



Underground Storage Tanks (UST's)

Metal Integrity and Lining Inspections

Understanding the Inspection Process for Owners and Operators

Presented By:
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Introduction Robert (Bob) McChan

- ✓ Involved with Underground Storage Tanks (UST's) and Aboveground Storage Tanks (AST's) for more than 25 years;
- ✓ Inspection, Maintenance, Repair, Installation, Removal, Lining Inspections, Lining Applications, Tank Systems and Piping, Regulatory Compliance,
- ✓ American Petroleum Institute (API) 653 Tank Inspector
- ✓ Steel Tank Institute (STI) Level II Tank Inspector (Former)
- Kansas and Arkansas UST certified Installation and Removal



Presentation Overview

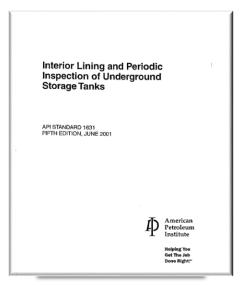
- Regulations and Standards
- Worker Qualifications
- Tank Inspection Requirements
- Tank Inspection Processes
- Tank Lining Requirements
- Tank Lining Application
- Summary
- Questions



Inspection Guidelines

- Underground Storage Tanks

 American Petroleum
 Institute (API) Standard
 I 63 I
- Aboveground Storage Tanks (up to 30 feet diameter)
 Steel Tank Institute SP001
- Aboveground Storage Tanks
 30 foot diameter –
 American Petroleum
 Institute (API) Standard 653









Worker Qualifications

Occupational Safety and Health Administration (OSHA) Requirements

- 29 CFR 1910.120 Hazardous Waste Operations
- ❖ 29 CFR 1910.1200 Hazard Communication
- 29 CFR 1910.146 Permit Required Confined Space
- 29 CFR 1910.147 Energy Isolation (Lockout/Tag out)
- 29 CFR 1910.134 Respiratory Protection







INSPECTIONS



API 1631 – Interior Lining and Periodic Inspection of Underground Storage Tanks

Interior Lining and Periodic Inspection of Underground Storage Tanks

API STANDARD 1631 FIFTH EDITION, JUNE 2001



Helping You Get The Job Done Right!**

- Section I General
- Section 2 References
- Section 3 Definitions
- Section 4 Objectives, Requirements and Specifications
- Section 5 Preparation for Opening the Tank
- Section 6 Tank Entry
- Section 7 Preparation of the Tank Interior
- Section 8 Application of Lining



Un-Lined Steel Tank Inspections Section 7.3 – Tank Inspection

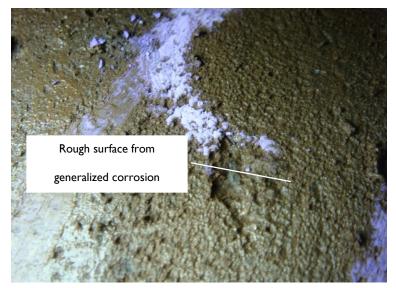
- 7.3.1 General
- 7.3.1.1-7.3.1.2 7.3.1.3 Confined Space Entry Requirements
- 7.3.2 Lighting Equipment
- 7.3.3 Steel Tanks
- 7.3.3.1 For steel tanks, the inspection shall identify those areas where corrosion has taken place and metal thickness has been reduced to 1/8 in. (0.32 cm) or less. Corrosion may take the form of uniform metal loss (general deterioration of a surface area) or may leave a pitted appearance (irregular surface deterioration). Uniform corrosion may be difficult to detect and may require the use on nondestructive techniques, in addition to destructive methods described below, to ensure metal thickness of at least 1/8 in. (0.32 cm).



Un-Lined Steel Tank Inspections Section 7.3 – Tank Inspection (Cont.)

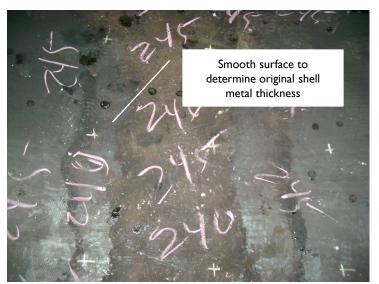
❖ 7.3.3.2 Pitted surfaces may be difficult to detect when there is a question about original metal thickness. As a result, thickness determinations in non-pitted areas are also necessary to establish an original thickness benchmark for comparisons with the pitted areas. Metal thickness determinations can be made by either destructive or nondestructive methods. Nondestructive metal thickness determinations may be made by ultrasonic or radiographic testing methods.



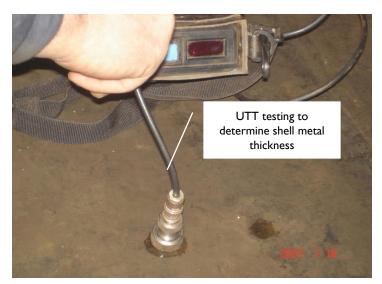




Non Destructive Testing Method – Ultrasonic Thickness Testing to Determine Original Shell Thickness









Un-Lined Steel Tank Inspections Section 7.3 – Tank Inspection (Cont.)

- 7.3.3.3 A destructive test method involves the use of a brass ball-peen hammer to tap the entire shell (a minimum of one tap in every I ft2 (0.093 m2) area and sound for thin areas. If a thin area is detected, the metal should be holed with the hammer or a drill to determine the metal thickness. The thin metal shall be removed until a minimum metal thickness on 1/8 in. (0.32 cm) at the edge of the hole is obtained. This method is often used to inspect underground tanks because corrosion typically takes the form of pitting rather that deterioration over the surface.
- Note: It may be preferable to conduct wire brushing or abrasive grit blasting (SSPC SP7 and SP10) of the internal surface of a tank prior to inspection.



Pit Depth Determinations

What is a pit?
What does it look like?
What are we looking for?
How do we measure?



A pit is an area in a tank where corrosion has taken place in a single area or spot. Pits take on different looks, shapes, depths:





What do we look for?

For steel tanks, the inspection shall identify those areas where corrosion has taken place and metal thickness has been reduced to 1/8 in. (0.32 cm) or less

How are pits measured? Pit Gauges







Once the pits are measured, marked and recorded they are compared to the original tank metal thickness to determine whether any exceed the requirements.





What if we find holes in the tank shell?

Can it still be lined?







7.3.3.4 The following guidelines shall be used to identify a steel tank that is SUITABLE for lining:

- a. A tank with a perforation no larger than $1 \frac{1}{2}$ in. (3.81 cm) in diameter, except under the gauging opening where the perforation may be no larger than $2 \frac{1}{2}$ in. (6.35 cm) in diameter.
- b. A tank with less than 5 perforations [none larger than $\frac{1}{2}$ in. (1.27 cm) diameter] in a I ft² (0.093 m²) area.
- c. A tank with less than 20 perforations [none larger than $\frac{1}{2}$ in. (1.27 cm) in diameter] in a 500 ft² (46.45 m²) area.



7.3.3.5 Steel tanks that exceed any of the guidelines in this section shall not be interior lined unless approved by the tank owner and the authority that has jurisdiction. To determine adherence to these guidelines, perforations shall be brass ball peen hammered (before any abrasive blasting) to remove any thin metal and to obtain structurally sound edges. Perforations shall be reamed until the metal thickness at the edges of the holes is a minimum of 1/8 in. (0.032 cm). Steel tanks meeting the criteria set forth in 7.3.2 shall be prepared as described in 7.4.1.



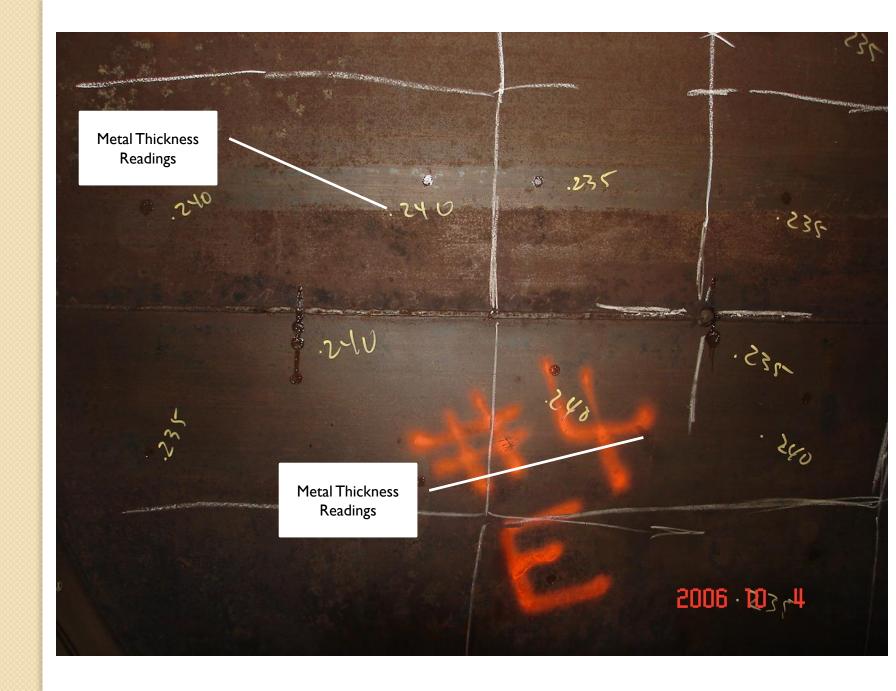
API 1631 Form B (Side 1) -Tank Cleaning, Repair, Lining, Testing and Inspection Affidavit API 1631 Form B (Side 2) -Tightness Test Certification /Material and Performance Certification

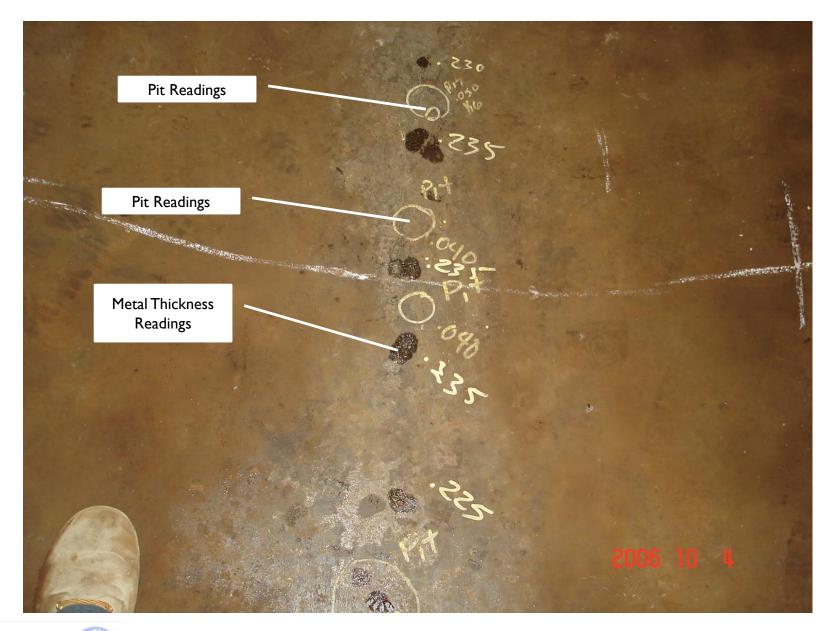
API 1631 Form C - Tank Re-Inspection Affidavit / Tightness Test Certification

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Lining Inspections

Lining inspection are conducted following the guidelines outlined in API 1631 Section 10.4, Paragraph 10.4.3.

- The tank lining is visually inspected for evidence of peeling, blistering, wrinkled surface or surface roughening of the lining material.
- In addition the inspector visually inspects for pitting, rusting, physical damage, water leakage, cracks, streaking, discoloration or other signs of structural instability.
- All areas discovered are marked, noted and photographed.

After the completion of the visual inspection the lining thickness is assessed.

- We utilize a "Elcometer 456" coating thickness gauge to determine existing lining thickness.
- All areas of the lining that do not meet the thickness requirements as outlined in API 1631 Section 8.2 "Lining Requirements", paragraph 8.2.4, (minimum 100 mils with a nominal 125 mils) are noted.
- A Barcol Hardness test is then conducted on the lining material to determine material hardness and that it not beginning to soften or has improper curing.



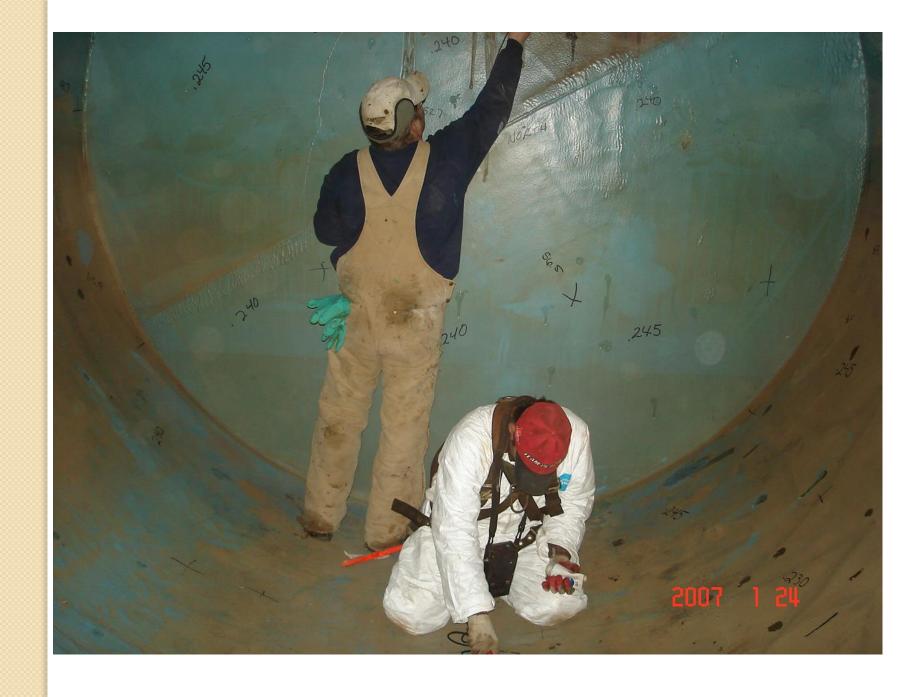
Elcometer 456 Coating Thickness Gauge



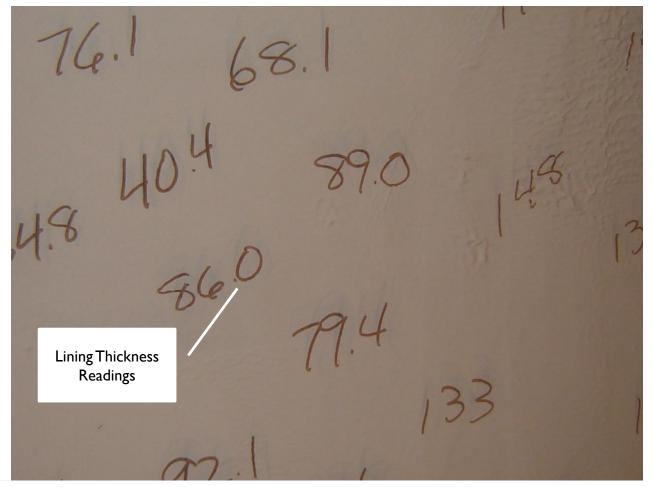
Cygnus 2 Ultrasonic Metal Thickness Tester





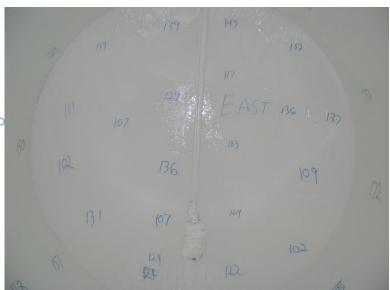


This Tank Fails !! Lining thickness less than the required minimum 100 mil and nominal 125 mil thickness





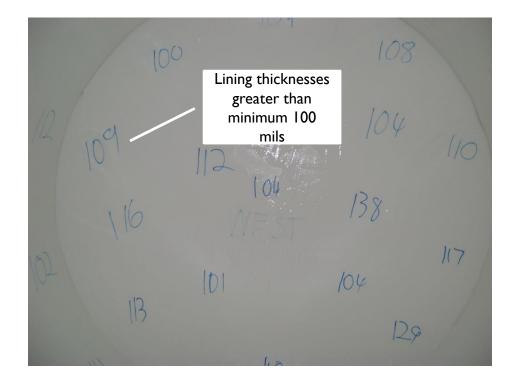






This Tank Passes

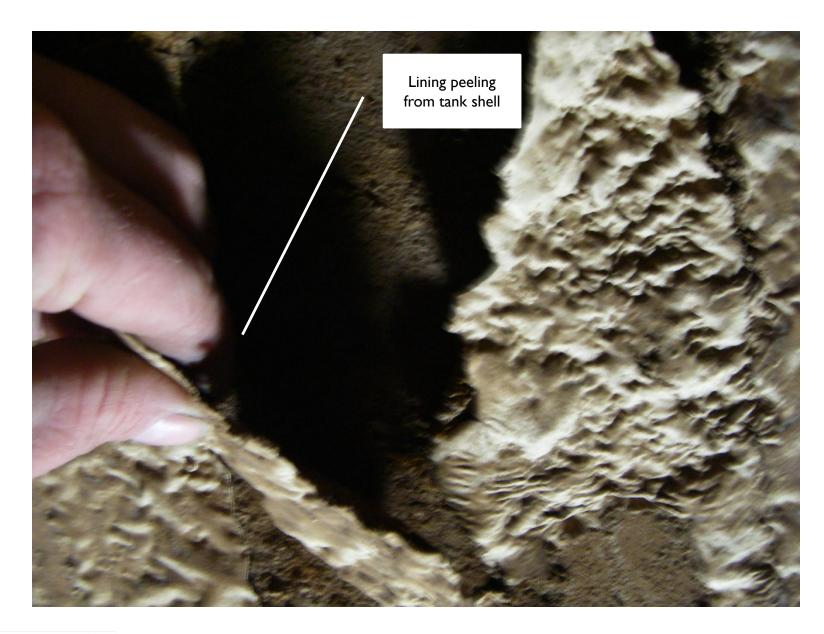




Lining Inspections What we don't want to find !!!

The tank lining is visually inspected for evidence of peeling, blistering, wrinkled surface or surface roughening of the lining material.

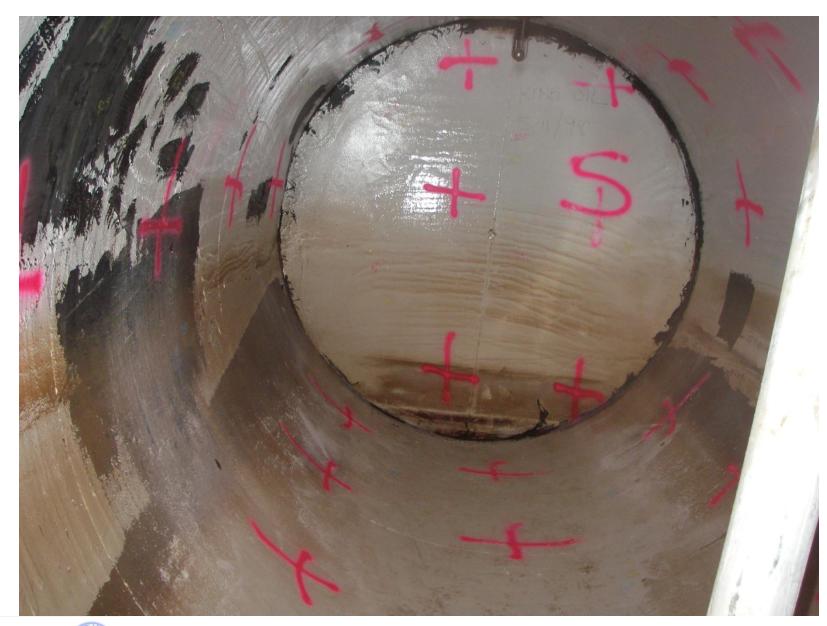










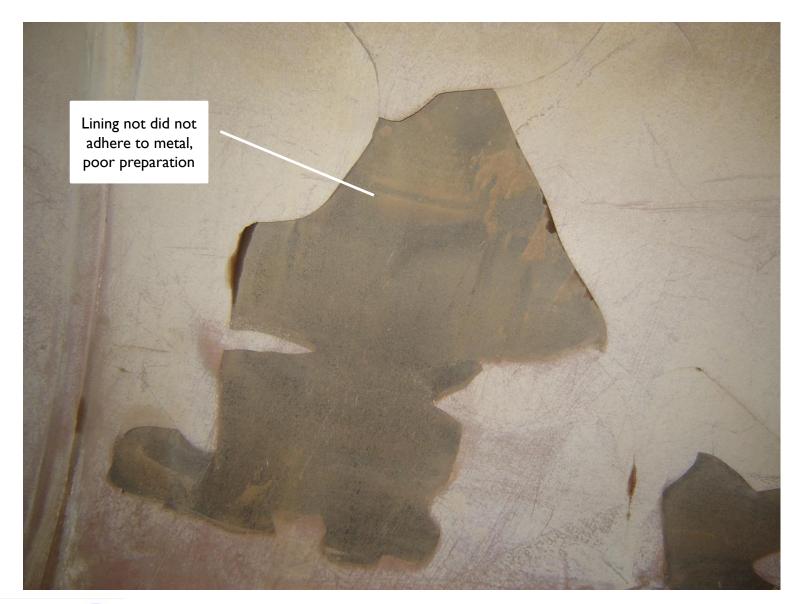
















Vertical AST - Internal Tank Lining 150 Ft. Diameter - 5.2 Million Gallon Tank







QUESTIONS???

Contact Information:

Robert "Bob" McChan API 653 Inspector

bmcchan@genesisenviro.com

Office: 816-229-5900 - Mobile: 816-868-3810

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QUESTIONS?