

Agenda Item 653-2041 – No Indication Liquid Penetrant Test (NI-PT) allowed to be substituted for Vacuum Box Test or Solution Film Test

Title: PT in lieu of Vacuum Box or Solution Film

Date: 16 May 2022

Revision: 2

Handled By: Art Szaradzinski
Bechtel
Houston, TX
aszaradz@bechtel.com

Rev 0 of the item was handled by Rick Simmons

Purpose: Use of PT as a substitute for Solution Film or Solution Film Leak Tests.

Source: Rick Simmons

Impact: Positive allowance overall cost and schedule and convenience.

Discussion (Rev 2 changes marked in green)

1. This proposed addition to API is for allowing a no-indication PT leak test alternative to Vacuum Box or Solution Film Testing for weld seam locations which are difficult to access (or where it is inconvenient or uneconomical to perform currently specified Vacuum Box or Solution Film testing). ~~There is no need to limit the areas where~~ This substitution may be utilized, as it may be considered equivalent or better than vacuum box /solution film, and further it would be cost prohibitive to use PT excessively since it is far more expensive than vacuum box /solution film. It is proposed to simultaneously revise API 620 and API 650 via Agenda Items 620-2048 and 650-2051 respectively.
2. Storage Tank Manufacturers have for many years proposed and utilized PT instead of vacuum box for difficult to access areas, even though it has not actually been allowed by API, except for very limited special cases /situations.
3. PT with its usual acceptance criteria per ASME is considered a surface quality 'structural' check, not a leak test. Therefore, acceptance criteria for the alternative leak tightness use of PT is more stringent, in order to significantly increase the leak tightness probably of the tested weld, as ANY surface flaw could indicate a through thickness leak path.
4. ~~Precedent. Refer to API 650 paragraph 7.3.4 item 4) for sumps, where PT with 'no indications' is allowed as an alternative to Vacuum Box, SFT, or penetrating oil.~~
5. Rev 1: Applicability updated to cover tank components which ~~are known to~~ have impractical surface configurations for vacuum box testing ~~such as certain floating roof deck and compartment welds.~~

Proposed Changes:

Rev 2 (Rev 2 changes marked in green)

Section 12:

12.1.10 Floating Roofs

12.1.10.1 Repair Work to Steel Floating Roofs

After repair work is complete:

- a) perform a visual examination from the top and bottom side of the floating roof;
- b) perform an air leak, vacuum box, penetrating oil, tracer gas, ~~or no-indication liquid penetrant examination when other examination methods are impractical due to surface configuration to~~ or other applicable non destructive test of the repaired welds (see Annex F).

As an alternative to Item b), conduct a flotation test of the repaired roof.

Examination and acceptance criteria for NDE shall be in accordance with 12.1.

Annex F:

...
PT	No-indication liquid penetrant examination of floating deck seams and other roof joints required to be liquid tight or vapor tight, if not tested by air leak test, penetrating oil, vacuum box, or tracer gas.	API 650, H.6.2, H.6.4, C.3.6 and C.4.2 API 653, 12.1.10.1
...
VB	Floating roof deck seams and other joints required to be liquid tight or vapor tight, if not tested by air leak test, penetrating oil, tracer gas, or no-indication liquid penetrant examination	API 650, H.6.2, H.6.4, C.3.6 and C.4.2 API 653, 12.1.10.1
...
Tracer-Gas	Floating roof deck seams and other joints required to be liquid tight or vapor tight, if not tested by air leak test, penetrating oil, vacuum box, or no-indication liquid penetrant examination	API 650, H.6.2, H.6.4, C.3.6 and C.4.2 API 653, 12.1.10.1
...
Pen. Oil	Floating roof deck seams and other joints required to be liquid tight or vapor tight, if not tested by air leak test, vacuum box, tracer gas, or no-indication liquid penetrant examination when other examination methods are impractical due to surface configuration.	API 650, H.6.2, H.6.4, C.3.6 and C.4.2 API 653, 12.1.10.1
...
Air Test	Floating roof deck seams and other joints required to be liquid tight or vapor tight, if not tested by penetrating oil, vacuum box, tracer gas or no-indication liquid penetrant examination.	API 650, H.6.2, H.6.4, C.3.6 and C.4.2 API 653, 12.1.10.1
...

Acceptance Standards:

....
MT/PT: ASME Section VIII, Appendix 8 (paragraphs 8-3, 8-4, 8-5), where no-indication liquid penetrant examination is specified, the acceptance criteria shall require examined surface to be completely free of indications, including linear, round, or crack-like
....
