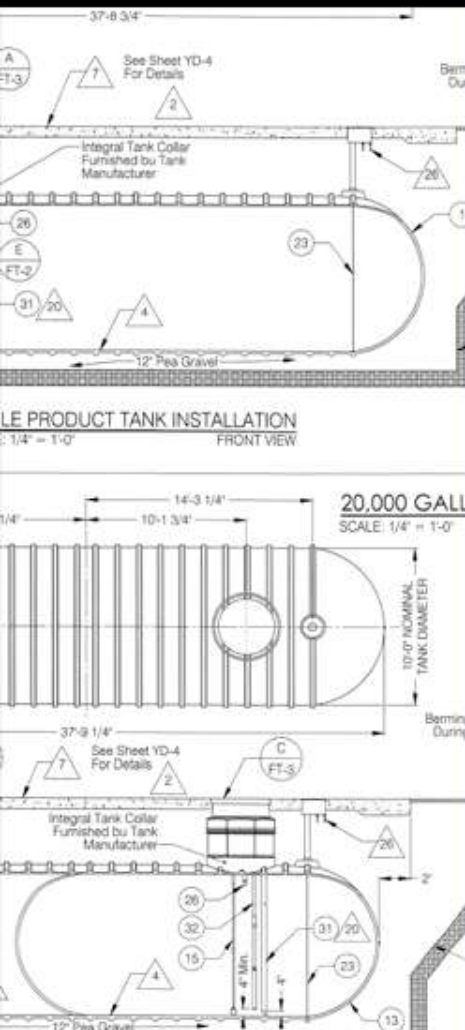


North Carolina Department of Environment and Natural Resources Underground Storage Tank Section



UST System Design

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)

UST System Design

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

UST System Design

15A NCAC 2N .0900 applies to:

- Tanks
- Piping
- Associated components (e.g., dispensers, submersible turbine pumps)
- Containment sumps

UST System Design

15A NCAC 2N .0900 applies to:

- Spill buckets
- Siting for new and replacement systems
- Operation and maintenance
- Emergency generator tanks

UST System Design

15A NCAC 2N .0900 does not apply to:

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



UST System Design

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

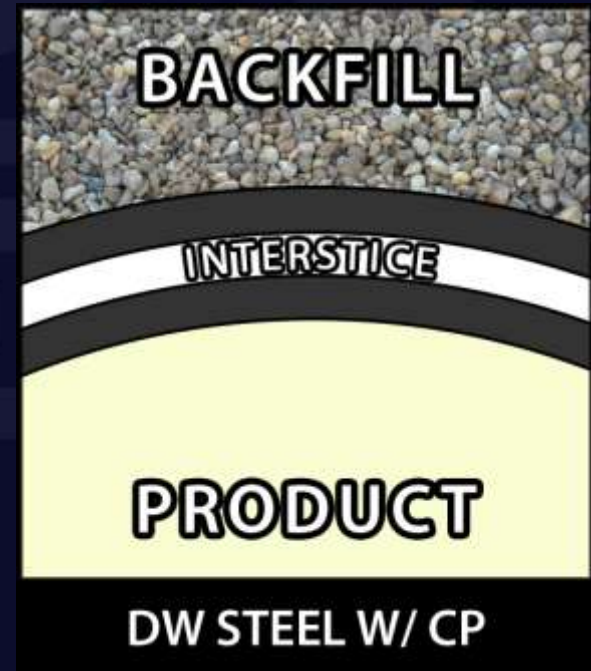


UST System Design

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

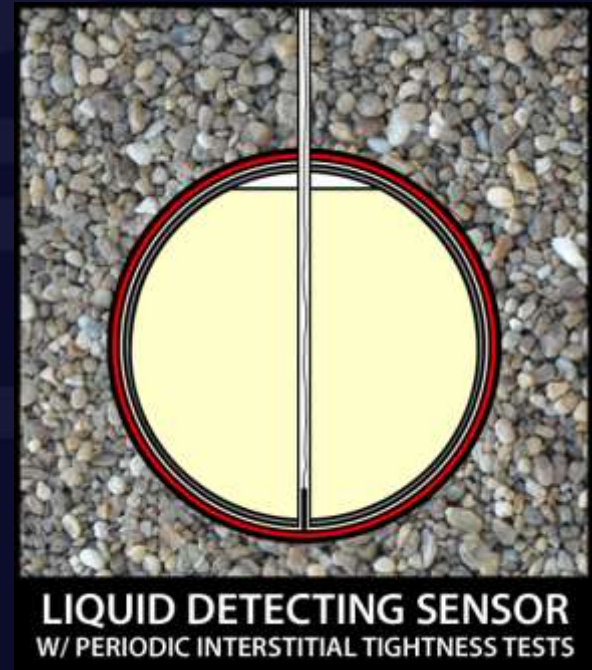


UST System Design

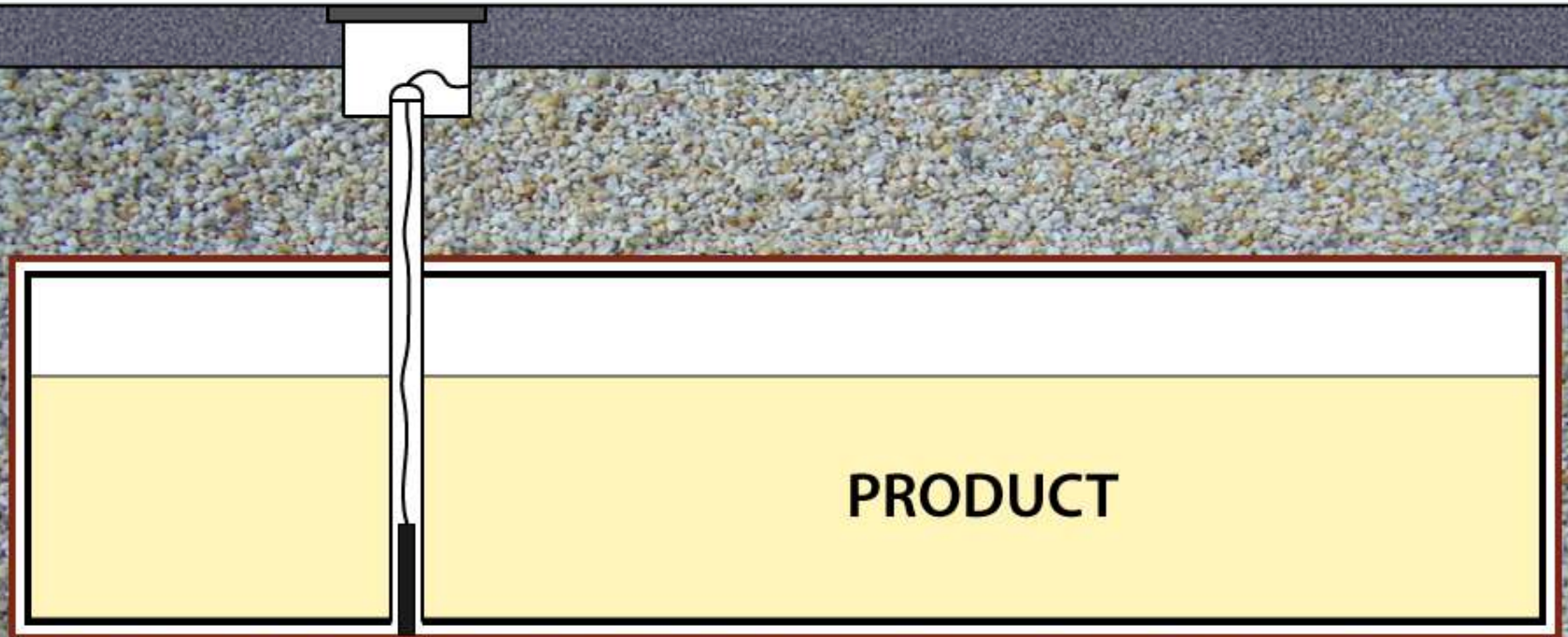
Tanks

Double-Walled with Continuous Monitoring

- Vacuum
- Pressure
- Hydrostatic (Brine)
- Liquid Detecting Sensor w/
Periodic Interstitial Tightness Tests

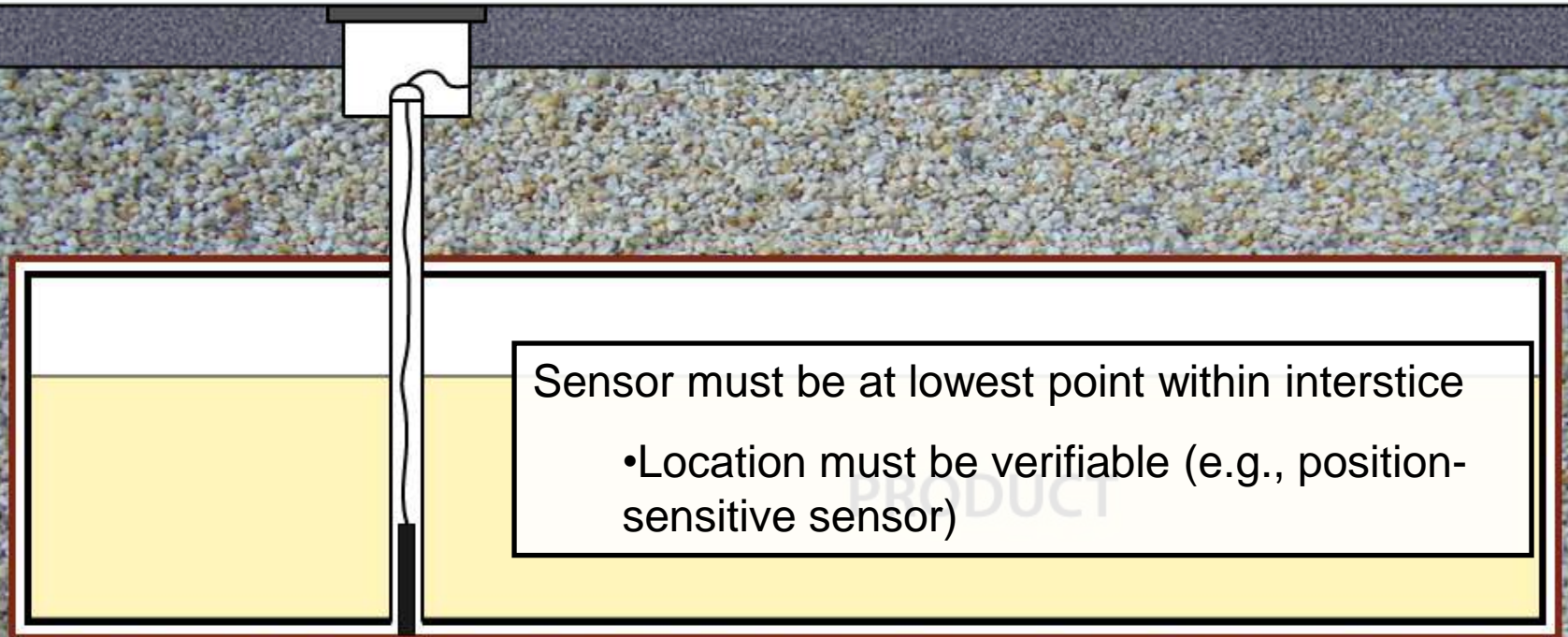


UST System Design



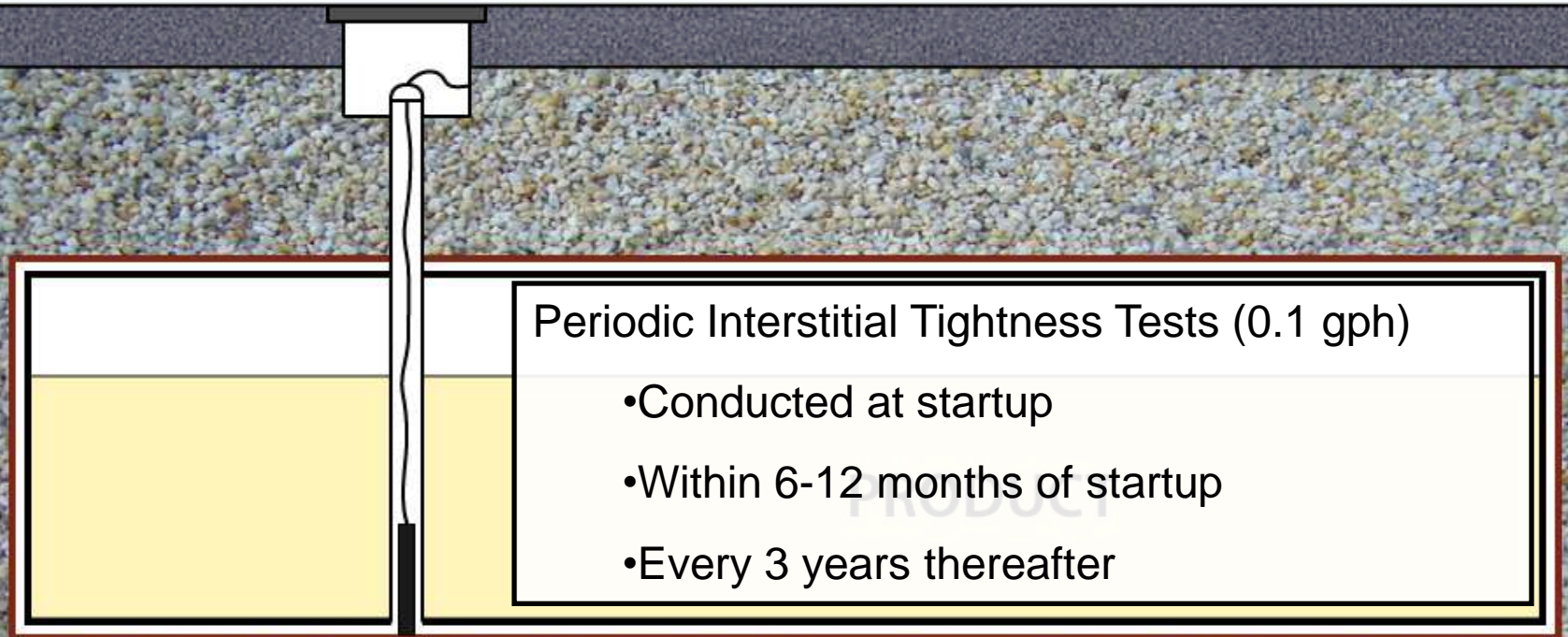
**LIQUID DETECTING SENSOR +
PERIODIC INTERSTITIAL TIGHTNESS TESTS**

UST System Design



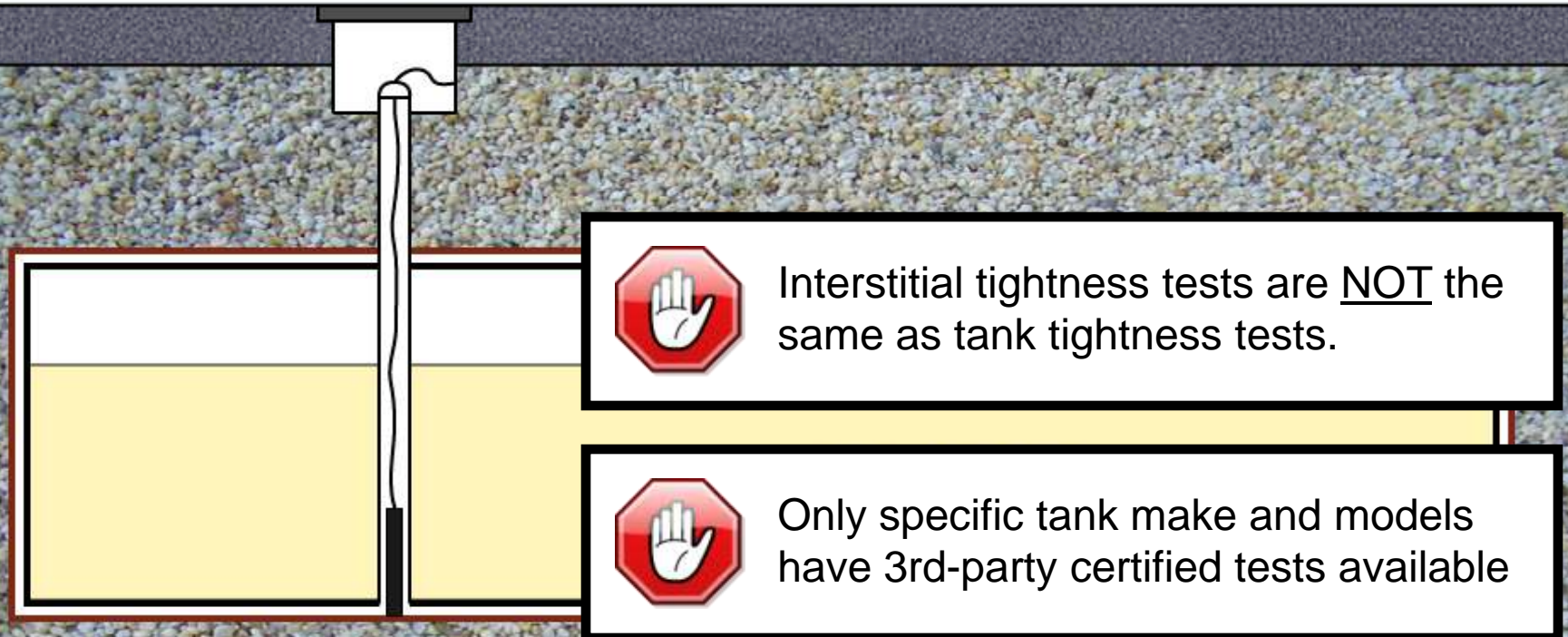
**LIQUID DETECTING SENSOR +
PERIODIC INTERSTITIAL TIGHTNESS TESTS**

UST System Design



**LIQUID DETECTING SENSOR +
PERIODIC INTERSTITIAL TIGHTNESS TESTS**

UST System Design



**LIQUID DETECTING SENSOR +
PERIODIC INTERSTITIAL TIGHTNESS TESTS**

UST System Design

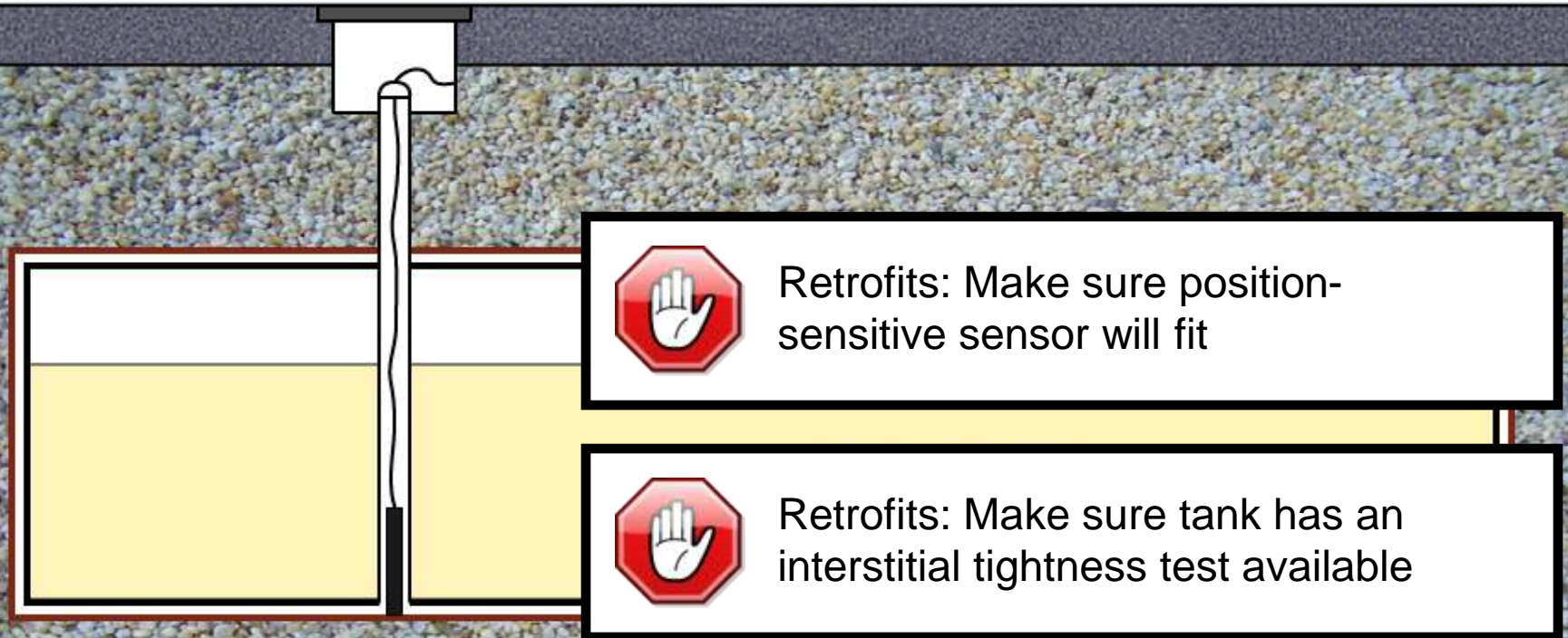
Table 3

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

Tank Capacity (gal.)	Tank Diameter (in.)	Modern Test Time (hrs.)
550	48	2
1000	48	3
1000	64	3
2000	64	4
3000	64	5
4000	64	6
4000	84	6
5000	72	7
5000	84	7

**LIQUID DETECTING SENSOR +
PERIODIC INTERSTITIAL TIGHTNESS TESTS**

UST System Design



**LIQUID DETECTING SENSOR +
PERIODIC INTERSTITIAL TIGHTNESS TESTS**

UST System Design

Piping

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



UST System Design

Piping

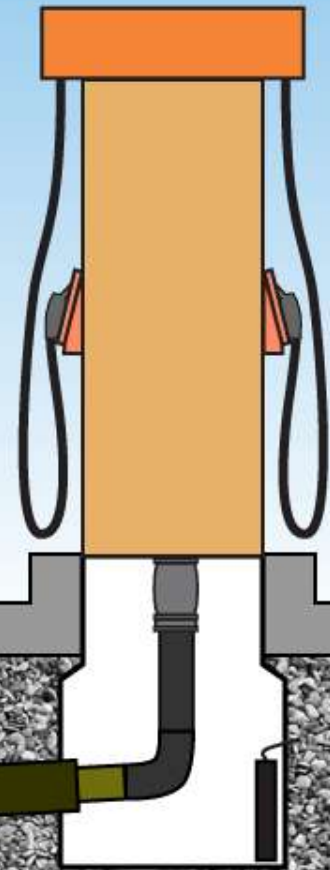
Double-Walled with Continuous Monitoring

- 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



 **Double-Walled Piping**



Piping with Open Interstice

UST System Design

Detectable Tape

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

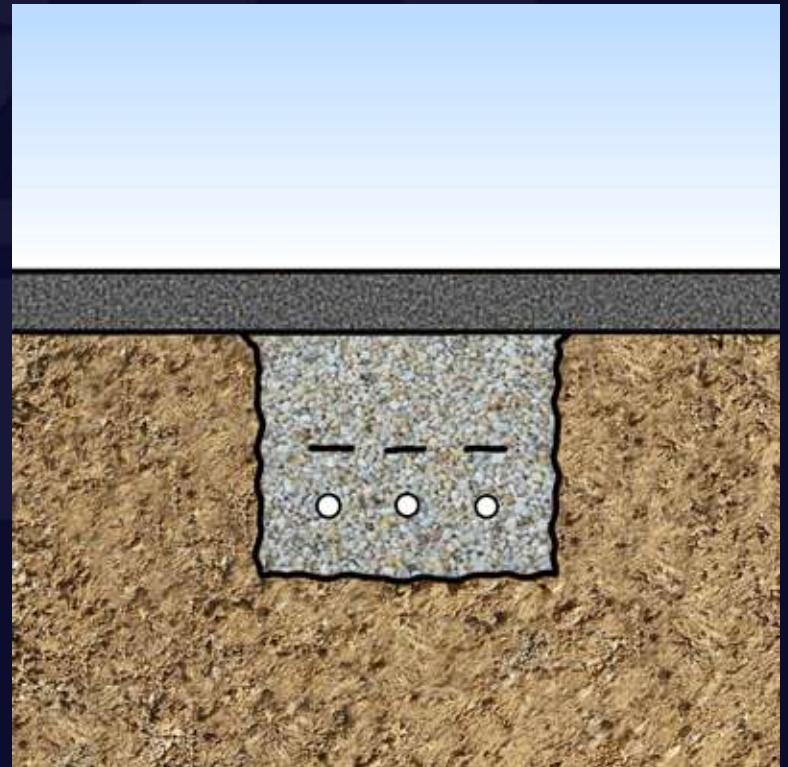


UST System Design

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



UST 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.



UST System Design

Containment Sumps

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



UST System Design

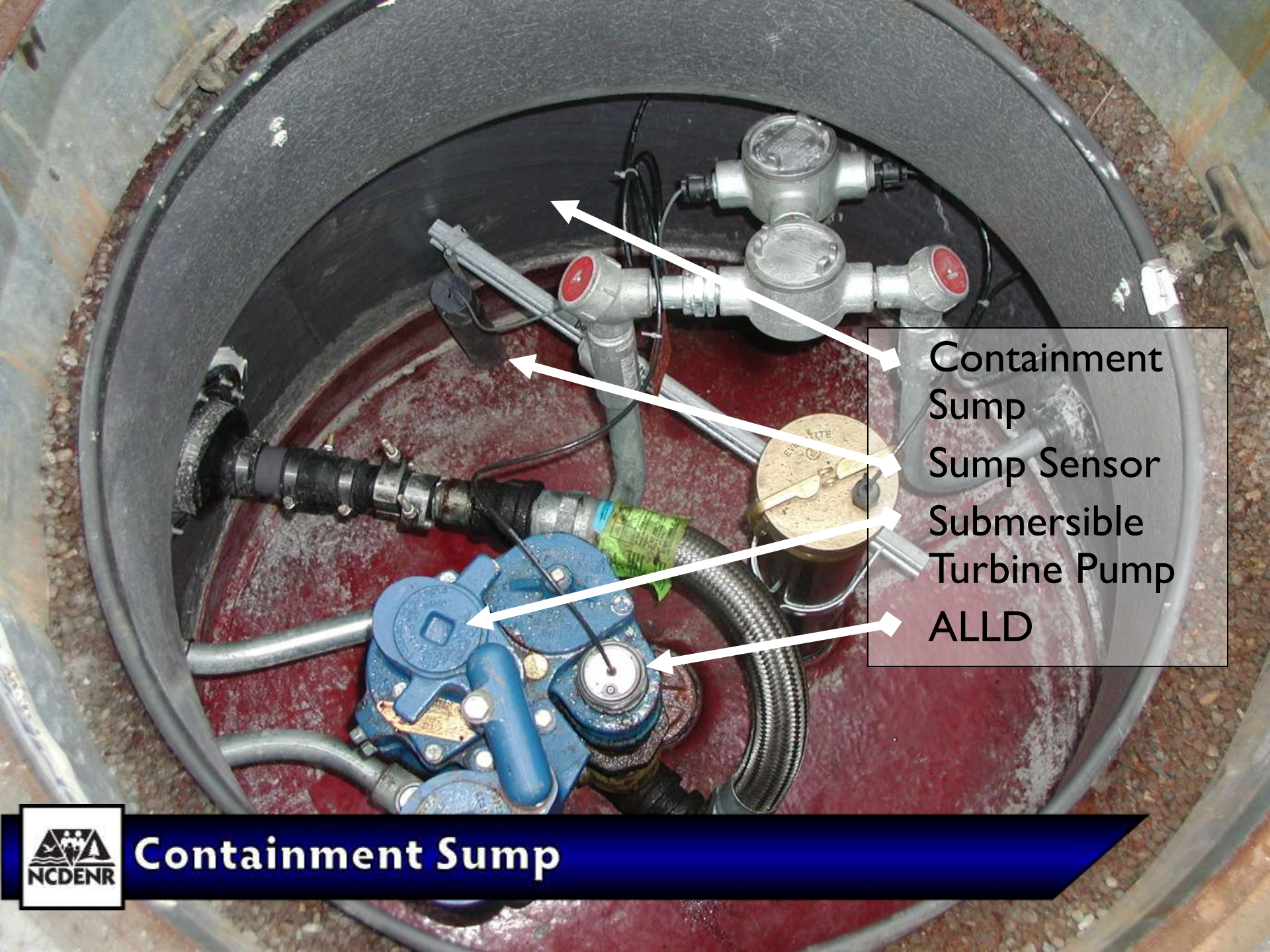
Containment Sumps

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

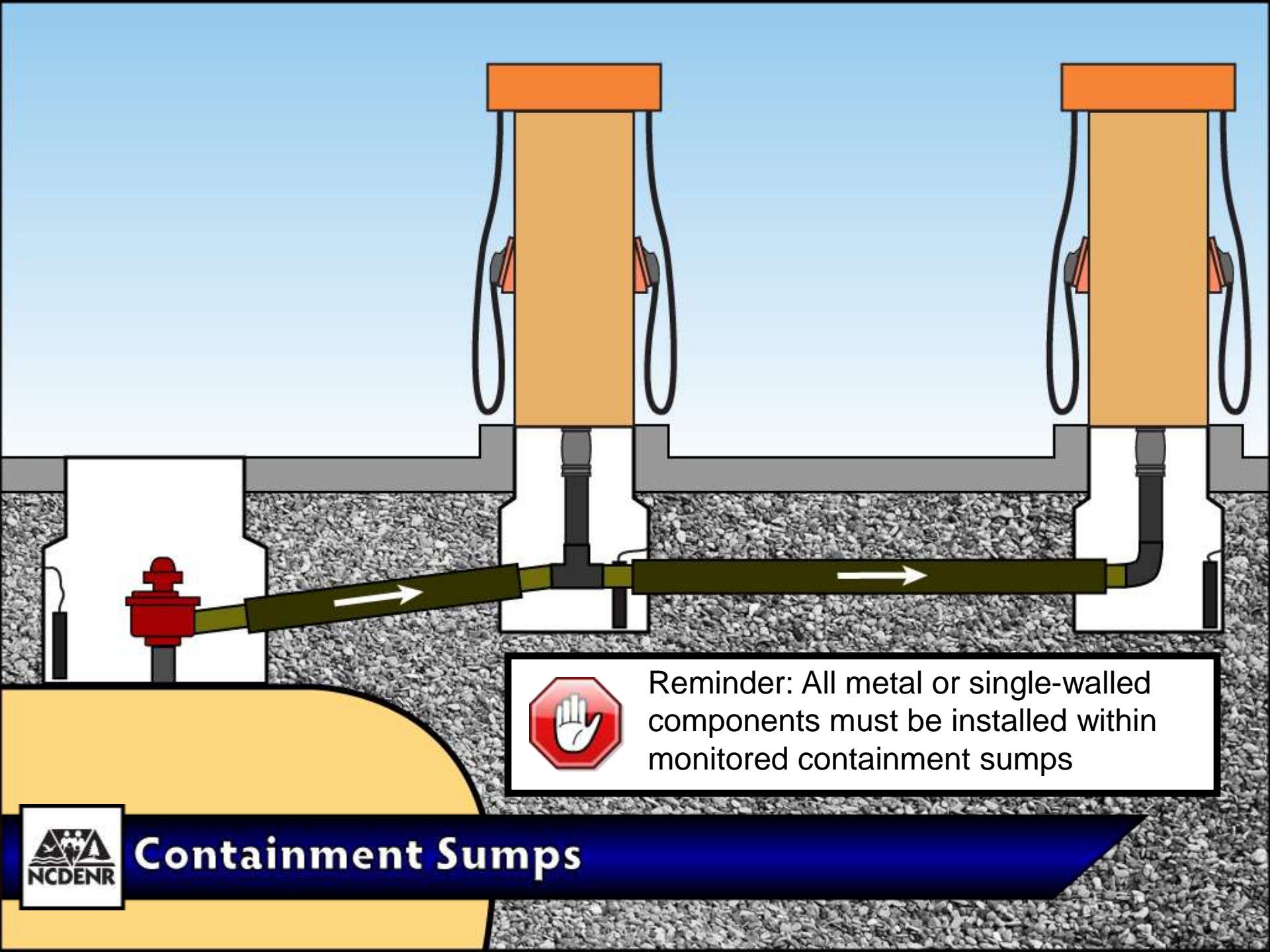




- Containment Sump
- Sump Sensor
- Submersible Turbine Pump
- ALLD




Containment Sump



Reminder: All metal or single-walled components must be installed within monitored containment sumps



Containment Sumps



Spill Buckets

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



Spill Buckets

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



Overflow Prevention

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



Overflow 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



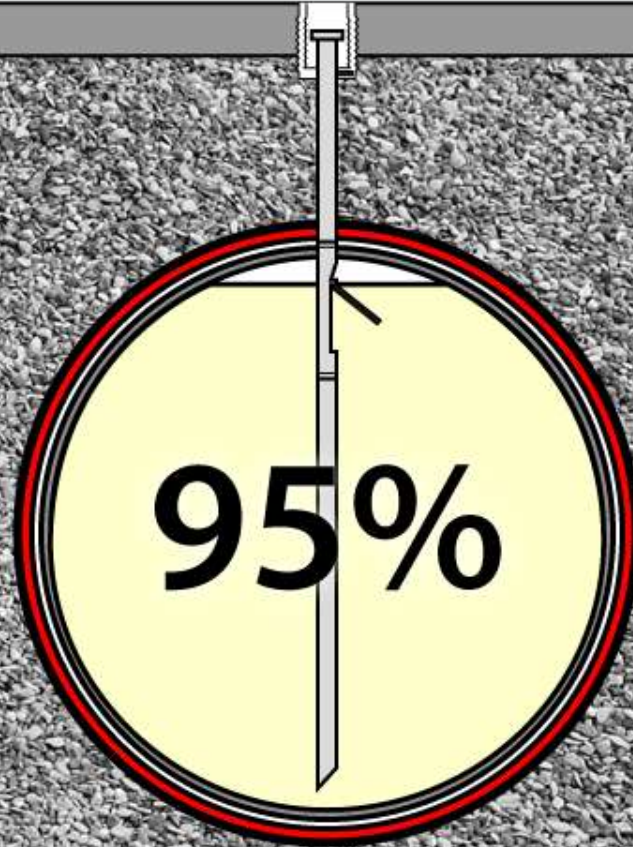
Ball floats cannot be used with gauge opening-style fills



Overfill Prevention (Ball Float)



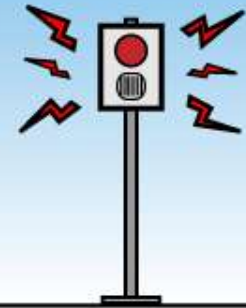
When installing both a flapper valve and ball float, the flapper valve must be installed below the level of the ball float



Overfill Prevention (Flapper Valve)



Overfill alarms must be located within visual/audible distance to fill port



Overfill Prevention (Overfill Alarm)

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

UST System Design

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



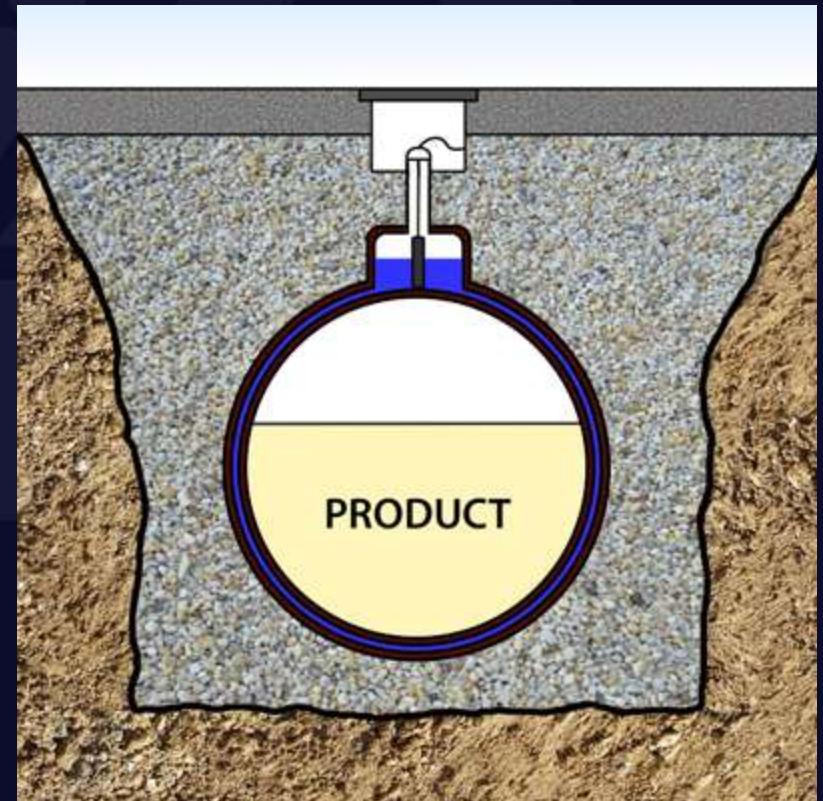
If contamination is discovered during excavation, you must contact the UST Section - Corrective Action Branch at the appropriate NCDENR Regional Office before continuing.

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

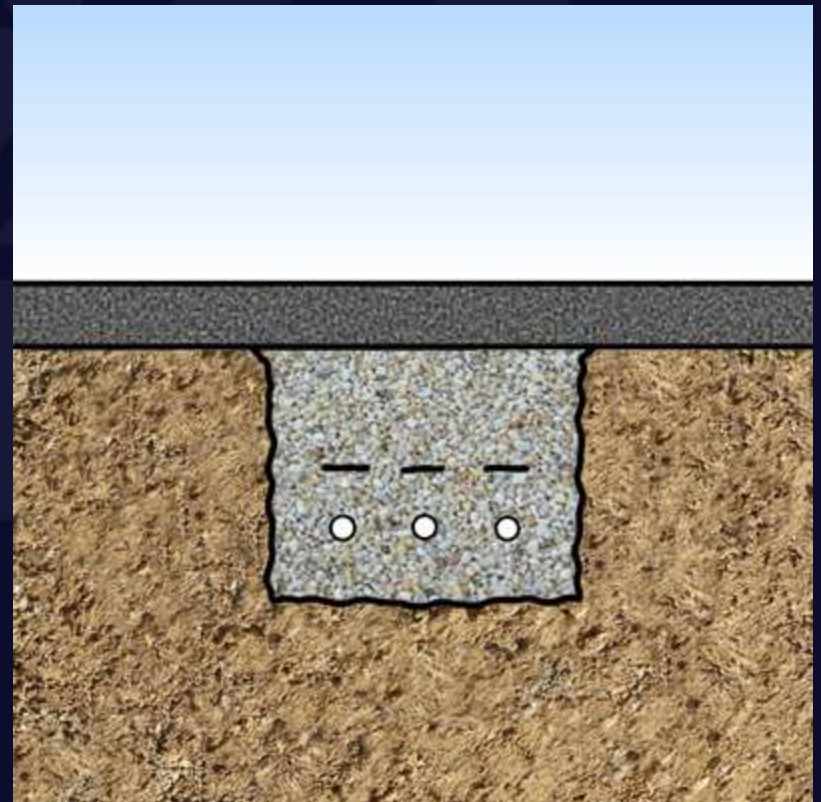


UST System Design

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



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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



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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

NCDENR

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



Questions?

