Inspection of Shop Fabricated ASTs per the SPCC Rule

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Steel Tank Institute
A Division of STI/SPFA
“Few states have any certifications for AST installers and it shows in the creative ways the tank systems are installed.”

- John Cignatta, course instructor for STI AST inspector certification
Review of 28 tanks at a major site

- Nearly 90% lacked adequate venting
- Over 50% lacked adequate containment
- Leaking tank
- Doorways in dikes
- No overfill alarms
Review of 28 tanks at a Major Facility

- Spill Control
- Normal Vent
- Containment
- UL Listing
- Overfill
- Emergency Vent
- Serious Other

% of tanks
Revised SPCC Rules

• References industry standards
  – Tank inspection per API 653 or STI SP001

• Requires “Integrity Testing”
  – Visual inspection alone no longer sufficient
Test Each Aboveground Container for Integrity

- Section 112.8(c)(6)
- On a regular schedule
- Combine **visual inspection** with another testing technique
  - Hydrostatic testing
  - Radiographic testing
  - Ultrasonic testing
  - Acoustic emissions testing
  - Other nondestructive shell testing
- Frequently inspect the outside of container
Show me some tanks!!!
HOME MADE
DO-NUTS
STRAIGHT
AHEAD
WALL DRUG
PLEASE DON'T SHIT AROUND THIS WORK AREA
AST Standards for Shop Fabricated Tanks

- API - American Petroleum Institute
- UL - Underwriters Laboratories
- SwRI - Southwest Research Institute
API Specifications

• API 12F
  – “Specification for Shop Welded Tanks for Storage of Production Liquids”
  – Vertical, cylindrical only

• API 650, Appendix J
  – “Shop Assembled Welded Steel Tanks for Oil Storage”
  – Vertical, cylindrical only
API Vertical Tanks
API Vertical-UL Horizontal Tanks
Underwriters Laboratories

- **UL 142** “Steel Aboveground Tanks for Flammable and Combustible Liquids”
- **UL 2085** “Protected Aboveground Tanks for Flammable and Combustible Liquids”
## UL 142 Steel thickness

### Table 13.1
Minimum steel thickness – horizontal tanks

<table>
<thead>
<tr>
<th>Actual capacity, U.S. gallons (kL)</th>
<th>Maximum diameter, inches (m)</th>
<th>Minimum steel thickness, inch (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Carbon steel</td>
</tr>
<tr>
<td>550 or less</td>
<td>(2.08)</td>
<td>0.093 (2.36)</td>
</tr>
<tr>
<td>551 – 1100</td>
<td>(2.14 – 4.16)</td>
<td>0.123 (3.12)</td>
</tr>
<tr>
<td>1101 – 9000</td>
<td>(4.17 – 34.07)</td>
<td>0.167 (4.24)</td>
</tr>
<tr>
<td>1101 – 35,000</td>
<td>(4.17 – 132.49)</td>
<td>0.240 (6.10)</td>
</tr>
<tr>
<td>35,001 – 50,000</td>
<td>(132.50 – 189.27)</td>
<td>0.365 (9.27)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stainless steel</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.071 (1.80)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.086 (2.18)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.115 (2.92)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.158 (4.01)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.240 (6.10)</td>
</tr>
</tbody>
</table>
UL 142 type tanks
UL 142 type tanks
STEEL TANK INSTITUTE

STANDARD FOR INSPECTION OF IN-SERVICE SHOP FABRICATED ABOVEGROUND TANKS FOR STORAGE OF COMBUSTIBLE AND FLAMMABLE LIQUIDS

SP001-00

STI SP001-03

Standard for Inspection of In-Service Shop Fabricated Aboveground Tanks for Storage of Combustible and Flammable Liquids
How STI SP001 differs from API 653

• API 653 emphasis is the large, field constructed tanks per API 650.
  – Strictly vertical tanks.
  – The bottom of the tank is not visible.

• API 653 requirements are needed because
  – Large volume
  – Large pressure
How STI SP001 differs from API 653

- API 650 includes equations for calculating the steel thickness needed for a particular tank.

- API 653 allows for / requires more judgement by inspector
How STI SP001 differs from API 653

- Shop fabricated tanks
  - Tables that specify the steel thickness based on tank diameter and capacity.
  - Smaller capacities and smaller hydrostatic pressures
  - Capacity up to 50,000 gallons.
  - Manufactured in controlled shop environments
50,000 gallon tank
Corrosion concerns

- Check corroded areas to find minimum thickness
Single wall tanks resting directly on the ground are a concern!!
Periodic Inspection by tank owner

- Water inside tank
- Vents
- Pipe connections
- Exterior paint
- Foundation

[www.steeltank.com/library/pubs/waterinfueltanks.htm]
Certified Inspection

• Performed by Qualified Tank Inspector
  – STI Trained and Certified
  – API Certified
• Every 10 Years
• All types of tanks (single and double wall, on ground and elevated)
STI AST Inspector Training

NEW for 2004

• Level 1
  – Tank inspector

• Level 2
  – Tank system inspector

• Michigan
  – May 24 - 28

• New York
  – June 14 - 18

• California
  – July 19 - 23

• Tennessee
  – November 20 - 2
Level 2 – Tank System

Aboveground Fuel Storage - Suction System
Rectangular double-wall tank with remote fill and remote pump

AST Bulk Storage
Emergency Vent (Threaded or Flanged)

Internal Emergency Valve
Automatic reset relief valve located below the vapor vent of the storage tank and linked to the inside tank.

Gate Valve with Expansion Relief
Expansion joint located above allows excess pressure due to temperature gain to bleed back to tank.

Frost Proof Drain Valve
Drain located just below bottom of tank to be drained off. Seat is located up against the tank shell.

Normal (P.O.) Vent - and with Flame Arrestor

Morrison Bros. Co. • P.O. Box 238 • Dubuque, IA 52004 • Ph: 319-583-5704 • Fax: 319-583-0028
STI Certified Inspection

• Tank type dictates inspection method:
  – Single wall not in contact with ground
  – Single wall in contact with ground
  – Double wall or double-bottom
Double wall or:

- Check leak detection system
- Check for water or fuel in interstice
STI Certified Inspection

• UT Testing by scanning if possible
  – Most reliable method for determining wall thickness
  – Qualified UT inspector necessary (ASNT Specifications)
6. Certified Inspection Criteria

- Must compare **remaining wall thickness** to original thickness
STI SP031-04

Standard for Repair of In–Service Shop Fabricated Aboveground Tanks for Storage of Combustible and Flammable Liquids
SP031 Repair Standard

- Patches
- New bottoms
- Addings
- Supervising Personnel
  - STI inspectors
  - API inspectors
- Modifications
- Repair Personnel
  - Tank manufacturer
  - ASME welders
  - AWS welders
- Testing of repairs
Not all that meets the eye!

Tank owner surprises
Tank #1
Tank #1

- No grounding anywhere
- Unsecured AST's in a flood plain (Not a single anchor bolt)
- Many Electric Code Violations
- Improperly Secured Conduits
- OSHA Access Issue on the back stairs and top platform
- PVC Caps atop various nozzles (No Fire Rating for PVC)
- Labeling Issues
Tank #2
Tank #2

- Unsupported Pipes
- Leaking Submersible Turbine Pump
- Kinked Flex Cc
- Improperly Inst Fuel
- No CP on burie pipe runs
- Electric Code \n
- Combustible Materials stored inside dike
- Poor Control on Tank Filling Rg
- Conduits pipes in
- Pipes an close in
- Unsupport
- Missing I
Tank #3
Tank #3

- Unsupported conduits
- Valve on Return Piping
- PVC Conduits support tank nozzle
- Flex Fuel lines secured to Unistrut conduit clamps
- Normal vent on secondary tank's bottom
- No vehicle Protection (i.e., bollards)
- No fire diamonds
- Improper labeling of nozzles
- Tank not being stick to check either ATG accuracy or accumulation of water
  - Veeder water float can get hung up on rusty muck/mud forms in bottom)
Get the BIG picture first
From 20 feet away….

- Dirt spots on tank, fuel spilled?
- Coated for underground?
- Tank next to river, is it anchored?
- Supports more than 12 in. high?

- Enough openings on top?
- Adequate containment?
- Paint condition?
- Level gauge visible?
- Condition of foundation?
Closer inspection

- Emergency vent condition?
- Normal vent condition?
- Weep holes? Use UV light here
- Adequate supports?
- Look inside tank, but with proper training only.
New STI Standards Committee

To review inspection standards

SP001
SP031
Does this Comply?
Inspection of Tanks Keeps Things Happy