North Carolina Department of Environment and Natural Resources
Underground Storage Tank Section

UST System Design
• UST system designs must meet current UST performance standards (15A NCAC 2N)
• UST system designs must be certified by a North Carolina professional engineer
UST System Design

• 15A NCAC 2N “Criteria and Standards Applicable to Underground Storage Tanks”
  – Section .0900 “Performance Standards for UST Systems and UST System Component Installation or Replacement Completed on or After November 1, 2007”

• Other Non-UST Section Standards (e.g., Fire Codes, NCDENR Air Quality Standards, Building Codes)
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15A NCAC 2N .0900 affect:

• Installations completed on or after November 1st, 2007

• Replacements on existing UST systems on or after November 1st, 2007

• Notification requirements
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15A NCAC 2N .0900 applies to:

- Tanks
- Piping
- Associated components (e.g., dispensers, submersible turbine pumps)
- Containment sumps
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15A NCAC 2N .0900 applies to:

- Spill buckets
- Siting for new and replacement systems
- Operation and maintenance
- Emergency generator tanks
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15A NCAC 2N .0900 does not apply to:

- Vent lines
- Vapor recovery systems
- Gravity-fed vertical fill ports
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Tanks

**Double-Walled**

- Fiberglass Reinforced Plastic (FRP)
UST System Design

Tanks

**Double-Walled**

- Fiberglass Reinforced Plastic (FRP)
- Steel Clad with FRP or Polyurethane
UST System Design

Tanks

*Double-Walled*

- Fiberglass Reinforced Plastic (FRP)
- Steel Clad with FRP or Polyurethane
- Steel Jacketed with FRP
UST System Design

Tanks

Double-Walled

- Fiberglass Reinforced Plastic (FRP)
- Steel Clad with FRP or Polyurethane
- Steel Jacketed with FRP
- Steel with Cathodic Protection
UST System Design

Tanks

Double-Walled with Continuous Monitoring

- Vacuum
- Pressure
- Hydrostatic (Brine)
UST System Design

Tanks

*Double-Walled with Continuous Monitoring*

- Vacuum
- Pressure
- Hydrostatic (Brine)

In NC, dual-float hydrostatic sensors are required
UST System Design

Tanks

Double-Walled with Continuous Monitoring

- Vacuum
- Pressure
- Hydrostatic (Brine)
- Liquid Detecting Sensor w/ Periodic Interstitial Tightness Tests
LIQUID DETECTING SENSOR + PERIODIC INTERSTITIAL TIGHTNESS TESTS
Sensor must be at lowest point within interstice

- Location must be verifiable (e.g., position-sensitive sensor)

LIQUID DETECTING SENSOR + PERIODIC INTERSTITIAL TIDINESS TESTS
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PeriodicInterstitialTightness Tests (0.1 gph)

- Conducted at startup
- Within 6-12 months of startup
- Every 3 years thereafter

LIQUID DETECTING SENSOR + PERIODIC INTERSTITIAL TIGHTNESS TESTS
UST System Design

Interstitial tightness tests are NOT the same as tank tightness tests.

Only specific tank make and models have 3rd-party certified tests available

LIQUID DETECTING SENSOR + PERIODIC INTERSTITIAL TIGHTNESS TESTS
# UST System Design

## Table 3

Minimum Test Times for Modern Welding Tanks Glasteel II Model GS-13, GS-16, and Glasteel Model GS-19*

<table>
<thead>
<tr>
<th>Tank Capacity (gal.)</th>
<th>Tank Diameter (in.)</th>
<th>Modern Test Time (hrs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>550</td>
<td>48</td>
<td>2</td>
</tr>
<tr>
<td>1000</td>
<td>48</td>
<td>3</td>
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<td>2000</td>
<td>64</td>
<td>4</td>
</tr>
<tr>
<td>3000</td>
<td>64</td>
<td>5</td>
</tr>
<tr>
<td>4000</td>
<td>64</td>
<td>6</td>
</tr>
<tr>
<td>4000</td>
<td>84</td>
<td>6</td>
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<tr>
<td>5000</td>
<td>72</td>
<td>7</td>
</tr>
<tr>
<td>5000</td>
<td>84</td>
<td>7</td>
</tr>
</tbody>
</table>

* LIQUID DETECTING SENSOR + PERIODIC INTERSTITIAL TIGHTNESS TESTS
UST System Design

Retrofits: Make sure position-sensitive sensor will fit

Retrofits: Make sure tank has an interstitial tightness test available

LIQUID DETECTING SENSOR + PERIODIC INTERSTITIAL TIGHTNESS TESTS
UST System Design

Piping

- Double-walled
- Non-corrodible
- UL 971 “Nonmetallic Underground Piping For Flammable Liquids”
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Piping

*Double-Walled with Continuous Monitoring*

- Vacuum
- Pressure
- Hydrostatic
- Electronic liquid-detecting sensor in sump that piping interstice drains to with primary and secondary wall integrity test every three years
Double-walled piping monitored with sump sensors must have interstice open to containment sumps.
Piping with Open Interstice
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Detectable Tape

- Piping must be installed with a means to locate it (e.g., detectable tape commonly used by utilities)
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Detectable Tape

*Provides:*
- Remote detection
- Provides early warning during excavation / drilling
UST System Design

Detectable Tape

*Consider:*
- Maximum detectable depth
- Active vs. passive detection

Consider using one strip of detectable tape per line
PUST System Design

Piping

- Pressurized piping must still have Automatic Line Leak Detectors (ALLDs)
- Suction piping, including European, and siphon bars must meet new standards
- Metal fittings, flex connectors and single-walled components must be in monitored containment sumps
UST System Design

Associated Components

Secondary containment with interstitial monitoring required:
(Must maintain 12 months of monthly printed records of release detection results and alarm history)

- Underground ancillary equipment
- Dispensers
- Line leak detectors
- Submersible pumps
- Remote fill pipes, etc.
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Containment Sumps

- Designed, constructed, installed, and maintained to prevent water infiltration
- Visually inspected annually
- Non-corrodible
UST System Design

Containment Sumps

*Continuous interstitial monitoring required:*
(Must maintain 12 months of monthly printed records of release detection results and alarm history)

- Vacuum
- Pressure
- Hydrostatic
- Electronic liquid-detecting sensor no more than two inches from sump bottom with integrity test every three years
Reminder: All metal or single-walled components must be installed within monitored containment sumps.
Spill Buckets

- Double-walled
- Non-corrodible OR isolated from backfill
- Prefabricated
- Designed, constructed, installed and maintained to prevent water infiltration
Spill Buckets

*Continuous interstitial monitoring required:*
(Must maintain 12 months of monthly printed records of release detection results and alarm history)

- Vacuum
- Pressure
- Hydrostatic
- Electronic liquid-detecting sensor with integrity test every three years
Overfill Prevention

- Automatic Shutoff (e.g., Flapper Valve)
- Vent Restriction Device (e.g., Ball Float)
- Overfill Alarm

Overfill prevention equipment must be tested annually for functionality.
Ball floats cannot be used with pressurized deliveries

Ball floats cannot be used with suction pumps with air eliminators

Ball floats cannot be used with coaxial Stage I vapor recovery

Ball floats cannot be used with gauge opening-style fills
When installing both a flapper valve and ball float, the flapper valve must be installed below the level of the ball float.
Overfill alarms must be located within visual/audible distance to fill port
UST System Design

Electronic Sensors (Interstitial / Sump Sensors)

- Must be certified by a third-party in accordance with federal UST requirements
- Must be compatible with product that they may come in contact with
- Electronic liquid-detecting sensors must detect any liquid and activate an alarm

- Discriminating sensors must alarm in both water and product
- Any liquid detected must be removed within 48 hours
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Monitoring Console

- Must be compatible with the electronic sensors being used
- Provide a printed record of release detection results
- Provide a printed record of alarm history
UST System Design

Siting UST Systems

*UST systems and UST system components prohibited from being installed:*

- In contact with contaminated soil or free product

If contamination is discovered during excavation, you must contact the UST Section - Corrective Action Branch at the appropriate NCDENR Regional Office before continuing.
UST System Design

Siting UST Systems

After contaminated soils are removed under the direction of the UST Section – Corrective Action Branch:

- Minimum of 2 feet of clean backfill between tank and sidewalls of excavation
- Minimum of 1 foot of clean backfill underneath tank
Siting UST Systems

After contaminated soils are removed under the direction of the UST Section – Corrective Action Branch:

• Minimum of 6 inches of clean backfill on sides and beneath piping
UST System Design

Siting UST Systems

_UST systems and UST system components prohibited from being installed:_

- Within 100 feet of well serving public water system
- Within 50 feet of any other well (human consumption)

During the UST system design phase, the presence of any wells on and off the property should be investigated.
UST System Design

Emergency Generator UST Systems

- Must comply with the new performance standards including secondary containment and interstitial monitoring
Periodic Testing Requirements

Tanks (interstice monitored with liquid-detecting sensor)

- Periodic Interstitial Tightness Test
  - Must be capable of detecting 0.1 gph leak
  - Must be third-party certified
  - Must be conducted at startup, within 6 and 12 months of startup and every 3 years thereafter
Periodic Testing Requirements

Piping (interstice monitored with liquid-detecting sensor)

- Integrity test of primary piping (i.e., line leak test)
- Integrity test on secondary piping (i.e., air test on interstice)
- Maintain results of most recent tests
Periodic Testing Requirements

**Containment Sumps (monitored by liquid-detecting sensors)**

- Integrity test every three years, maintain most recent test
- Visually inspect annually, empty water/regulated substance within 48 hours of discovery
- Maintain results of most recent visual inspection
Periodic Testing Requirements

Spill Buckets (monitored by liquid-detecting sensors)

- Integrity test of primary and secondary walls every three years
- Maintain results of most recent test
Periodic Testing Requirements

Overfill Prevention Equipment

• Checked annually for operability and proper operating condition
• Maintain results of most recent check
Periodic Testing Requirements

Automatic Line Leak Detectors (ALLD)
• Annual functionality test
• Maintain results of most recent test
Periodic Testing Requirements

*Electronic monitoring sensors*

- Checked annually for operability, proper operating condition and proper calibration
- Maintain results of most recent check
North Carolina Department of Environment and Natural Resources
Underground Storage Tank Section

Questions?