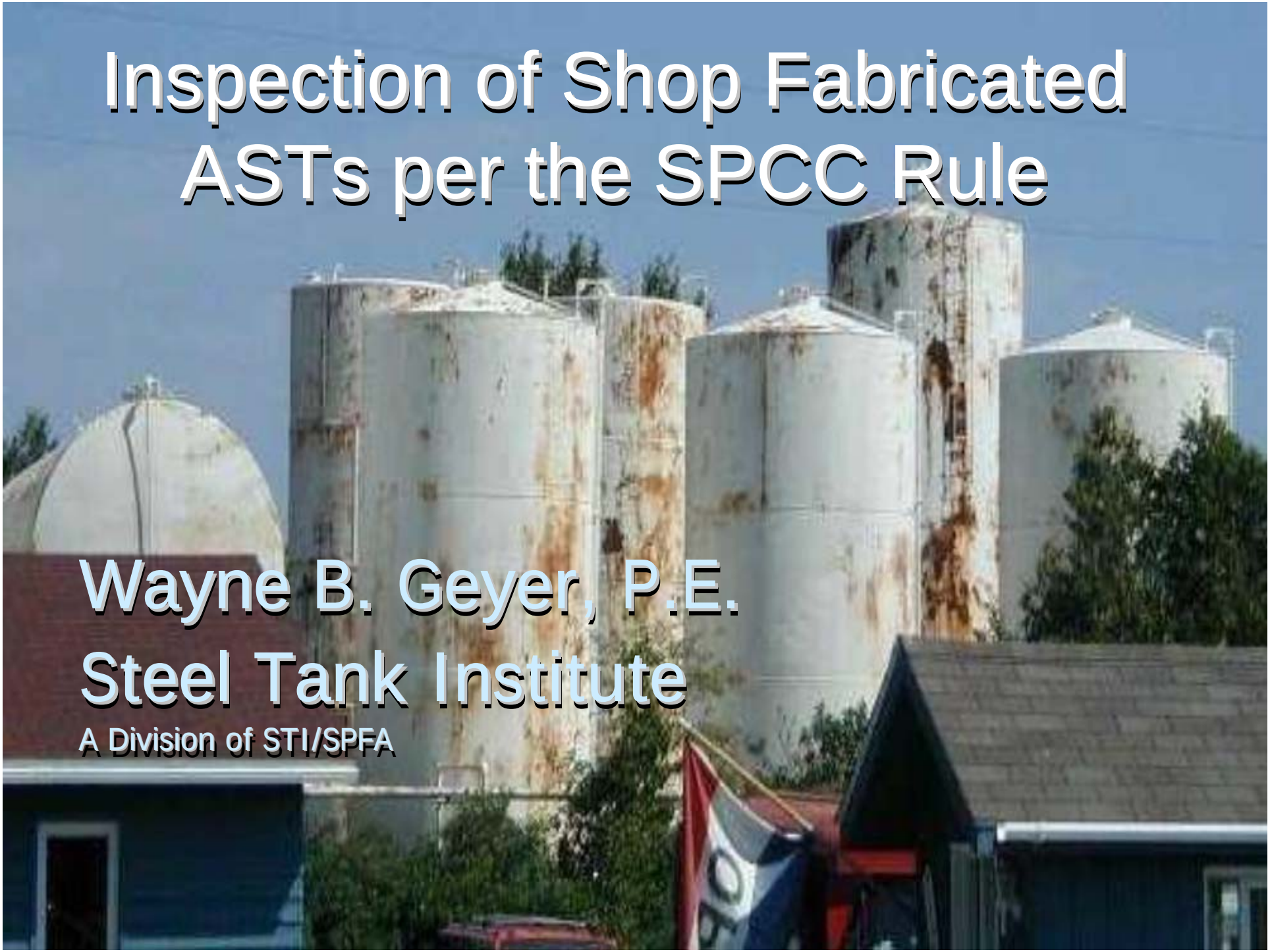
Inspection of Shop Fabricated ASTs per the SPCC Rule



Wayne B. Geyer, P.E.

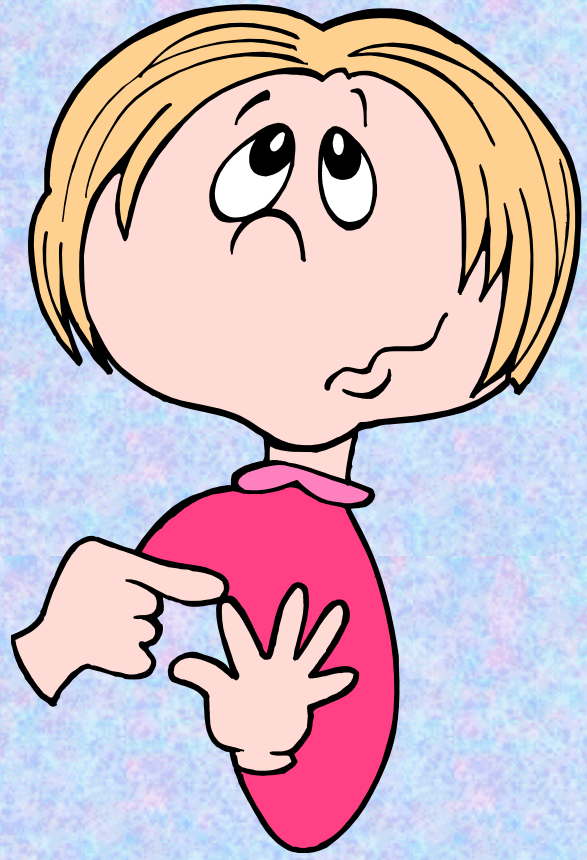
Steel Tank Institute

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."

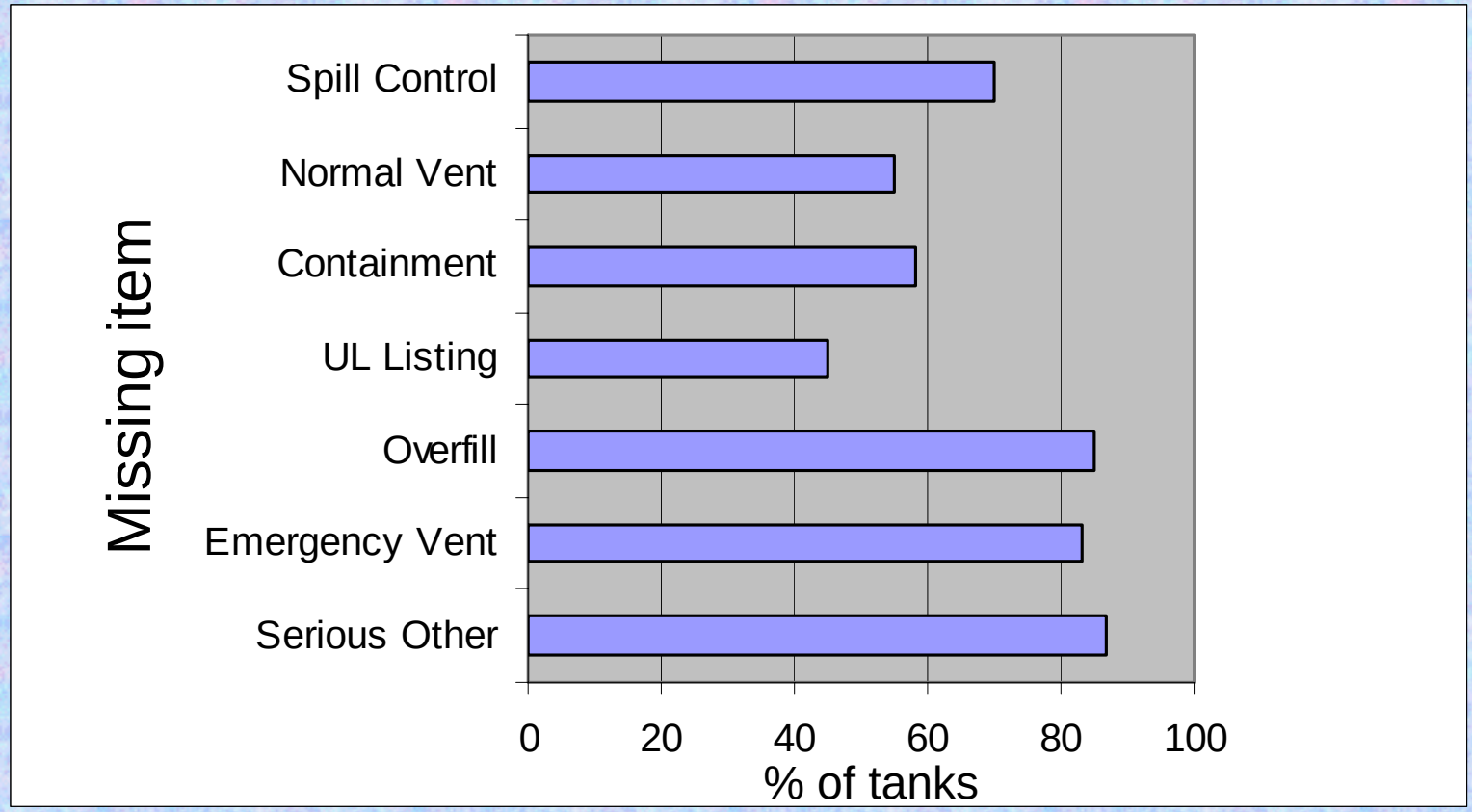
- John Cignatta, course instructor for STI AST inspector certification

Review of 28 tanks at a Major Facility



- 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



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!!!


modern
modern


HOME MADE
DO-NUTS
STRAIGHT
AHEAD
WALL DRUG


TOYOTA


KARTTS


SERVICE
TANK
LOUISVILLE KY
PLEASE DONT SHIT
AROUND THIS WORK AREA
FEB 22 2002

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"

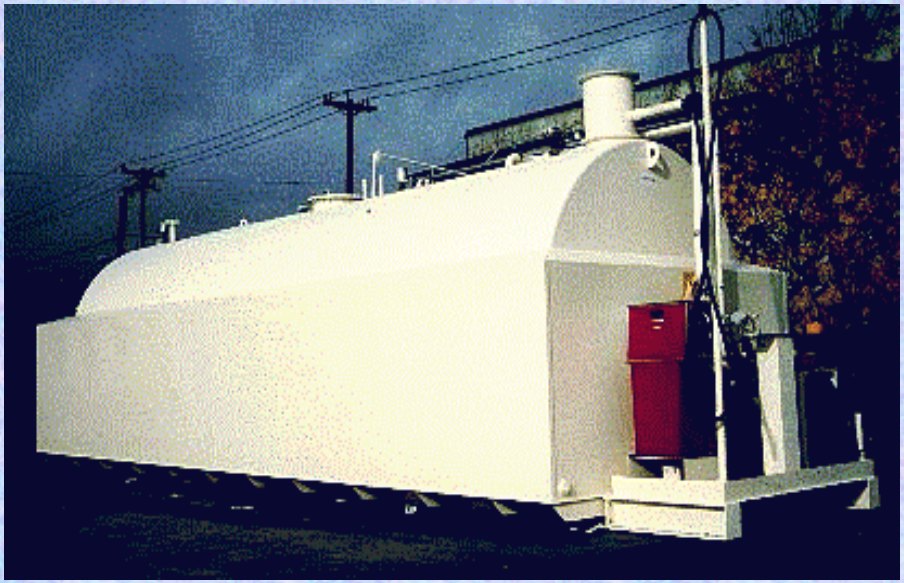
UL 142 Steel thickness

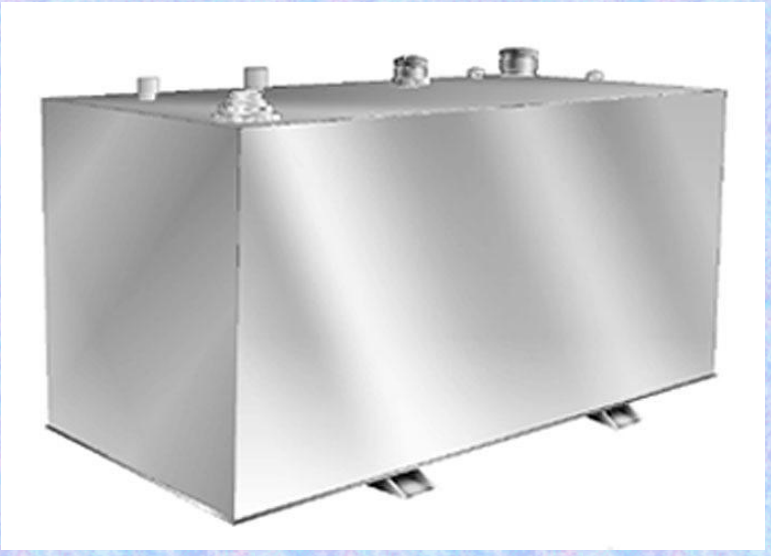
Table 13.1
Minimum steel thickness – horizontal tanks

Actual capacity, U.S. gallons (kL)		Maximum diameter, inches (m)	Minimum steel thickness, inch (mm)	
			Carbon steel	Stainless steel
550 or less	(2.08)	48 (1.22)	0.093 (2.36)	0.071 (1.80)
551 – 1100	(2.14 – 4.16)	64 (1.63)	0.123 (3.12)	0.086 (2.18)
1101 – 9000	(4.17 – 34.07)	76 (1.93)	0.167 (4.24)	0.115 (2.92)
1101 – 35,000	(4.17 – 132.49)	144 (3.66)	0.240 (6.10)	0.158 (4.01)
35,001 – 50,000	(132.50 – 189.27)	144 (3.66)	0.365 (9.27)	0.240 (6.10)

UL 142 type tanks

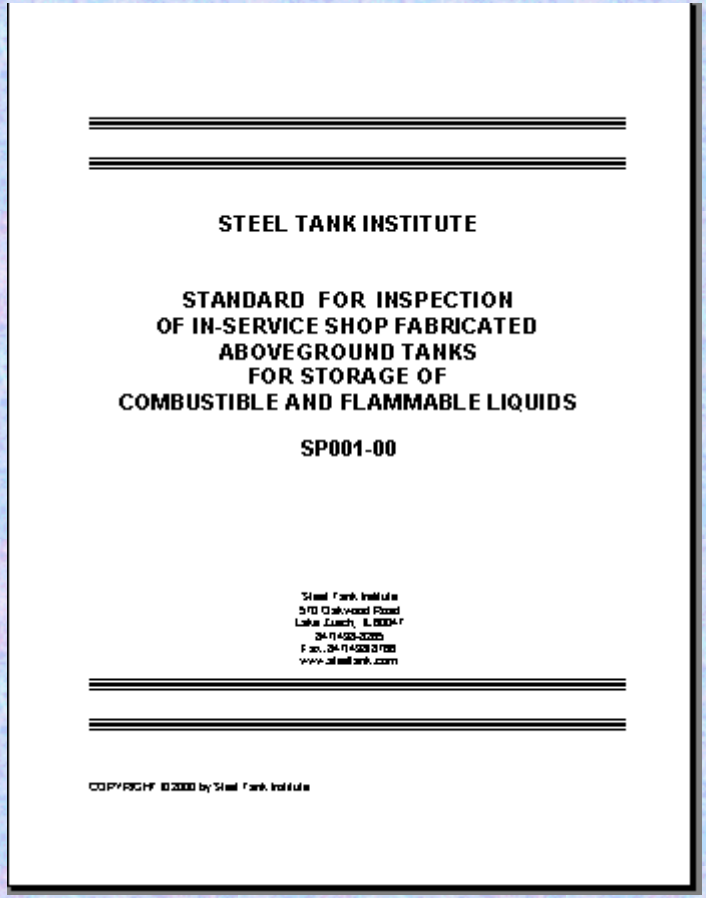
UL 142 type tanks






PELIGRO INFLAMABLE

STI SP001-03



STEEL TANK INSTITUTE

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

SP001-00

Steel Tank Institute
570 Oakwood Road
Lake Zurich, IL 60047
847/438-8265
Fax: 847/438-8766
www.steeltank.com

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)

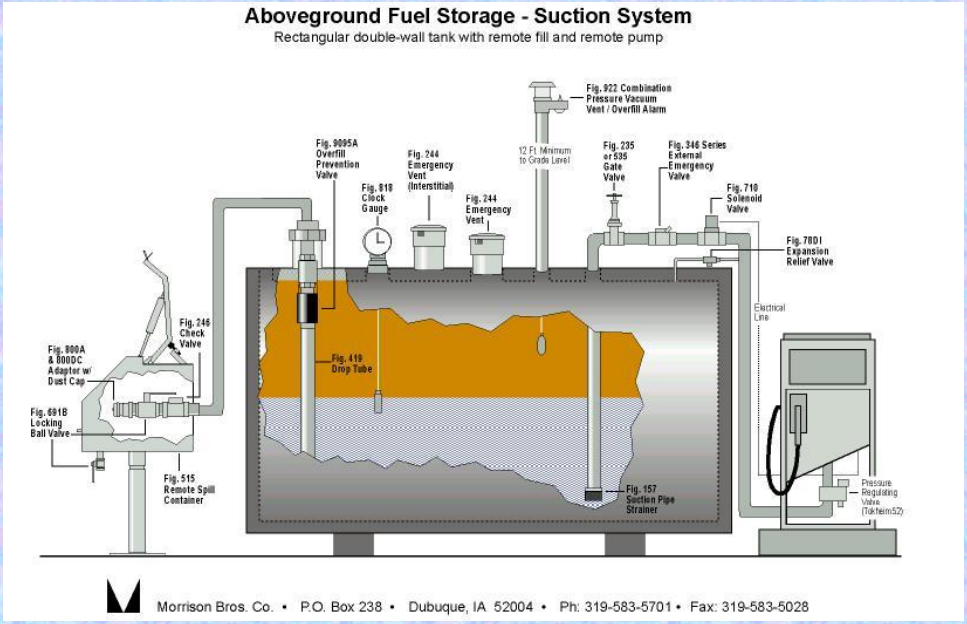
STI AST Inspector Training

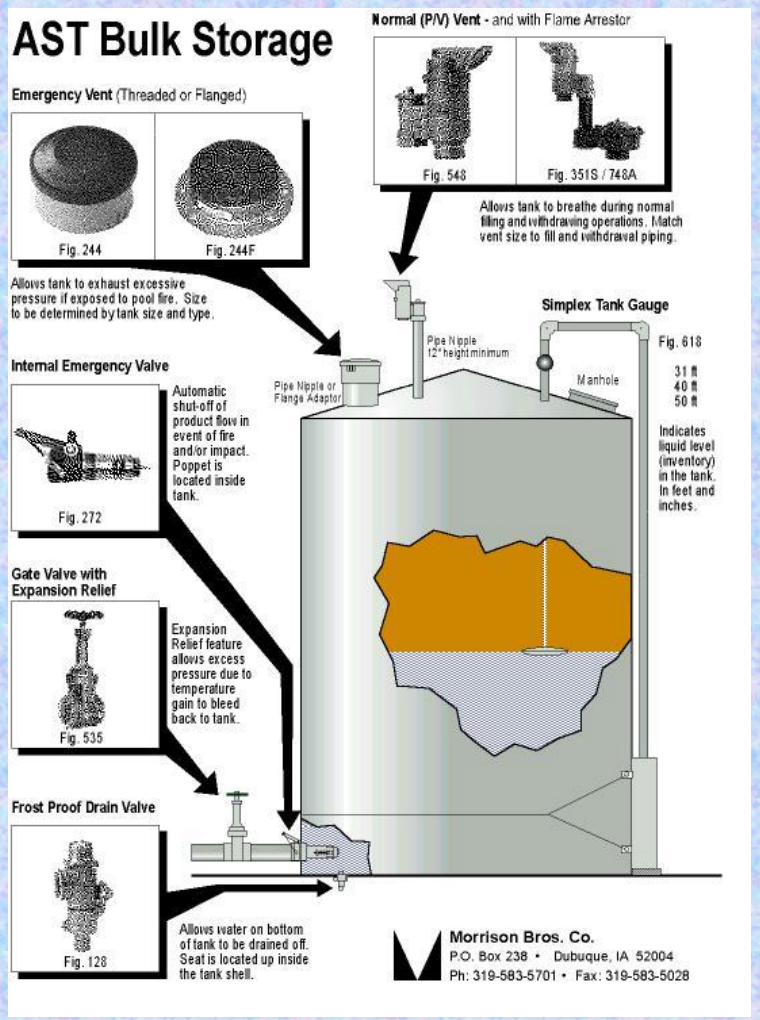
NEW for 2004

- Level 1
  - Tank inspector
- Level 2
  - Tank system inspector

- Michigan
  - May 24 - 28
- New York
  - June 14 - 18
- California
  - July 19 - 23
- Tennessee
  - September 20 - 24

Level 2 – Tank System





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 double-bottom

- Check leak detection system
- Check for water or fuel in interstice

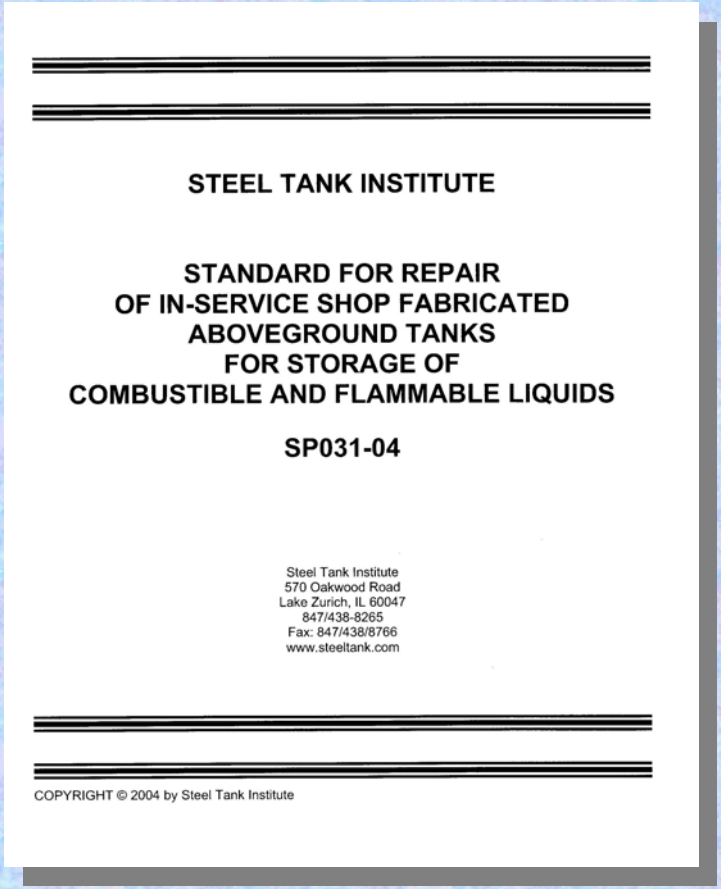
STI Certified Inspection

- 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


STEEL TANK INSTITUTE

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

SP031-04

Steel Tank Institute
570 Oakwood Road
Lake Zurich, IL 60047
847/438-8265
Fax: 847/438/8766
www.steeltank.com

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

SP031 Repair Standard

- Patches
- New bottoms
- Adding openings
- Support modifications
- Testing of repairs

- Supervising Personnel
  - STI inspectors
  - API inspectors
- Repair Personnel
  - Tank manufacturer
  - ASME welders
  - AWS welders

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 Connector
- Improperly Installed Fuel Piping
- No CP on buried fuel pipe runs
- Electric Code Violations
- Combustible Materials stored inside dike
- Poor Control on Tank Filling Routine Spillage
- Conduits between fuel pipes in pipe trench
- Pipes and conduits too close in pipe trench
- Unsupported Conduits
- Missing Fire Diamonds

Tank #3

Tank #3

- Unsupported conduits
- Valve on Return Piping
- PVC Caps on various tank nozzles
- Flex Fuel lines secured to Unistrut with conduit clamps
- Normal vent on secondary tank's annular space
- No Vehicle Damage Protection (i.e., bollards)
- No fire diamonds
- Improper labeling of nozzles
- Tank not being sticked to check either ATGS accuracy or accumulation of water
  - Veeder-Root bottom water floats can get hung up on shafts if 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?


sti-P3

Inspection of Tanks Keeps Things Happy