-2052

Title: **Bottom Corrosion Repair Methods**

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Purpose: Clarify that traditional methods of weld overlay and welded bottom patch plates are the only permitted repair method to restore bottom thickness after bottom corrosion.

Source: Subgroup Fab Meeting Spring 2021

Revision: 0

Impact: Neutral

Background: Recent development of new technologies including non-metallic epoxy repairs and friction stud welding may challenge the accepted practice of repair of tank bottom corrosion.

Traditional repair methods are defined in API 653 Sections 4.4.5.5, 4.4.5.6, and 9.11.

Proposal: Clarify repair methods, and standardize requirements to exclude non-permitted repair methods.

Proposed Changes

4.4.5.5 The repair of ~~internal pitting~~ product-side or soil-side corrosion, when performed to extend the in-service period of operation, shall be by pit welding, overlay welding, or welded-on lap patching per Sections 9.7, 9.11 , followed by inspection and testing. The extent of weld repairs is limited in the critical zone in accordance with 9.11.1.2.

4.4.5.6 The treatment of bottom ~~pitting~~ corrosion by the use of non-welded repairs (e.g. coatings, caulking, epoxies, bolting) ~~can not~~ shall not be used to increase RT_{ip} or RT_{bc} for calculating MRT.

9.11 Repair of Tank Bottoms

9.11.1 Repairing a Portion of Lap-welded or Butt-welded Tank Bottoms

9.11.1.1 General Repair Requirements

The use of welded-on patch plates for repairing a portion of uniformly supported tank bottoms is permitted within the limitations given in this section and 9.11.1.2. See Figure 9.13 for acceptable details for welded-on patch plates.

a) The minimum dimension for a welded-on patch plate that overlaps a bottom seam or existing patch is 12 in. The welded-on patch plate may be circular, oblong, or polygonal with rounded corners.

b) A welded-on patch plate smaller than 12 in. in diameter is permitted if: it does not overlap a bottom seam; it is not; placed fully or partially over an existing patch; and it extends beyond the corroded bottom area, if any, by at least 2 in. This patch plate must be no smaller than 6 in. across in any direction.;

c) Welded-on patch plates shall not be placed over areas of the tank bottom that have global dishing, local dishing

[except as allowed by 9.11.1.1 d)], settlement, or distortion greater than the limits of Annex B.

NOTE If the tank is still undergoing settlement, the addition of welded-on patch plate may not be advisable.

d) A welded-on patch plate may be placed over a mechanical dent or local dishing if: its unsupported dimension does not exceed 12 in. in any direction; it is at least 1/4 in. thick; it is at least as thick as the existing bottom; and does not overlap seams nor other patches, except for tanks designed in accordance with API 650, Annex M, which shall have welded-on patch plates at least 3/8 in. thick.

e) These repairs are permanent repairs subject to an on-going inspection and maintenance program.

f) Installation of a new sump shall conform to the following in API Standard 650: Section 5.8.7, Tables 5.16a and 5.16b, and Figure 5.21.

g) Dimensions given are from toe of fillet welds or to the centerline of the butt weld, and also apply to new-to-existing welds.

h) When the edge of a welded-on patch plate is approximately parallel to a bottom seam, the edge shall be held at least 2 in. from weld seam. Patch plates not crossing an existing bottom lap joint shall be no closer than 2 in. from any other bottom lap weld.

i) Patch plates covering 3-plate laps shall extend a minimum of 12 in. in all directions along all bottom lap welds beyond the 3-plate lap.

j) Patch plates crossing an existing bottom lap weld shall be no closer than 4 in. to an adjacent 3-plate lap.

k) Patches crossing existing bottom lap seams must cross creating an angle of no less than 45 degrees. Patches over three-plate lap joints shall cross the seams at either 45 degrees or 90 degrees.

l) Patch plates shall be seal welded to the floor with full-fillet welds.